Table of Contents

Chapter/Section			Page

Chapter/Section			Page

Table of Contents

VOLUME II: Exhibits

1.1 DESCRIPTION OF APPLICANT

WAC 463-42-015 General—Description of applicant. *The applicant shall provide an appropriate description of the applicant's organization and affiliations for this proposal.*

This application for a Site Certification Agreement is made for the construction and operation of the Kittitas Valley Wind Power Project herein referred to as the "Project". The Applicant for the Site Certification Agreement is Sagebrush Power Partners, LLC.

1.1.1 Sagebrush Power Partners, LLC

Sagebrush Power Partners was created as a Delaware Limited Liability Company for the sole purpose of developing, permitting, financing, constructing, owning and operating the Kittitas Valley Wind Power Project. Sagebrush Power Partners, LLC is 100% owned by Zilkha Renewable Energy. Sagebrush Power Partners's address and telephone numbers are as follows:

Sagebrush Power Partners, LLC
c/o Zilkha Renewable Energy
1001 McKinney Street
Suite 1740
Houston, TX 77002
Phone (713) 571-6640
Fax (713) 571-6659

1.1.2 Zilkha Renewable Energy

Zilkha Renewable Energy was formerly International Wind Corporation (IWC). In early 2001, Michael and Selim Zilkha acquired all remaining shares in IWC, and renamed the company Zilkha Renewable Energy. Zilkha Renewable Energy's address and telephone numbers are as follows:

Zilkha Renewable Energy
1001 McKinney Street
Suite 1740
Houston, TX 77002
Phone (713) 571-6640
Fax (713) 571-6659

1.2 DESIGNATION OF AGENT

WAC 463-42-025 General – Designation of agent. *The applicant shall designate an agent to receive communications on behalf of the applicant.*

The designated agent for the Kittitas Valley Wind Power Project EFSEC application for site certification is:

Christopher Taylor
Zilkha Renewable Energy
210 SW Morrison
Suite 310
Portland, OR 97204
Telephone: (503) 222-9400
Facsimile: (503) 222-9404
ctaylor@zilkha.com

1.3 ASSURANCES

WAC 463-42-075 GENERAL-ASSURANCES. *The application shall set forth insurance, bonding or other arrangements proposed in order to mitigate for damage or loss to the physical or human environment caused by Project construction, operation, abandonment, termination, or when operations cease at the completion of the Project's life.*

1.3.1 Insurance Policies

The Applicant will establish or cause to be established and maintained, policies of insurance during the development construction and operation of and for the Kittitas Valley Wind Power Project. Such forms of insurance will be established and maintained as required by state, federal and local ordinance or law, customary business practice and third-party participants and lenders. The following coverage will be included:

1.3.1.1 Commercial General Liability Insurance

The construction contractor, and subcontractors or Applicant, will be required to carry commercial general liability insurance, including products and completed operations in specified amounts to respond to liability and property damage claims arising during the construction and startup phase of the Project.

The Applicant will obtain and maintain in full force and effect, commercial general liability insurance against claims for liability and property damage arising out of the use and occupancy of the premises.

The Applicant will purchase insurance policies to cover liabilities arising from casualty and other major incidents. The insurance industry views facilities such as the Kittitas Valley Wind Power Project as low risk. Therefore, high coverage limits are available at reasonable costs. The potential for damages can be defined. Damages would occur only if engineered safeguards would fail. In many cases, more than one simultaneous failure would be required to produce significant damages.

Upon completion of power plant design, insurance underwriters will evaluate the design and estimate potential damages. In some cases, design changes may be implemented to mitigate the damages.

1.3.1.2 Automobile Insurance

The construction contractor, and subcontractors, will be required to carry automobile liability insurance covering all owned, leased, non-owned and hired automobiles used during the construction and startup phase of the project.

The Applicant will obtain and maintain in full force and effect automobile liability insurance covering owned, non-owned and hired autos.

1.3.1.3 Property Insurance

The Applicant will obtain and maintain, at all times during the term of construction and operation of the Project, physical damage insurance on the buildings and all improvements that are to be erected on the premises on an "all risk" basis including coverage against damage or loss caused by earth movement and flood to the full insurable value of such improvements, if commercially available.

Upon completion of the Project, the Applicant will be required by its customer(s) and lenders to maintain specific forms of business interruption coverage to ensure continued operation of the Kittitas Valley Wind Power Project.

1.3.1.4 Machinery Insurance

The Applicant will obtain and maintain machinery insurance at all times during the term of construction, including testing, and operation of the facility. Coverage will be written on a comprehensive form for all insurable objects, including all production machinery located on or adjacent to the property in a minimum amount equal to the maximum foreseeable loss, and including expediting expenses, extra expense and business income.

1.3.1.5 Worker's Compensation And Washington Stop Gap Liability

The Applicant will fully comply with the worker's compensation and unemployment laws as required with respect to any employees performing work on the subject property and premises. The Applicant will also insure for exposure under Washington Stop Gap Liability. The Applicant will require that the construction contractor and subcontractors working on the Project similarly comply with the worker's compensation and unemployment laws with respect to their employees performing work on the subject property and premises. The Applicant also will require insurance for exposure under Washington Stop Gap Liability.

1.3.2 Environmental Impairment

The Applicant will be responsible, as required by law, for acts of environmental impairment related to the ownership and operation of the Project. Such losses may, in some circumstances, be covered by liability insurance, which the Applicant and/or the construction contractor will carry. In addition, the Applicant and/or its contracted operator will obtain environmental impairment liability insurance to the extent such coverage is commercially available. This insurance will cover the acts of the Applicant and its operators at the project site, consistent with, or in excess of, the then prevailing industry standards for such insurance in the wind power industry. The concept of commercial availability is determined by reference to the norm of the industry.

1.3.3 Project Site Abandonment

If the Project were to terminate operations, the Applicant would obtain the necessary authorization from the appropriate regulatory agencies to decommission the facilities. A Final Site Restoration plan would be developed and submitted to EFSEC for review and approval. Experience in other regions with older wind power projects indicates that a non-operating wind power project does not present any significant threats or risks to public health and safety or environmental contamination.

Experience with older wind plants which have been decommissioned and/or repowered has shown that the scrap value of the materials and equipment contained in the Project infrastructure (steel towers, electric generators, steel, copper, etc.) would exceed the cost of dismantling the Project, based on historic and current scrap prices. The Applicant will provide adequate financial assurances to cover all anticipated costs associated with decommissioning the Project in the form of a rolling reserve account, using funds from the operation of the Project, or a decommissioning surety bond. In all cases, final financial responsibility for decommissioning will rest with the Applicant.

1.4 MITIGATION MEASURES

WAC 463-42-085 General-Mitigation Measures. *The Applicant shall describe the means to be utilized to minimize or mitigate possible adverse impacts on the physical or human environments*

1.4.1 Construction Mitigation Measures

4.1.1.1 Storm Water Pollution Prevention Plan

A detailed construction Storm Water Pollution Prevention Plan (SWPPP) will be developed for the Project to help minimize the potential for discharge of pollutants from the site during construction activities. The SWPPP will be designed to meet the requirements of the Washington state Department of Ecology General Permit to Discharge Storm Water through its storm water pollution control program (Chapter 173-220 WAC) associated with construction activities.

The SWPPP will include both structural and non-structural best management practices (BMPs). Examples of structural BMPs could include the installation of silt curtains and/or other physical controls to divert flows from exposed soils, or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non-structural BMPs include management practices such as implementation of materials handling, disposal requirements and spill prevention methods.

A SWPPP meeting the conditions of the Storm Water General Permit for Construction Activities will be prepared and submitted to EFSEC along with a Notice of Intent (NOI) for construction activities prior to the start of Project construction activities.

Specific elements of the SWPPP are covered in more detail in Section 2.10 Surface Water Runoff and Section 3.3 Water.

1.4.1.2 Fire

The applicant will institute mitigation measures for protection from fire during construction, including negotiating a contract with local fire district(s) to provide fire protection during construction. These mitigation measures are set out in detail in Section 4.1.2, Table 4.1.2.1.

1.4.1.3 Dust Control

Construction of the Project will create fugitive dust and air emissions from construction-related traffic and additional wind-blown dust as a result of ground disturbance. Mitigation measures to limit dust and air emissions during construction are described in Section 3.2.5 Mitigation Measures. These measures include such things as water-based dust suppression to control dust generated by vehicle traffic.

1.4.1.4 Traffic

During construction, roadways and intersections in the vicinity of the Project site will provide an acceptable level of passage for traffic, even during the evening peak traffic periods. However, the following mitigation measures are proposed to further reduce the impact of Project construction on roadway traffic in the region: Adopt and obtain approval for a Traffic Management Plan from EFSEC prior to construction; provide notice to landowners of construction activities; provide road signage; use pilot cars; encourage car pooling; provide flaggers; and provide detour plans. These mitigations are set forth in detail in Section 5.2.5.5.

1.4.1.5 Archaeology and Historic Preservation

The Applicant carried out an archaeological survey that covered all areas within the Project where ground-altering activities are proposed. Two small lithic scatter sites were identified. Both sites will be avoided to prevent any damage.

A qualified archeologist will monitor all ground disturbing activities during the construction process. If a cultural resource feature is encountered, all construction will be halted temporarily in the area of the feature. If human remains/burials are encountered, construction will cease immediately in the area of the burial and the area will be secured and placed off limits for anyone but authorized personnel. The archeologist will notify the relevant authorities concerned with such an inadvertent discovery, specifically including the Yakama Nation. The Yakama Nation has been consulted during the planning process beginning in February of 2002. The Yakama Nation will be notified prior to commencement of construction and be invited to have representatives present during all ground breaking activities. It is anticipated that a stipulation will be made with the Yakama Nation establishing procedures to be followed in the event of any finds during construction.

1.4.1.6 Plants and Animals

As described in detail in Section 3.4.8, Proposed Mitigation Measures for Potential Impacts to Plants and Animals, the Applicant has proposed a comprehensive set of mitigation measures for impacts related to construction of the Project. These include the following:

- Avoidance of construction in sensitive areas such as riparian zones, wetlands, forests, etc.;
- Minimization of new road construction by improving and using existing roads and trails instead of constructing new roads.
- Construction techniques and BMPs to minimize impacts, such as:
- Reseeding of all temporarily disturbed areas with an appropriate mix of native plant species as soon as possible after construction is completed to accelerate the revegetation of these areas and to the prevent spread of noxious weeds.

1.4.1.7 Public Services and Socioeconomic Impacts

Potential impacts to public services and utilities will be mitigated by tax revenues generated by the Applicant. No adverse impacts are expected. However, should there be construction impacts requiring additional staffing levels during construction or other impacts or costs related to services which will not be covered timely by tax revenues, the Applicant will enter into agreement(s) with the respective local governmental agency for prepayment of taxes to offset the cost impacts. This would include fire, police and county roads. Mitigation for potential public services and socioeconomic impacts are described in greater detail in Section 5.3.4, including specific mitigation measures for fire, police and emergency services.

1.4.2 Operation

1.4.2.1 Storm Water Pollution Prevention

The Applicaion will prepare a Storm Water Pollution Prevention Plan to be approved by EFSEC as part of the final design. The Project operations group will be responsible for monitoring the SWPPP measures that were implemnted during construction to ensure they continue to function properly. Final designs for the permanent BMPs will be incorporated into the final construction plans and specifications prepared by the engineering team's civil design engineer. An operations manual for the permanent BMPs will be prepared by the EPC contractor civil design engineer and the Project's enginering team.

The permanent storm water BMPs will include permanent erosion and sedimentation control through site landscaping, grass, and other vegetative cover. The final designs for these permanent BMPs will conform to the Washington Department of Ecology Storm Water Management Manual. The operational storm water mitigations are described in greater detail in Section 3.3.2

1.4.2.2 Fire

The applicant will institute mitigation measures for protection from fire during operation. These mitigation measures are set out in detail in Section 4.1.2, Table 4.1.2.1.

1.4.2.3 Aesthetics, Light and Glare

Mitigation measures that have been made an integral part of the Project's design for aesthetics, light and glare generally include such things as: Restoring temporarily disturbed areas to original condition; using uniform turbine designs and coloring to reduce their visibility; synchronizing aviation lights; utilize a light design that minimizes light propagation and limit their number to the extent allowed by the FAA; and the placement of the electrical collection system underground as much as is feasible. The mitigations measures for aesthetics, light and glare are described in detail in Section 5.1.4.

1.4.2.4 Mitigation for Operations Impacts to Plants and Animals

As described in detail in Section 3.4.8, Proposed Mitigation Measures for Potential Impacts to Plants and Animals, a comprehensive mitigation package for operations impacts to plants and animals is proposed for this Project. It consists of several categories of actions, including:

- Thorough study and analysis to avoid impacts (e.g. avian baseline study, raptor nest survey, rare plant investigation, etc.);
- Project design features to minimize impacts (e.g. use of underground rather than overhead lines, use of bird flight diverters on guy wires, etc.);
- Operational BMPs to minimize impacts (e.g. noxious weed control, fire control plan, removal of livestock carcasses to prevent raptor scavenging, etc.);
- Monitoring and adaptive management to minimize impacts during operations (e.g. establish a Technical Advisory Committee, conduct one year post-construction wildlife monitoring plan, etc.);
- Acquisition and enhancement of a large, contiguous on-site area of good quality habitat that faces immediate threat of development

1.5 SOURCES OF INFORMATION

WAC 463-42-095 General – Sources of information. *The applicant shall disclose sources of all information and data and shall identify all preapplication studies bearing on the site and other sources of information.*

1.5 1 Sources Of Information And Data

The following references, preapplication studies, and sources of information are listed by Application for Site Certification Section. Other sources of information include the Federal, State and Local Laws, Ordinances, Regulations and Standards as listed in **Section 1.6 Pertinent Federal, State, and Local Requirements** and **Section 1.5.2 Studies**.

Sources Of Information For Section 2.1 Site Description

Prominent Geographic Features

US Department of Agriculture (USDA). 2002*a*. Soil Survey Geographic (SSURGO) database for Kittitas County Area, Washington. USDA Natural Resources Conservation Service, Ft.
Worth, Texas.

Western Regional Climate Center, 'Climate of Washington',
http://www.wrcc.sage.dri.edu/narratives/WASHINGTON.htm.

Kittitas Labor Market and Economic Analysis Branch, State of Washington Employment Security Department, June 1998. 'Kittitas County Profile Report'

Franklin, J.F., and C.T. Dryness. 1988. *Natural Vegetation of Oregon and Washington*. USDA Forest Service General Technical Report PNW-8. USDA Forest Service, Portland, OR.

Eagle Cap Consulting, Inc and CH2M Hill, August 2002. An Investigation of Rare Plant Resources Associated with the Proposed Kittitas Valley Wind Power Project (Kittitas County, Washington).

Typical Geological Features

CH2M Hill, November 2002. Geotech Data Report, Kittitas Valley Wind Power Project

Climate Characteristics

National Lightning Detection Network (NLDN)

International Station Meteorological Climate Summary, Ver 4.0, September 1996. Federal Climate Complex

Western Regional Climate Center (WRCC). 2001*a*. Cle Elum, WA: Period of record monthly climate summary: 1931-2001. WRCC, Reno, Nevada. http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?wachee.htm

Wantz and Sinclair 1981, J. Appl. Meteor. 20, 1044-1411

Western Regional Climate Center (WRCC). 2001*b*. Ellensburg, WA: Period of record monthly climate summary: 1901-2001. WRCC, Reno, Nevada. http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?waelle

Kittitas County Web Site (http://www.co.kittitas.wa.us/about/climate.asp)

Wantz and Sinclair, BPA Report, J. Appl. Meteor., 20, 1044-1411.

2.1.5 Land Use and Planning

Kittitas County. 2001. Comprehensive Plan, Volume I.

Kittitas County. 1997. Comprehensive Plan, Volume II.

Kittitas Labor Market and Economic Analysis Branch, State of Washington Employment Security Department, June 1998 , Kittitas County Profile Report.

Sources Of Information For Section 2.2 Legal Descriptions and Ownership Interests

Kittitas County Assessor's Office Records.

Sources Of Information For Section 2.4 Energy Transmission Systems

Bonneville Power Administration. April 1999. Technical Requirements for the Interconnection Of Generation Resources.

Bonneville Power Administration. March 2000. Connection of Transmission Lines and Loads.

Sources Of Information For Section 2.13 Construction Management

Code of Federal Regulations Title 8. General Industry Safety Orders, Construction Safety Orders, and High Voltage Safety Orders.

Code of Federal Regulations Title 29, Part 1926. General Industry Safety Orders.

National Fire Protection Association. 1994. A Compilation of NFPA Codes, Standards, Recommended Practices And Guides. Quincy, Massachusetts.

National Safety Council. 1992. Accident Prevention Manual, Volume 2, Chapter 6, Fire Protection.

Sources Of Information For Section 2.15 Protection From Natural Hazards

Bauer, H.H., and A.J. Hansen. 2000. *Hydrology of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho.* Department of the Interior, U. S. Geologic Survey, Water-Resources Investigations Report 96-4106, p.61.

Federal Emergency Management Agency. 1997. NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures, Part 1 - Provisions, 1997 Edition, FEMA 302, Washington, D. C.

Freeman, O.W., J.O. Forrester, and R.I. Lupher. 1945. "Physiographic Divisions of the Columbia Intermountane Province." *Annual of the Association of American Geographrs*. Vol. 35, No. 2. p. 50-75.

Geomatrix. 1995. Final Report, Seismic Design Mapping, State of Oregon. Report prepared for the Oregon Department of Transportation, Project No. 2442.

Meyer, C.W., and S.M. Price. 1979. Geologic Studies of the Columbia Plateau, A Status Report: Rockwell International, Rockwell Hanford Operations RHO-BWI-ST-4.

Molinari, M.P. 1999. Rebuttal Testimony of Mark P. Molinari, *In Re* Application No 96-1., Olympic Pipeline Company, Cross Cascade Pipeline Project. Issue; Earthquakes and Seismicity, Erosion Sponsor, Olympic Pipeline Company.

Noson, L.L., A. Qamar, and G.W. Thorsen. 1986. Washington State Earthquake Hazards

Washington Division of Geology and Earth Resources. Information Circular 85.

Reidel, S.P. 1982. Stratigraphy of the Grande Ronde Basalt, Columbia River Basalt Group, from the Lower Salmon River and Northern Hells Canyon Area, Idaho, Oregon, and Washington; *in* Bill Bonnichsen and R.M. Breckenridge, eds., Cenozoic Geology of Idaho. Idaho Bureau of Mines and Geology Bulletin 26, p. 77-101

Soil Survey Division, Natural Resources Conservation Service, U. S. Department of Agriculture. Official Soil Series Descriptions [Online WWW]. Available URL: " http://ortho.ftw.nrcs.usda.gov/osd/" [Accessed 11 November 2002].

Tabor, R.W., Waitt, Jr., R.B., Frizzell, V.A., Swanson, D.A., Byerly, G.R., and Bentley, R.D. 1982. Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington. Department of the Interior, U. S. Geologic Survey, Miscellaneous Investigations Series, Map I-1311.

Uniform Building Code. 1997.

U. S. Geological Survey (USGS). 2002. National Earthquake Information Center. URL http://neic.usgs.gov.

U. S. Geological Survey (USGS). 2002. Active and Potentially Active Volcanoes in Washington State. http://vulcan.wr.usgs.gov/Vhp/C1073/active_volcanoes_washington.html.

U. S. Geological Survey (USGS). 1981. *The Severity of an Earthquake, a U. S. Geological Survey General Interest Publication.* U.S. Government Printing Office: 1989-288-913.

Williams. M., 2002. The Ellensburg Blue Agate**.** *Ore-bits, Clallam County Gem and Mineral Society*. Vol. 47, Issue 8. August 2002.

Sources Of Information For Section 2.16 Security Concerns

Telephone conversation with Curt Maloy of WindPro Insurance, Inc. of Palm Desert, CA – Dec. 18, 2002

Sources Of Information For Section 3.1 Earth

Freeman, O.W. Forrester, J.O., and Lupher, R.I., 1945. Physiographic divisions of the Columbia Intermountane Province. Annual of the Association of American Geographers, v. 35, no. 2, p. 50-75.

Geomatrix. 1995. *Final Report, Seismic Design Mapping, State of Oregon*. Report prepared for the Oregon Department of Transportation, Project No. 2442.

Tabor, R.W., Waitt, Jr., R.B., Frizzell, V.A., Swanson, D.A., Byerly, G.R., and Bentley, R.D. 1982. Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington. Department of the Interior, United States Geologic Survey, Miscellaneous Investigations Series, Map I-1311.

Uniform Building Code. 1997.

Sources Of Information For Section 3.2 Air

U.S. Environmental Protection Agency, 2000. *Compilation of Air Pollutant Emission Factors,* Fifth Edition.

Walla Walla County, 2000. *Final SEPA EIS for FPL Energy's Stateline Wind Project,* Section 1.1.4.

U.S. Environmental Protection Agency. 2000. *National Air Pollutant Emission Trends, 1900-1998*. Office of Air Quality, EPA-454/R-00-002. Environmental Protection Planning and Standards March 2000. Agency Research Triangle Park, NC 27711.

Sources Of Information For Section 3.3 Water

Bauer, H.H., and A.J. Hansen. 2000. Hydrology of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho. U. S. Geologic Survey, Water-Resources Investigations Report 96-4106, 61 p.

Bauer, H.H., and J.J. Vaccaro. 1990. Estimates of Ground-water Recharge to the Columbia Plateau Regional Aquifer System, Washington Oregon, and Idaho, for Predevelopment and Current Land-use Conditions. U. S. Geologic Survey, Water-Resources Investigations Report 88-4018, 37 p., 2 plates.

Hansen, A.J., J.J. Vaccaro, and H.H. Bauer. 1994. Ground-water Flow Simulation of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho. U. S. Geologic Survey, Water-Resources Investigations Report 91-4178, 81 p., 15 sheets.

Lane, R.C., and K.J. Whiteman. 1986. Ground-water Levels Spring 1985, and Ground-water Level Changes Spring 1983 to Spring 1985, in Three Basalt Units Underlying the Columbia Plateau, Washington and Oregon. U. S. Geologic Survey, Water-Resources Investigations Report 88-4018, 4 sheets.

Whiteman, K.J., 1986. Ground-water Levels in Three Basalt Hydrologic Units Underlying the Columbia Plateau in Washington and Oregon, Spring 1984. U. S. Geologic Survey, Water-Resources Investigations Report 86-4046, 4 sheets.

Sources Of Information For Section 3.4 Plants And Animals

Eagle Cap Consulting, and CH2M Hill. 2003. An Investigation of Rare Plant Resources Associated with the Proposed Kittitas Valley Wind Power Project (Kittitas County, Washington).

Beck, Kathryn (Calypso Consulting Botanist). 2001. Telephone conversation with R. Krichbaum (ECCI) on May 24, 2001.

Bonneville Power Administration (BPA). 2002. Maiden Wind Farm Draft Environmental Impact Statement (March 29, 2002). Bonneville Power Administration, Portland, Oregon.

Cassidy, K. M., M. R. Smith, C. E. Grue, K. M. Dvornich, J. E. Cassady, K. R. McAllister, and R. E. Johnson. 1997. Gap Analysis of Washington State: An evaluation of the protection of biodiversity. Volume 5 in Washington State Gap Analysis - Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.). Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle. 192 pp.

Dames & Moore Consultants. 1997*a*. Biological Evaluation for the Olympic Cross Cascade

Pipeline Project (February 28, 1997). Washington Energy Facility Site Evaluation Council, Olympia, Washington.

Dames & Moore Consultants. 1997*b*. Vegetation Report for the Olympic Cross Cascade Pipeline Project (February 28, 1997). Washington Energy Facility Site Evaluation Council, Olympia, Washington. Daubenmire, R. 1970. Steppe vegetation of Washington. Originally Agriculture Experiment Station Publication XT0062. Reprinted in 1988 as EB1446, Department of Agriculture and Home Economics, Washington State University, Pullman. 132 pp.

Downs, Janelle (PNL Botanist). 2001. Personal communication with R. Krichbaum (ECCI) on May 24, 2001.

Eagle Cap Consulting Inc. (ECCI). 2002. Unpublished database of Northwest plant species. Eagle Cap Consulting Inc., Beaverton, Oregon.

Flora ID Northwest. 2001. Computer-based expert ID system for the plants of the Northwest. Flora ID Northwest, Pendleton, Oregon.

Franklin, Jerry F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 452 pp.

Hickman, James C. *ed*. 1993. The Jepson manual. University of California Press, Berkeley, California. 1,400pp.

Hitchcock, C. Leo, and Arthur Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Washington. 730pp.

Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey, and J.W. Thompson. 1964. Vascular plants of the Pacific Northwest (5 volumes). University of Washington Press, Seattle, Washington.

Pacific Northwest National Laboratory (PNL). 2000. Hanford Site: Ecosystem Monitoring Project: Hanford Site Species Listings: Plants (last updated December 11, 2000). PNL, Richland, Washington.

Simmons, Dr. Sally A. (Washington State University Botanist, Richland Campus) 2001. Personal communication with R. Krichbaum (ECCI) on May 24, 2001.

US Department of Agriculture (USDA). 2002*a*. Soil Survey Geographic (SSURGO) database for Kittitas County Area, Washington. USDA Natural Resources Conservation Service, Ft. Worth, Texas.

US Department of Agriculture (USDA). 2002*b*. The PLANTS Database: Version 3.5. National Plant Data Center, Baton Rouge, LA. http://plants.usda.gov

US Fish and Wildlife Service (USFWS). 2002. Letter to Wally Erickson (WEST Inc.) from Mark G. Miller (USFWS Supervisor: Ephrata, Washington, Ecological Services Office) dated July 9, 2002.

US Fish and Wildlife Service (USFWS). 2001. Section 7 Guidelines – Snake River Basin Office: *Spiranthes diluvialis* Ute Ladies'-tresses (threatened): dated April 24, 2001. USFWS Snake River Basin Office, Boise, Idaho.

US Forest Service (USFS) and Washington Energy Facility Site Evaluation Council. 1998. Draft Environmental Impact Statement: Olympic Cross Cascade Pipeline (September 1998). Washington Energy Facility Site Evaluation Council, Olympia, Washington.

Washington Natural Heritage Program (WNHP). 2002*a*. Rare plant species with ranks: Plants tracked by the Washington Natural Heritage Program (January 2002). WNHP, Olympia, Washington. http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/lists/plantrnk.html

Washington Natural Heritage Program (WNHP). 2002*b*. Letter to Greg Johnson (WEST Inc.) from Sandy Swope Moody (WNHP Environmental Coordinator) dated April 3, 2002.

Washington Natural Heritage Program (WNHP). 2002*c*. Definitions of terms used by Natural Heritage Methodology. WNHP, Olympia, Washington. http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/lists/stat&rank.html

Washington Natural Heritage Program (WNHP). 1999. Field Guide to Selected Rare Vascular Plants of Washington. Washington Department of Natural Resources, Olympia, Washington.

Western Regional Climate Center (WRCC). 2001*a*. Cle Elum, WA: Period of record monthly climate summary: 1931-2001. WRCC, Reno, Nevada. http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?wachee

Western Regional Climate Center (WRCC). 2001*b*. Ellensburg, WA: Period of record monthly climate summary: 1901-2001. WRCC, Reno, Nevada. http://www.wrcc.dri.edu/cgibin/cliMAIN.pl?waelle

Erickson, W.P., Jeffrey, J., Young, Jr, D.P, Bay K., Good, R., Sernka, K.J. and K. Kronner. 2003. Wildlife Baseline Study for the Kittitas Valley Wind Project, Summary of Results from 2002 Wildlife Surveys, Final Report February 2002– November 2002.

American Wind Energy Association. 1995. Avian interactions with wind energy facilities: a summary. Prepared by Colson & Associates for AWEA, Washington, D.C.

Brown, C. G. 1992. Movement and migration patterns of mule deer in southeastern Idaho. *Journal of Wildlife Management* 56: 246-253.

Crockford, N.J. 1992. A review of the possible impacts of wind farms on birds and other wildlife. JNCC Report No. 27. Joint Nature Conservancy Committee, Peterborough, UK. 60pp.

Eagle Cap Consulting and CH2M HILL. 2002. An investigation of rare plant resources associated with the proposed Kittitas Valley wind power project (Kittitas County, Washington).

England, A.E. 2000. North American Bat Ranges. U.S. Geological Survey. Map format.

Erickson, W. P., G. D. Johnson, D. P. Young, Jr., M. D. Strickland, R. E. Good, M. Bourassa, K. Bay. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind developments. Technical Report prepared for Bonneville Power Administration, Portland, Oregon.

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young, Jr., K. J. Sernka and R. E. Good. 2001. Avian collisions with wind turbines: A summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee Publication. http://www.nationalwind.org/pubs/default.htm

Erickson, W. P., G. D. Johnson, M. Dale Strickland, and Karen Kronner. 2000. Avian and bat mortality associated with the Vansycle Wind Plant, Umatilla County Oregon. 1999 study year. Technical report submitted to Umatilla County Department of Resource Services and Development, Pendleton, Oregon. 22 pp.

Fitzner, R.E and R.H Gray. 1991. The status, distribution, and ecology of wildlife on the U.S. DOE Hanford Site: A historical overview of research activities. *Environmental Monitoring and Assessment* 18:173-202.

FPL Energy Inc., W.P. Erickson and K. Kronner. 2001. Avian and bat monitoring plan for the Washington portion of the Stateline Wind Project. Technical Report prepared for Walla Walla Regional Planning Department. May, 2001.

Franklin, Jeny F. and C.T. Dyrness. 1988. *Natural Vegetation of Oregon and Washington*. Oregon State University Press, Corvallis, Oregon.

Johnson, G.D., M.K. Perlik, W.P. Erickson, M.D. Strickland, D.A. Shepherd, and P. Sutherland, Jr. 2003. Bat interactions with wind turbines at the Buffalo Ridge, Minnesota Wind Resource Area. Electric Power Research Institute, Concord, California. In Press.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. *Wildlife Society Bulletin* 30:879-887.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd and D. A. Shepherd. 2000a. Avian monitoring studies. Buffalo Ridge, Minnesota Wind Resource Area, 1996-1999, results of a 4-year study. Technical Report prepared for Northern States Power Co., Minneapolis, MN. 212 pp.

Johnson, G.D., D.P. Young, Jr., C.E. Derby, W.P. Erickson, M.D. Strickland, and J.W. Kern. 2000b. Wildlife Monitoring Studies, SeaWest Windpower Plant, Carbon County, Wyoming, 1995-1999. Tech. Rept. prepared by WEST for SeaWest Energy Corporation and Bureau of Land Management. 195pp.

Karlsson, J. 1983. Interactions between birds and aerogenerators. Lund, Ekologihuset.

Larsen, J.K. and J. Madsen. 2000. Effects of wind turbines and other physical elements on field utilization by pink-footed geese (Anser brachyrhynchus): A landscape perspective. *Landscape Ecology* 15:755-764.

Leddy, K.L. 1996. Effects of wind turbines on nongame birds in Conservation Reserve Program grasslands in southwestern Minnesota. M.S. Thesis, South Dakota State Univ., Brookings. 61pp.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. *Wilson Bulletin* 111:100-104.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho. 332 pp.

Orloff, S., and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final report to Alameda, Costra Costa, and Solano Counties and the California Energy Commission. Biosystems Analysis, Inc. Tiburon, CA.

Osborn, R.G., C.D. Dieter, K.F. Higgins, and R.E. Usgaard. 1998. Bird flight characteristics near wind turbines in Minnesota. *Am. Midl. Nat*. 139:29-38.

Pederson, M.B. and E. Poulsen. 1991. Impact of a 90m/2MW wind turbine on birds – avian responses to the implementation of the Tjaereborg wind turbine at the Danish Wadden Sea. Dansek Vildundersogelser, Haefte 47. Miljoministeriet & Danmarks Miljoundersogelser.

Phillips, J.F. 1994. The effects of a windfarm on the upland breeding bird communities of Bryn Titli, Mid-Wales: 1993-1994. Royal Society for the Protection of Birds, The Welsh Office, Bryn Aderyn, The Bank, Newton, Powys.

Reeve, A. F. and F. G. Lindzey. 1991. Evaluation of mule deer winter mortality in south-central Wyoming. Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY. 147 pp.

Rost, G. R. and J. A. Bailey. 1979. Distribution of mule deer and elk in relation to roads. *Journal of Wildlife Management* 43(3): 634-641.

Short, H. L. 1981. Nutrition and metabolism. Pages 99-127 *in* O.C. Wallmo, editor. Mule and black-tailed deer of North America. University of Nebraska Press, Lincoln, NE.

Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding birds of Washington state, location data and predicted distributions. Seattle Audubon Society Publications in Zoology No. 1. Seattle. 538 pp.

Stephenson, T. R., M. R. Vaughan, and D. E. Andersen. 1996. Mule deer movements in response to military activity in southeast Colorado. *Journal of Wildlife Management* 60: 777-787.

The Nature Conservancy. 1999. Biodiversity Inventory and Analysis of the Hanford Site: Final Report 1994-1999. The Nature Conservancy of Washington, Seattle, Washington. Van Dyke, F. and W.C. Klein. 1996. Response of elk to installation of oil wells. *Journal of Mammalogy* 77(4): 1028-1041.

Vauk, G. 1990. Biological and ecological study of the effects of construction and operation of wind power sites. Jahrgang/Sonderheft, Endbericht. Norddeutsche Naturschutzakademie, Germany.

Washington GAP Analysis Project. Washington Cooperative Fish and Wildlife Research Unit (WCFWRU). 1999. University of Washington, Seattle, Washington http://www.fish.washington.edu/naturemapping/wagap/public_html/index.html

West, S.D., R. Gitzen, and J.L. Erickson. 1998. Hanford Vertebrate Survey: Report of Activities for the 1997 Field Season. Technical Report to The Nature Conservancy of Washington.

West, S.D., R. Gitzen, and J.L. Erickson. 1999. Hanford Vertebrate Survey: Report of Activities for the 1998 Field Season. Technical Report to The Nature Conservancy of Washington.

Winkelman, J.E. 1989. Birds at a windpark near Urk: bird collision victims and disturbance of wintering ducks, geese and swans. Rijksinstituut voor Natuurbeheer, Arnhem. RINRapport 89/15.

Winkelman, J.E. 1990. Disturbance of birds by the experimental wind park near Oosterbierum (Fr.) during building and partly operative situations [1984-1989]. RIN-report 90/9, DLO-Institute for Forestry and Nature Research, Arnhem.

Winkelman, J. 1992. The impact of the SEP wind park near Oosterbierum (Fr.), the Netherlands, on birds, 4: Disturbance. RIN-report 92/5, DLO-Institute for Forestry and Nature Research, Arnhem.

Winkelman, J.E. 1994. Bird/wind turbine investigations in Europe. Pp. 43-47 in *Proceedings of the National Avian-Windpower Planning Meeting.* National Wind Coordinating Committee/RESOLVE. Washington, D.C.

Wood, A. 1988. Use of shelter by mule deer during winter. Prairie Naturalist 20: 15-22.

Young, D. P. Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and J. P. Eddy. 2002. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming: November 1998 - June 2000. Technical Report prepared by WEST, Inc. for Pacificorp, Inc., SeaWest Windpower, Inc. and the U.S. Bureau of Land Management.

Erickson, W.P., Young, Jr, D.P, and K.J. Sernka. 2003. Draft Biological Assessment: Endangered, Threatened, Proposed and Candidate Species, Zilkha Renewable Energy Kittitas Valley Wind Power Project.

Arcata Fish and Wildlife Office (AFWO). 2001. Species profile: Northern Spotted Owl, *Strix occidentalis caurina*. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, CA

Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In The Birds of North America, No. 506. (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Carbyn, L. N. 1987. Gray wolf and red wolf. Pages 358-376 in M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch (eds.). Wild Furbearer Management and Conservation in North America.

Cederholm, D. J., D. H. Johnson, R. E. Bilby, L. G. Dominguez, A. M. Garrett, W. H. Graeber, E. L. Greda, M. D. Kunze. 2002. Pacific Salmon and Wildlife - Ecological Contexts, Relationships, and Implications for Management. Pages 628-684 in Honson, D. H. and T. A. Neil. 2001. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Eagle Cap Consulting, Inc. and CH2M Hill. 2002. An investigation of rare plant resources associated with the proposed Kittitas Valley wind power project (Kittitas County, Washington). Technical report prepared by Eagle Cap Consulting, Inc., Beaverton, Oregon and CH2M Hill, Portland, Oregon. August 20, 2002.

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young, Jr., K. J. Sernka and R. E. Good. 2001. Avian collisions with wind turbines: A summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee Resource Publication.

Erickson, W., J. Jeffrey, D. Young, K. Bay, R. Good, and K. Sernka. 2003. Ecological Baseline Study for the Kittitas Valley Wind Project Summary of Results from 2002 Wildlife Surveys Final Report February 2002– November 2002. Technical Report prepared for: Zilkha Renewable Energy, Portland, OR. Prepared by: Western EcoSystems Technology, Inc., Cheyenne, WY.

Fraley, J.J. and B.B. Shepard. 1989. Life history, ecology, and population statue of bull trout (*Salvelinus confluentus*) in the Flathead Lake and River system, Montana. *Northwest Science* 63: 133-143. *In:* USFWS 1998a.

Franklin, J.F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 452 pp

Goetz, F. 1989. Biology of the bull trout (*Salvelinus confluentus*): a literature review. U. S. Department of Agriculture, Forest Service, Willamette National Forest, Eugene, OR. In: USFWS 1998a.

Green, N.F. 1985. The bald eagle. *Audubon Wildl. Rep*. 1985. Pages 508-531.

Gutiérrez, R. J., A. B. Franklin, and W. S. Lahaye. 1995. Spotted Owl (*Strix occidentalis caurina*). *In* The Birds of North America, No. 506. (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hays, D. W., M. J. Tirhi, and D. W. Stinson. 1998. Washington state status report for the sage grouse. Washington Department Fish and Wildlife, Olympia. 62 pp.

Hansen, A. J., M. I. Dyer, H. H. Shugart, and E. L. Boeker. 1986. Behavioral ecology of bald eagles along the northwest coast: landscape perspective. Oak Ridge Nat. Lab. Environmental Science Div. Publ. No. 2,548. Oak Ridge, TN.

Harmata, A. R. 1989. Bald Eagle *Haliaeetus leucocephalus*. Pages 65-67 *in*: T.W. Clark, A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves (eds.). Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. Northern Rockies Conservation Cooperative, Jackson, Wyoming. 186 pp.

Harmata, A. R., and R. Oakleaf. 1992. A management oriented study of bald eagle ecology in the Greater Yellowstone Ecosystem. Wyoming Game and Fish Department, 1 December 1992.

Hodges, J. I., E. L. Boeker, and A. J. Hansen. 1987. Movements of radio-tagged bald eagles, *Haliaeetus leucocephalus*, in and from southwestern Alaska. *Can. Field Nat.* 101:136-140.

Montana Bald Eagle Working Group (MBEWG). 1986. Montana bald eagle management plan. U. S. Department of the Interior, Bureau of Land Management, Billings, MT.

Quigley, T. M. and S. J Arbelbide, eds. 1997. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Vol. III. USDA-FS, Gen. Tech. Rep. PNW-GTR-405. Pacific Northwest Research Station, Portland, OR.

Rieman, B. E. and J. D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. *Transactions of the American Fisheries Society* 124:285-296.

Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding birds of Washington state location data and predicted distributions. Seattle Audubon Society Publications in Zoology No. 1. Seattle 538 pp.

Stinson, D. W., J. W. Watson, and K. R. McAllister. 2001. Washington State Status Report for the Bald Eagle. Washington Department of Fish and Wildlife, Olympia. 92 pp.

Tucker, P.A., D.L. Davis, and R.R. Ream. 1990. Wolves, identification, documentation, population monitoring and conservation considerations. National Wildlife Federation, Northern Rockies Natural Resource Center, Missoula, Montana. 28 pp.

U. S. Department of Agriculture Forest Service (USDA FS). 1977. Bald eagle habitat management guidelines. USDA FS, San Francisco, CA.

U. S. Fish and Wildlife Service. 1978. Determination of Certain Bald Eagle Populations as Endangered or Threatened. Federal Register 43:6230-6233

U. S. Department of Interior Fish and Wildlife Service. 1990. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Northern Spotted Owl; Final Rule. Federal Register 55(123):26114-26194.

U. S. Fish and Wildlife Service. 1992. Endangered and Threatened Wildlife and Plants: Final Rule to List the Plant *Spiranthes diluvialis* as a Threatened Species. Fed. Reg. 57(12): 2048-2054.

U. S. Fish and Wildlife Service. 1995a. Recommendations and guidelines for Ute ladies'-tresses orchid (*Spiranthes diluvialis*), Recovery and fulfilling Section 7 Consultation responsibilities. U.S. Fish and Wildlife Service. 7pp + attachments.

U. S. Fish and Wildlife Service. 1995b. Endangered and Threatened Wildlife and Plants; Final Rule to Reclassify the Bald Eagle from Endangered to Threatened in All of the Lower 48 States. Fed. Reg. 60(133):36000-36010.

U. S. Fish and Wildlife Service. 1998a. Gray Wolf, *Canis lupus*. U. S. Fish and Wildlife Service, http://www.fws.gov July 1998

U. S. Fish and Wildlife Service. 1998b. Endangered and threatened wildlife and plants; determination of threatened status for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register: June 10, 1998 Vol. 63, Number 111.

U.S. Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife. Federal Register 64(128):36454-36464.

U. S. Fish and Wildlife Service. 2000a. The Endangered Species Act and Candidate Species. U. S. Fish and Wildlife Service, Division of Endangered Species, Arlington, Virginia. 1p.

U. S. Fish and Wildlife Service. 2000b. Endangered and Threatened Wildlife and Plants; Proposal to Reclassify and Remove the Gray Wolf from the List of Endangered and Threatened Wildlife in Portions of the Conterminous United States; Proposal to Establish Three Special Regulations for Threatened Gray Wolves; Proposed Rule. Fed. Reg. 65(135):43450-43496.

U. S. Fish and Wildlife Service. 2001. Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petition to List Yellow-Billed Cuckoo (*Coccyzus americanus*) in the Western Continental United States. Federal Register 66(143):38611-38626, July 25, 2001.

Washington Cooperative Fish and Wildlife Research Unit (WCFWRU). 1999. Washington GAP Analysis Project. University of Washington, Seattle, Washington .http://www.fish.washington.edu/naturemapping/wagap/public_html/index.html

Washington Department of Fish and Wildlife. 1999. Wolves in Washington: Fact Sheet, June 1999. Washington Department of Fish and Wildlife, Olympia. 2pp.

Washington Department of Fish and Wildlife, Priority Habitats and Species Database (WDFW PHS). 2002. Habitat and Species Maps for Townships: T18N, R16E; T18N, R17E; T18N, R18E; T19N, R16E; T19N, R17E; T19N, R18E; T20N, R16E; T20N, R17E; and T20N, R18E.

Washington Natural Heritage Program (WNHP). 1999. Field guide to selected rare plants of Washington. Washington Department of Natural Resources, Natural Heritage Program and U. S. Department of Interior, Bureau of Land Management.

Watson, G. and T. W. Hillman. 1997. Factors affecting the distribution and abundance of bull trout: an investigation at hierarchial scales. *North American Journal of Fisheries Management* 17:237-252. *In:* USFWS 1998a.

Watson, J. W., D. W. Stinson, K. E. McAllister, and T. E. Owens. 2002. Population status of bald eagles breeding in Washington at the end of the 20th century. *Journal of Raptor Research* 36(3):161-169.

Young, D. P. Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and J. P. Eddy. 2002. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming: November 1998 - June 2000. Technical Report prepared by WEST, Inc. for Pacificorp, Inc., SeaWest Windpower, Inc. and Bureau of Land Management.

Sources Of Information For Section 3.5 Energy and Natural Resources

Energy Center of Wisconsin, “Net Energy Payback and CO2 Emissions from Wind-Generated Electricity in the Midwest”, 1999.

Erik Grum-Schwensen, Spring 1990. "The Real cost of Wind Turbine Construction," *Wind Stats*, Vol. 3, No. 2, pp 1-2.

Gydesen. D. Maimann. P. B. Pedersen. "Renere Teknologi pa Energiomradet," Energigruppen, Fysisk Laboratorium III, Danmarks Tekniske Hoejskole, Miljoeministeriet, Miljoeprojekt Nr. 138, Denmark, 1990, pp. 123-127.

G. Hagedorn. F. Ilmberger,. "Kumulierter Energieverbrauch fuer die Herstellung von Windkraftanlagen," Forschungsstelle fuer Energiewirtschaft, Im Auftrage des Bundesministeriums fuer Forschung und Technologie, Muenchen, August 1991, pp. 79, 98, 100, 111.

Sources Of Information For Section 4.1 Environmental Health

Barnes, James D., Miller, Laymon N., Wood, Eric W., Power Plant Construction Noise Guide, Empire State Electric Energy Research Corp., New York, 1977.

Beranek, L.L. *Noise and Vibration Control*. Institute of Noise Control Engineering. McGraw Hill. 1988.

CEC (California Energy Commission), Presiding Members Proposed Decision, Metcalf Energy Center, 2001.

International Electrotechnical Commission, Geneva. Wind Turbine Generator Systems Part 11: Acoustic Noise Measurement Techniques (Reference Number: IEC 61400-11:1998(E)). 1998.

International Organization for Standardization, Geneva. Acoustics-Attenuation of Sound during Propagation Outdoors, Part 2, A General Method of Calculation (Reference Number: ISO 9613-2:1996(E)). 1996.

Kryter, Karl D. *The Effects of Noise on Man*. New York: Academic Press. 1970.

Peterson and Gross (Peterson, Arnold P. G. and Ervin E. Gross, Jr.). *Handbook of Noise Measurement*, 7th edition. Concord, MA: GenRad. 1974.

Washington Administrative Code (WAC 173-060).

Sources Of Information For Section 5.1 Land And Shoreline Use

Kittitas County. 1997. Comprehensive Plan, Volume II.

Kittitas County. 1991. Kittitas County Code, Chapter 17, Zoning Ordinances.

Kittitas County. 2001. Comprehensive Plan, Volume I.

Sources Of Information For Section Section 5.1. Land Use

CH2M Hill and Zilkha Renewable Energy, 2002. Housing and Recreational Facility Availability Survey.

CH2M Hill and Zilkha Renewable Energy, 2002. Interviews with Ellensburg Chamber of Commerce, WA Parks and Recreation Commission and US Forest Service.

Asthetics, Light and Glare

Amadeo, D., D.G. Pitt, and E.H. Zube, 1989, Landscape Feature Classification As A Determinant Of Perceived Scenic Value, *Landscape Journal* 8(1): 36-50

Buhyoff, G.J., P.A. Miller, J.W. Roach, D. Zhou, and L.G. Fuller. 1994. "An AI Methodology for Landscape Visual Assessments" *AI Applications*, 8, 1, pp. 1-13.

EMD. Description of the WindPro software. Available at: www.emd.dk. Accessed, November, 2002.

Gipe, Paul B. "Design As If People Matter: Aesthetic Guidelines for the Wind Industry." Paper presented at the American Wind Energy Association, Washington, D.C., March 30, 1995a.

Gipe, Paul, 1995b. Wind Energy Comes of Age, John Wiley & Sons, New York, New York.

Gipe, Paul. 1997. "Time to Clean Up the Mess in Kern County". Editorial appearing the *Bakersfield Californian* on September 28. Available at: rotor.fb12.tu-berlin.de/windnet/cleanup.html. Accessed November, 2002.

Gipe, Paul B. 2002. "Design As If People Matter: Aesthetic Guidelines for a Wind Power Future". Chapter in Pasqualetti, Martin J, P. Gipe and R.W. Righter, 2002. Wind Power in View, Energy Landscapes in a Crowded World, San Diego, California: Academic Press.

Goulty, G. A. 1990. Visual Amenity Aspects of High Voltage Transmission. Taunton, Somerset, England: Research Studies Press, Ltd. 1990.

Hydro-Quebec and Electricite de France. 1996. L' integration dans l'environnement des ouvrages de transport d'energie electrique.

Kaplan, R., 1985, "The Analysis Of Perception Via Preference: A Strategy For Studying How". in Kaplan, S., and R. Kaplan, 1982*,* Cognition and Environment: Functioning in an Uncertain World, Praeger Publishers, New York, New York.

Kittitas County. 1997. Comprehensive Plan, Volume II.

Kittitas County. 1997. Swift Water Corridor Vision.

Kittitas County. 2001. Comprehensive Plan, Volume I.

Nassauer, J. and M. Benner. 1984. "Visual Preferences for a Coastal Landscape, including Oil and Gas Development." *Journal of Environmental Management.* 18: 323-338. Cited in Thayer, Robert L. and C. M. Freeman, 1987, "Altamont, Public Perceptions of a Wind Energy Landscape", *Landscape and Urban Planning*, 14: 379-398.

Pasqualetti, Martin J, P. Gipe and R.W. Righter, 2002. Wind Power in View, Energy Landscapes in a Crowded World, Academic Press, San Diego, California.

Ribe, R.G., 1989. "The Aesthetics of Forestry. What Has Empirical Preference Research Taught Us?" *Environmental Management* 13(1): 55-74.

Shafer, E.L., Jr., J.F. Hamilton, Jr., and E.A. Schmidt, 1969, Natural preferences: A predictive model, *Journal of Leisure Research* 1(1): 1-19.

Survey Research Laboratory, 1977, Public Reactions to Wind Energy Devices; Report #5, Reactions to Different Types of Windmills in Different Settings, University of Illinois.

Thayer, Robert L. and C. M. Freeman, 1987, Altamont, Public Perceptions of a Wind Energy Landscape, *Landscape and Urban Planning*, 14: 379-398.

Thayer, R. L. J. and H.A. Hansen, 1991, Wind Farm Siting Conflicts in California: Implications for Energy Policy, Davis, California.

U. S. Department of Agriculture Forest Service. 1973. National Forest Landscape Management Volume 1. Washington, D.C.: Superintendent of Documents.

US DOT Federal Highway Administration. 1988. Visual Impact Assessment for Highway Projects.

Cultural Resources

Ames, Kenneth M., Don E. Dumond, Jerry R. Galm, and Rick Minor, 1998. Prehistory of the Southerna Plateau. In *Handbook of North American Indians, Plateau*, Volume 12, edited by Deward E. Walker, Jr., pp. 103-119. Smithsonian Institution, Washington, D.C.

Anglin, Ron. 1995. Forgotten Trails: Historical Sources of the Columbia's Big Bend Country. Washington State University Press, Pullman, WA.

Bicchieri, B. 1994. Reecer Canyon Quadrangle Random Survey: A Report to the Archaeological and Cultural Task Group of the Yakima Resources Management Cooperative. Central Washington University, Ellensburg, WA.

DePuyd, R. 1990 A Cultural Resources Survey Along Puget Sound Power and Light's Intermountain Transmission Line Between Hyak and Vantage, Washington. *Eastern Washington University Reports in Archaeology and History 100-73*. Cheney, WA .

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

General Land Office (GLO) 1874 Survey Plat of Township 19 North, Range 17 East, Willamette Meridian. Microfilm on file at Washington State Department of Natural Resources.

General Land Office (GLO) 1892. Survey Plat of Township 20 North, Range 17 East, Willamette Meridian. Microfilm on file at Washington State Department of Natural Resources.

Glauert, Earl T. and Merle H. Kunz (editors). 1976. *Kittitas Frontiersman*. Ellensburg Public Library, Ellensburg, WA.

Henderson, Eugene Marshel. 1990. *The Pine Tree Express: A History of the Cascade Lumber Company's Pine Hauling Railroad in Kittitas County, Washington 1916-1946.* Published by the author.

Historical Research Associates, Inc. 1996. Results of a Cultural Resources Assessment for Olympic Pipeline Company's Proposed Cross Cascades Petroleum Products Pipeline, Washington. Seattle,WA.

Holstine, C., and S. Gough. 1994. Cultural Resources Surveys of Portions of the Washington State Department of Transportation's SR 97: Junction SR 970 to Tronsen Campground Project, Chelan and Kittitas Counties, Washington, Short Report DOT94-20. Cheney, WA.

Hunn, E. 1990. Nch'i-wana, The Big River, Mid-Columbia Indians and Their Land. University of Washington Press, Seattle.

Kincade, M. Dale, William W. Elmendorf, Bruce Rigsby, and Haruo Aoki. 1998. Languages. In *Handbook of North American Indians, Plateau*, Volume 12, edited by Deward E. Walker, Jr., pp. 103-119. Smithsonian Institution, Washington, D.C.

Kirk, Ruth, and Carmela Alexander. 1990. *Exploring Washington's Past: A Roadside Guide to History*. University of Washington Press, Seattle and London.

Kirk, Ruth, and Richard D. Daugherty. 1978. *Exploring Washington Archaeology*. University of Washington Press, Seattle, WA.

Meinig, Donald William. 1968. *The Great Columbia Plain: A Historical Geography, 1805-1910.* University of Washington Press, Seattle and London.

Miller, F., and F. Lentz. 2002. From Native American Trails to the Inland Empire Highway. Ms. on file at Kittitas County Public Works, Ellensburg, WA.

Oliphant, J. Orin. 1976. *Cattle Drives Through Snoqualmie Pass. Pacific Northwest Quarterly, XXXVII (1947), 193-213*. In *Kittitas Frontiersmen*, edited by Earl T. Glauert and Merle H. Hunz, pp 208-216. Ellensburg Public Library, Ellensburg, WA.

Prater, Yvonne. 1981. Snoqualmie Pass: From Indian Trail to Interstate. The Mountaineers, Seattle, WA.

Ray, V. 1936. Native Villages and Groupings of the Columbia Basin. In *Pacific Northwest Quarterly*, Vol. XXVII, pp. 99-152.

Ricard, Pascal. 1976. Les origines de nos missions de Oregon, d'apres un memoire du P. Ricard. Missions de la Congregation Des Marie Immaculee, Nos 197, 198 (March, June 1912) 74-83, 163-176. In Kittitas Frontiersmen, edited by Earl T. Glauert and Merle H. Hunz, pp 76-82. Ellensburg Public Library, Ellensburg, WA.

Ross, Alexander. 1976. *Fur Hunters of the Far West, 2 Vols*. Kittitas Horses to Equip a Brigade. In *Kittitas Frontiersmen*, edited by Earl T. Glauert and Merle H. Hunz, pp 20-23. Ellensburg Public Library, Ellensburg, WA.

Schuster, H. H. 1975. *Yakima Indian Traditionalism: A Study in continuity and Change*. Unpublished Ph.D. dissertation. Department of Anthropology, University of Washington, Seattle, WA.

1982 *The Yakimas: A Critical Biography.* Published for the Newberry Library. Indiana University Press, Bloomington, IN.

1990 *Indians of North America: The Yakima.* Chelsea House Publishers. New York, Philadelphia, PA.

1998 Yakima and Neighboring Groups. In *Handbook of North American Indians, Plateau*, Volume 12, edited by Deward E. Walker, Jr., pp. 327-351. Smithsonian Institution, Washington, D.C.

Soderberg, L. 1985. NAER Inventory, Specialized Structures, Hydraulic Works: Irrigation System. Kittitas Reclamation District. Office of Archaeology and Historic Preservation, Olympia, WA.

Thompson, G. 1998. Letter Report for an Archaeological Survey of Selected Areas along the Proposed Bonneville Power Authority Seattle-to-Spokane Fiber Optic Cable Project in King, Kittitas, Douglas, and Grant Counties, Washington. Historical Research Associates, Inc., Seattle, WA.

Wilkes, Charles. 1845. *Narrative of the United States Exploring Expedition during the Years 1838-1842, 5 Vols*. Lieutenant Johnson Meets Kittitas Chief Te-i-as. In *Kittitas Frontiersmen*, edited by Earl T. Glauert and Merle H. Hunz, pp 37-40. Ellensburg Public Library, Ellensburg, WA.

Sources Of Information For Section 5.2 Transportation

Cle Elum School District . 2002. Telephone Conversation with G. Barr, Bus Garage, on October 18, 2002.

Ellensburg School District. 2002. Telephone Conversation with S. Nelson, Superintendent's Office, on October 18, 2002.

Kittitas County Department of Public Works. 2002. Personal communication with David Spurlock on October 30, 2002.

Thorp School District. 2002. Telephone Conversation with J. Morgan on October 29, 2002.

Washington State Department of Transportation. 1996. *Washington State Highway Accident Report.*

Washington State Department of Transportation. 2002. State Highway Log. http://www.wsdot.wa.gov/mapsdata/tdo/statehighwaylog.htm (29 October 2002)

Washington State Department of Transportation. 2002. Posted Bridges. http://www.wsdot.wa.gov/freight/mcs/POSTEDLIST.cfm (17 October 2002)

Washington State Department of Transportation. 2002. Restricted Bridges. http://www.wsdot.wa.gov/freight/mcs/RESTRICTEDBRIDGEtest.cfm (17 October 2002)

Washington State Department of Transportation. 2001. *2001 Annual Traffic Report*.

Washington State Department of Transportation. 2000. *2000 Annual Traffic Report*.

Washington State Department of Transportation. 1999. *1999 Annual Traffic Report*.

Washington State Department of Transportation. 1998. *1998 Annual Traffic Report.*

Washington State Department of Transportation. 1997. *1997 Annual Traffic Report*.

Washington State Department of Transportation. 1996. *1996 Annual Traffic Report.*

Sources Of Information For Section 5.3. Public Services And Utilities

Comsearch. 2002. Telecommunications Obstruction Analysis, Kittitas Valley, Washington.

Sources Of Information For Section 7.3 Initial Site Restoration Plan

Walla Walla County, 2000. *Final SEPA EIS for FPL Energy's Stateline Wind Project.*

Sources Of Information For Section 8.1 Socioeconomic Impact

ECONorthwest, *Economic Impacts of Wind Power in Kittitas County*. For the Phoenix Economic Development Group. October 2002. Modified for the Kittitas Valley Wind Power Project by CH2M HILL, November 2002.

Colwell, Peter F. 1990. "Power Lines and Land Value." *Journal of Real Estate Research*. Volume 5(1): 117-127.

CH2M Hill and Zilkha Renewable Energy, 2002. Housing and Recreational Facility Availability Survey.

CH2M Hill and Zilkha Renewable Energy, 2002. Interviews with Ellensburg Chamber of Commerce, WA Parks and Recreation Commission and US Forest Service.

Delaney, Charles J. and Douglas Timmons. 1992. "High Voltage Power Lines: Do They Affect Residential Property Value?" *Journal of Real Estate Research*. Volume 7(2): 315-329.

Des Rosiers, Francois. 2002. "Power Lines, Visual Encumbrance and House Values: A Microspatial Approach to Impact Measurement." *Journal of Real Estate Research*. Volume 23(3): 275-301.

Hamilton, Stanley W. 1995. "Do High Voltage Electric Transmission Lines Affect Property Value?" *Land Economics*. Volume 71(4): 436-444.

Jordal-Jorgensen, J. 1995. "Social Costs of Wind Power: Partial Report of Visual Impacts and Noise from Windturbines." Institute of Local Government Studies, Copenhagen, Denmark.

Kung, Hsiang-te and Charles F. Seagle. 1992. "Impact of Power Transmission Lines on Property Values: A Case Study." *The Appraisal Journal*. Volume 64(3): 413-418. July.

Rikon, Michael. 1996. "Electromagnetic Radiation Field Property Devaluation." *The Appraisal Journal*. Volume 64(1): 87-90.

Sources Of Information For Section 9.1 Analysis Of Alternatives

Pacific Northwest Laboratory, 1991. *An Assessment of the Available Windy Land Area and Wind Energy Potential in the Contiguous United States*.

RAND Corporation Science and Technology, 2002. *Generating Electric Power in the Pacific Northwest: Implications of Alternative Technologies,* Pernin C., Bernstein M., Mejia A., et al. Arlington, VA.

1.5 2 Preapplication Studies

Exhibit 6: **CH2M Hill, November 2002.** Geotech Data Report, Kittitas Valley Wind Power Project

Exhibit 8: **Eagle Cap Consulting, and CH2M Hill. 2003.** An Investigation of Rare Plant Resources Associated with the Proposed Kittitas Valley Wind Power Project (Kittitas County, Washington).

Exhibit 10: **Erickson, W.P., Jeffrey, J., Young, Jr, D.P, Bay K., Good, R., Sernka, K.J. and K. Kronner. 2003.** Wildlife Baseline Study for the Kittitas Valley Wind Project, Summary of Results from 2002 Wildlife Surveys, Final Report February 2002–November 2002.

Exhibit 11: **Erickson, W.P., Young, Jr, D.P, and K.J. Sernka. 2003.** Draft Biological Assessment: Endangered, Threatened, Proposed and Candidate Species, Zilkha Renewable Energy Kittitas Valley Wind Power Project.

Exhibit 14 **Comsearch. 2002.** Telecommunications Obstruction Analysis, Kittitas Valley, Washington.

Exhibit 16: **Flenniken, Ph.D, J.J., and P. Trautman, B.S. 2002.** Archaeological Survey of the Kittitas Valley Wind Power Project, Kittitas County, Washington.

Exhibit 23 **ECONorthwest,** *Economic Impacts of Wind Power in Kittitas County*. For the Phoenix Economic Development Group. October 2002. Modified for the Kittitas Valley Wind Power Project by CH2M HILL, November 2002.

Additionally, extensive research, field research and surveys, and modeling were conducted to determine potential visual and noise impacts to the Project area. The results of this work are presented in this application as Section 5.1.4, ‘Aesthetics, Light and Glare, and Section 4.1.1, Noise Analysis. No separate technical reports were crafted as a result of these studies.

Aesthetic impact research and analysis was conducted by Dr. Tom Priestley of CH2M Hill. Noise impact modeling and analysis was conducted by Mr. Mark Bastasch of CH2M Hill.

Applicant has also performed on-going meteorological investigations of the wind resource at the Project site with the assistance of consulting meteorologists Ron Nierenberg and Jack Kline.

Measurements of television signals and modeling of potential microwave obstruction in Kittitas County were performed by Comsearch of Ashburn, VA in October 2002 to assist in identifying areas of potential interference. These measurements were reported in “Microwave and TV Propagation Measurement and Analysis Report”, November 2002.

1.6 PERTINENT FEDERAL, STATE AND LOCAL REQUIREMENTS

***WAC 463-42-685 Pertinent federal, state and local requirements*.**

(1) Each application submitted to the council for site certification shall include a list of all applicable federal, state, and local codes, ordinances, statutes, rules, regulations and permits that would apply to the project if it were not under council jurisdiction. For each listed code, ordinance, statute, rule, regulation and permit, the applicant shall describe how the project would comply or fail to comply with each requirement. If the proposed project does not comply with a specific requirement, the applicant shall discuss why such compliance should be excused.

(2) Inadvertent failure to discover a pertinent provision after a reasonable search shall not invalidate the application, but may delay processing the application as necessary to gather and consider relevant information.

1.6.1 Table of Pertinent Federal, State and Local Codes, Ordinances, Statutes, Rules, Regulations and Permits

Table 1.6.1-1 Pertinent Federal, State and Local Codes, Ordinances, Statutes, Rules, regulations and Permits lists the pertinent federal, state and local permits and related requirements pursuant to Chapter 463-42-685 WAC that apply to construction and operation of the Kittitas Valley Wind Power Project. The table lists the permits or requirements, identifies the permitting agency, and cites the authorizing statute or regulation. The table also identifies the sections in the Application relating to each permit or requirement.

Table 1.6.1-1
Pertinent Federal, State and Local Codes, Ordinances, Statutes, Rules, Regulations and Permits

Permit Or Requirement	Agency/Code, Ordinance, Statute, Rule, Regulation Or Permit	Application Section)
Federal:		
Aviation Regulations And Lighting	Federal Aviation Administration (FAA) 14, CFR Part 77: specifies the criteria for determining whether a "Notice of Proposed Construction or Alteration" is required for potential obstruction hazards; FAA Advisory Circular 70/7460-1 AC70/7460-1K, Obstruction Marking and Lighting, Chapters 4, 8 and 12 describes the FAA standards for marking and lighting structures that may pose a navigation hazard as established using the criteria of Title 14, CFR Part 77; FAA Advisory Circular No. 70/460-2H, relates to the filing of a "Notice of Proposed Construction or Alteration."	5.1.4.
Threatened Or Endangered Species	U.S. Fish and Wildlife Service Endangered Species Act of 1973 (16 USC, Section 1531, et seq.) and implementing regulations. Designates and provides for protection of threatened and endangered plants	

Permit Or Requirement	Agency/Code, Ordinance, Statute, Rule, Regulation Or Permit	Application Section)
	and animals and their critical habitat.	
State:		
Electrical Construction Permit	Washington Department of Labor and Industries Chapter 296-746A WAC Washington Department of Labor and Industries Safety Standards – Installing Electrical Wires and Equipment – Administration Rules.	NR
Noise Control	Washington Department of Ecology Noise Control, Chapter 70.107 RCW; Chapter 173-58 WAC, Sound Level Measurement Procedures; and Chapter 173-60 WAC, Maximum Environmental Noise Levels.	4.1.1.
Water Quality Storm Water Discharge: Construction Activities	Washington Department of Ecology Water Pollution Control Act, Chapter 90.48 RCW establishes general stormwater permits for the Washington Department of Ecology National Pollutant Discharge Elimination System Permit Program (NPDES) ; Chapter 173-201A WAC Washington Department of Ecology Water Quality Standards for Surface Waters of the State of Washington, which regulates water quality of surface waters. Federal statute(s) and regulations implemented by the above state statute(s) and regulations include: Federal Clean Water Act, 42 USC 1251; 15 CFR 923-930.	1.1.4; 2.3; 2.10; 2.13; 2.15.6; 3.1.7; 3.3.2; and 3.4.7.
Ground Water	Washington Department of Ecology Washington Water Resources Act, Chapter 90.54 RCW; Chapter 18.104 RCW; and Chapter 43.12 RCW: Chapter 173-160 WAC Washington Department of Ecology, Minimum Standards for Construction and Maintenance of Wells, which establishes minimum standards for the construction and decommissioning of all wells in the state of Washington; and Chapter173-162 WAC regulation and licensing of water well contractors and operators.	3.3.5
Fish And Wildlife	Washington Department of Fish and Wildlife Chapter 232-12 WAC Washington Department of Fish and Wildlife Permanent Regulations, provides information on classification of wildlife species and promotion of the delisting of bald eagles as a threatened or endangered species	3.4
State Environmental Policy Act (SEPA)	Kittitas County would have been lead agency absent EFSEC jurisdiction, Washington Environmental Policy Act, Chapter 43.21C RCW; Chapter 197-11 WAC Washington Department of Ecology SEPA Rules, which establishes uniform requirements for compliance with SEPA.	NR
Transportation/Highway Access	Washington Department of Transportation State Of Washington Highway Access Management, Chapter 47.50 RCW; Chapter 468-51 WAC and Chapter 468-52 WAC, Washington Department of Transportation Highway Access Management Access Permits – Administration Process, which regulates and controls vehicular access and connection points of ingress to and egress from the state highway system	2.3.2; and 5.2.

Permit Or Requirement	Agency/Code, Ordinance, Statute, Rule, Regulation Or Permit	Application Section)
Archaeology and Historic Preservation	Washington State Office of Archaeology and Historic Preservation Archaeological Sites and Resources, Chapter 27.53 RCW.	5.1.6.
Local:		
Comprehensive Plan	Kittitas County Comprehensive Plan, 2000-2020.	2.1.5; 5.1.1; and 5.1.2
Zoning Ordinance.	Kittitas County Code Title 17	2.1.5; 5.1.1; and 5.1.2.
Building Codes	Kittitas County Code 14.04 Implements Chapter 19.27 RCW, State Building Code and Chapter 51-40 WAC State Building Code regulations.	NR
Sewage Disposal Installation And Design And Septic Tank Cleaning Regulations	Kittitas County Code Title 13.04	NR
County Road Franchise for Underground Transmission Line	Kittitas County Code Title 12.56	2.3.2; and 5.2.
Culvert Installation Permit	Kittitas County Code Title 12.16	2.3.2; and 5.2.
Storm Water Management Plan	Kittitas County Code Title 12.70	2.3; 2.10; 2.15.6; 3.1.6; and 3..3.2.
Noxious Weed Control	Kittitas County Noxious Weed Control Board Noxious Weeds-Control Boards Chapter17.10 RCW.	NR

Legend: NR means not referenced directly in this section but project compliance required.

1.6.2 Pertinent Federal Statutes, Regulations, Rules and Permits

1.6.2.1 Federal Aviation Administration (FAA) "Notice of Proposed Construction or Alteration"

The Federal Aviation Administration (FAA) requires notification and lighting of objects that might pose a hazard to aviation. The applicable regulation is as follows: 49 USC, Section 44718 and Title 14, CFR part 77: specifies the criteria for determining whether a "Notice of Proposed Construction or Alteration" is required for potential obstruction hazards; FAA Advisory Circular 70/7460-1 AC70/7460-1K, Obstruction Marking and Lighting, Chapters 4, 8 and 12. describes the FAA standards for marking and lighting objects such as wind turbine generators that may pose a navigation hazard as established using the criteria of 14 CFR 77; and FAA Advisory Circular No. 70/460-2H, relates to the filing of a "Notice of Proposed Construction or Alteration".

<u>Statement of Compliance</u>

The Applicant filed a "Notice of Proposed Construction or Alteration" with the FAA and will comply with all requirements related to 14 CFR 77. The FAA reviewed the notice and completed an aeronautical study to determine if the proposed structures will be a hazard to air navigation. The FAA concluded that the proposed structures (wind turbine generators and meteorological towers) will not pose a hazard to air navigation (FAA Aeronautical Studies No. 2002-ANM-1017-OE through 2002-ANM-1199-OE dated October 28, 2002. The aforementioned FAA Aeronautical Studies indicate which structures should be lighted in accordance with FAA Advisory Circular 70/7460-1 AC70/7460-1K, Obstruction Marking and Lighting, Chapters 4, 8 and 12.

The Applicant will submit a revised "Notice of Proposed Construction or Alteration" to the FAA based on the final, approved site layout and proposed turbine size and will comply with all requirements of the FAA. The FAA's aeronautical studies state that, for certain turbines, a Notice of Actual Construction or Alteration (FAA Form 7460-2) be submitted within 5 days after the construction reaches its greatest height. The Applicant will submit a Notice of Actual Construction or Alteration (FAA Form 7460-2) for all structures for which the FAA has required them in accordance with the required timeline.

1.6.2.2 Threatened or Endangered Species

The Endangered Species Act of 1973 (16 USC 1531, et seq.) and implementing regulations designates and provides for protection of threatened and endangered plants and animals and their critical habitat. It requires a determination of whether a protected species is present in the area affected by a project. Section 7 of the ESA requires that Federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) for their determination in authorizing a project that may affect listed species or designated critical habitats that may be found in the vicinity of a project. Prior to any consultation process with these agencies, the project proponent and Federal agency develop and submit a biological assessment (BA) for listed species (animals and plants) and critical habitat that may occur with the project vicinity. The biological assessment is typically based on an analysis of project information (e.g. field studies/surveys) and pertinent natural resource information and provides an effects analysis for the project on the listed species. The BA concludes with a determination of whether the project will adversely affect each listed species or adversely modify critical habitat. Upon completion of the biological assessment, formal consultation between the action agency and the USFWS or NMFS is initiated. In cases where a project does not require the approval, funding or conduct of a federal agency, Section 10 of the ESA provides a parallel process whereby non-federal entities may consult with the USFWS or NMFS and acquire a take statement for incidental adverse effects or take of listed species by the project.

<u>Statement of Compliance</u>

The Applicant has carried out studies and field surveys conducted by Project consultants who have determined that bald eagle (*Haliaeetus leucocephalus*), a threatened species, is present in the Project area during the winter months and therefore may be adversely affected by the Project. There are no other threatened, endangered, proposed or candidate species, or designated critical habitat present at the Project site. The Applicant has prepared a thorough draft BA to analyze and disclose the potential for the project to adversely affect bald eagles (See Exhibit 12, Biological Assessment.) The Applicant has committed to continued coordination and consultation with the USFWS to prepare a Habitat Conservation Plan (HCP) in order to acquire an incidental take statement through Section 10 of the ESA. The Applicant has initiated several conservation measures designed to minimize the potential for the project to adversely affect bald eagles (see Section 3.4.8, Plants and Animals-Mitigation). Continued consultation with the USFWS will determine the need for additional conservation measures necessary for ESA compliance. The Project will fully comply with the ESA through the Section 10, HCP process.

1.6.3 Pertinent State Statutes, Regulations, Rules and Permits

1.6.3.1 Electrical Construction Permit

Washington Department of Labor And Industries which permits, inspects and enforces regulations regarding electrical installations pursuant to Chapter 296-746A WAC Washington Department of Labor and Industries Safety Standards – Installing Electrical Wires and Equipment – Administration Rules.

Statement of Compliance
The Washington Department of Labor and Industries will administer and enforce all electrical permitting, inspecting, design and enforcement regulations regarding electrical installations either directly or pursuant to a contract with EFSEC. The Project will be designed and constructed in conformance with Chapter 296-746A WAC.

1.6.3.2 Noise Control

The Washington Department of Ecology has the authority regarding noise standards and control pursuant to Chapter 70.107 RCW Noise Control; Chapter 173-58 WAC, Sound Level Measurement Procedures; and Chapter 173-60 WAC, Maximum Environmental Noise Levels.

Statement of Compliance
The Project will be designed, constructed and operated to meet the Washington Department of Ecology's noise regulations and standards.

1.6.3.3 Water Quality Storm Water Discharge: Construction Activities and Operation

The Project will require a Stormwater General Permit for construction activities because construction of the facility will disturb more than five acres of land. EFSEC has jurisdiction regarding the National Pollution Discharge Elimination System (NPDES) Permit over the Project pursuant to Chapter 463-38 WAC. The Washington Department Of Ecology would have had jurisdiction in the absence of EFSEC. The applicable statutes and regulations are as follows: Chapter 90.48 RCW Water Pollution Control Act; Chapter173-226 WAC Waste Water General Permit Program establishes general stormwater permits for the Washington Department of Ecology National Pollutant Discharge Elimination System Permit Program (NPDES); Chapter 173-201A WAC Washington Department of Ecology Water Quality Standards for Surface Waters of the State of Washington, which regulates water quality of surface waters.

Federal statute(s) and regulations implemented by the above state statute(s) and regulations include: 42 USC 1251 Federal Clean Water Act; 15 CFR 923-930. A NPDES Pemit will be required for construction activities and may be required for operation.

Statement of Compliance

The Applicant will obtain the necessary NPDES Permit(s) from EFSEC pursuant to Chapter 463-39 WAC that will conform and be in compliance with all the requirements set forth above.
An NPDES Permit for stormwater will be obtained for construction of the Project.

1.6.3.4 Minimum Standards for the Construction and Maintenance of Wells

The Washington Department of Ecology regulates the withdrawal and water rights permit and permit modifications for ground water sources. The applicable statutes and regulations include: Chapter 90.54 RCW Washington Water Resources Act; Chapter 18.04 RCW; Chapter 43.21A RCW; Chapter 173-160 WAC Washington Department of Ecology Minimum Standards for Construction and Maintenance of Wells, which establishes minimum standards for the construction and decommissioning of all wells in the state of Washington; and Chapter 173-162 WAC regulation and licensing of water well contractors and operators.

Statement of Compliance

A well using less than five thousand gallons of water a day exempt pursuant to RCW 90.44.040 will be installed to provide water for domestic type use to the operation and maintenance building. The well will be installed by a licensed well contractor, licensed pursuant to Chapter 173-162 WAC, and in compliance with the requirements and standards of Chapter 173-160 WAC.

1.6.3.5 Department of Fish and Wildlife

The Washington Department of Fish and Wildlife, pursuant to Chapter 232-12 WAC provides information on the classification of wildlife species and promotion of the delisting of bald eagles as a threatened or endangered species. Additionally the Washington Department of Fish and Wildlife, pursuant to Chapter 232-12 WAC, designates certain "Priority Habitats".

Statement of Compliance

The Applicant will comply with the substantive requirements of Washington Department of Fish and Wildlife regarding the promotion and delisting of the bald eagle and the appropriate minimization and mitigation of impacts to "Priority Habitat" areas.

1.6.3.6 State Environmental Policy Act (SEPA)

A Development Permit would have been required from Kittitas County, which would have made it the lead agency for SEPA absent EFSEC jurisdiction. The applicable statutes, regulations are as follows: Chapter 43.21C RCW Washington Environmental Policy Act; Chapter 197-11 WAC Washington Department of Ecology SEPA Rules, which establishes uniform requirements for compliance with SEPA and Kittitas County SEPA regulations set out in Kittitas County Code Title.

Statement of Compliance

A SEPA EIS will be issued by EFSEC that will comply with the statutes and regulations set out above. The substantive requirements set out in the Kittitas County Code Chapter 15.04 is the same and will be used by EFSEC in its SEPA process.

1.6.3.7 Transportation/Highway Access

The Washington Department of Transportation regulates access onto state highways. The applicable statutes and regulations are as follows: Chapter 47.50 RCW State of Washington Highway Access Management; Chapter 468-51 WAC and Chapter 468-52 WAC, Washington Department of Transportation Highway Access Management Access Permits – Administration Process, which regulates and controls vehicular access and connection points of ingress to and egress from the state highway system.

Statement of Compliance

The Project will need to obtain access directly to U.S. Highway 97, which is under the Washington Department of Transportation jurisdiction and would require an access permit. The Applicant has been consulting and coordinating with the Washington Department of Transportation and will substantively comply with all of its requirements.

1.6.3.8 Archaeological Sites

The Washington State Office of Archaeology and Historic Protection regulates and protects the cultural and historic resources on private and public lands in the State of Washington. The applicable statute is as follows: Archaeological Sites and Resources, Chapter 27.53 RCW.

Statement of Compliance

The Project will comply with Chapter 27.53 RCW. The Applicant has researched state and federal registries along with all archaeological and historical files and maps located at the Washington State Office of Archaeology and Historic Preservation (OAHP) in Olympia. The Applicant conducted a comprehensive pedestrian field survey of the project area. This archaeological survey project covered the entire areas within the Project where ground-altering activities are proposed. Two small lithic scatter sites were identified. These sites will be avoided during construction and operation of the Project. A qualified archeologist will monitor all ground disturbing activities during the construction process. The Yakama Nation has been consulted during the planning process, beginning in February of 2002. The Yakama Nation will be notified prior to commencement of construction and will be invited to have representatives present during all groundbreaking activities. It is anticipated that a stipulation will be made with the Yakama Nation establishing procedures to be followed in the event of any finds during construction.

1.6.4 Pertinent Local Ordinances and Permits

1.6.4.1 Zoning

The Kittitas County Zoning Regulations are found in Title 17 of the Kittitas County Code. Specifically, Kittitas County Zoning Code 17.61.020 (D) provides that "major alternative energy facilities" are allowable in Agriculture-20, Forest and Range, Commercial Agriculture and Commercial Forest zones pusuant to the provisions of Kittitas County Code 17.61A. The primary conditions are for the protecton of the health, wilfare, safety, and quality of life of the gerneral public, and to ensure compatible land use in the vicinity.

Statement of Compliance
The Project site is in a zoning designation(s) for which the proposed use may be allowed pursuant to conditions that the protect the health, wilfare, safety, and qualityof life of the gerneral public, and ensure compatible land use in the vicinity. The requirements set out in the Kittitas County Code Chapter 17.61A for approval are substantially of the same nature as used by EFSEC in its administrative and SEPA process.

1.6.4.2 Comprehensive Plan

The Kittitas County Comprehensive Plan is not directly applicable to the Project, in that the Plan is implemented through adopted development regulations. However, to the extent that the Plan contains goals and policies, which may be considered to be criteria applied in any development regulations or as substantive SEPA policies, the Applicant summarizes such goals and policies below.

Chapter 2, "Land Use," contains goals and policies encouraging land uses in agricultural and forestry zones which are compatible with, promote, conserve and protect agricultural and forestry uses, and discouraging land uses which are not compatible with these goals and objectives. (GPO 2.114B, 2.118, 2.130, 2.132, 2.133, 2.135, 2.139 and 2.140).

Chapter 5, "Capital Facilities Plan" contains goals and policies concerning Kittitas County's development of electric generation and transmission facilities both within urban areas and in rural areas. (GPO 5.110A and 5.110B).

Chapter 6, "Utilities" contains goals and policies relating to the development of utility facilities, including provisions for processing permits in a fair and timely manner, requiring the solicitation of community input prior to county approval of utility facilities, and requiring that decisions regarding utility facilities be made "in a manner consistent with and complementary to regional demands and resources." Chapter 6 also addresses policies guiding the routing of electric transmission and distribution facilities in rural areas. (GPO 6.7, 6.10, 6.18, 6.21, 6.31, and 6.32.)

Chapter 8, "Rural Lands," contains goals and policies guiding the development of rural areas of the county. These polices include the assurance that private land owners "should not be expected to provide public benefits without just compensation," and that "if the citizens desire open space, or habitat, or scenic vistas that would require a sacrifice by the land owner or homeowner, all citizens should be prepared to shoulder their share in the sacrifice." Chapter 8 encourages the development of "resource based industries and processing." (GPO 8.7, 8.24, 8.42, and 8.62).

Statement af Compliance
The Project will be compatible with the goals and policies of the Kittitas County Comprehensive Plan and will not conflict with surrounding land uses. It will comply with all Kittitas County Comprehensive Plan standards as may be applicable and enforceable through relevant regulatory criteria.

1.6.4.3 Building Codes

A building permit will be required from Kittitas County pursuant to Kittitas County Code Title 14.04 for the construction of the permanent buildings. A permit is usually issued upon submittal of detailed plans.

Statement of Compliance
The Applicant will coordinate with Kittitas County and comply with the building codes. It is anticipated that EFSEC will enter into a contract with Kittitas County for the administration of the building codes.

1.6.4.4 Sewage Disposal Installation and Design Regulations

Kittitas County has the jurisdiction and regulates the design, installation and maintenance (including pumping) of on-site sewage disposal systems using septic tanks and subsurface disposal fields for systems with designed flows of less than 3,500 gallons/day pursuant to Kittitas County Code Title 13.04.

Statement of Compliance
The Project will require an on-site septic system with a design flow of less than 3,500 gallons/day. The Applicant will coordinate with Kittitas County and comply with the septic tank and subsurface disposal field design, installation and maintenance requirements pursuant to Kittitas County Code Titles 13.04. It is anticipated that EFSEC will enter into a contract with Kittitas County for the administration of the on-site sewage disposal systems design and installation.

1.6.4.5 County Road Franchise for Underground Transmission Line

Kittitas County has the jurisdiction and regulates the design and installation of all transmission lines utilizing its right of way pursuant to Kittitas County Code Title 12.56.

Statement of Compliance
The Project will require the installation of underground transmission lines and potentially other utilities in the right of way of county roads. The Applicant will coordinate with Kittitas County and comply with its substantive road franchise requirements. It is anticipated that EFSEC will enter into a contract with Kittitas County for the administration of all roadway design and construction.

1.6.4.6 Culvert Installation Permit

Kittitas County requires a permit for the installation of any culvert within its road right of way pursuant to Kittitas County Code 12.16.

Statement of Compliance
Kittitas County requires a permit for culverts installed on county right of ways and it is anticipated that the Project may require the installation of culvert(s) on county right of way. The Applicant will coordinate with Kittitas County and comply with its substantive culvert permit requirements. It is anticipated that EFSEC will enter into a contract with Kittitas County for the administration of all roadway design and construction.

1.6.4.7 Stormwater Management Plan

Kittitas County requires stormwater management plans under for projects pursuant to Kittitas Count Code Title 12.70.

Statement of Compliance
It is uncertain whether a stormwater management plan would be required for this project, however Applicant will coordinate with Kittitas County and comply with to stormwater control. It is anticipated that EFSEC will enter into a contract with Kittitas County for the administration of all design and construction regarding the project including aspects related to stormwater management.

1.6.4.8 Noxious Weeds

Kittitas County Noxious Weed Control Board regulates noxious weeds in Kittitas County pursuant to RCW 17.10.

Statement of Compliance

The Project will comply with the requirements of Chapter 17.10 RCW as administered by the Kittitas County Noxious Weed Control Board.

2.1 SITE DESCRIPTION

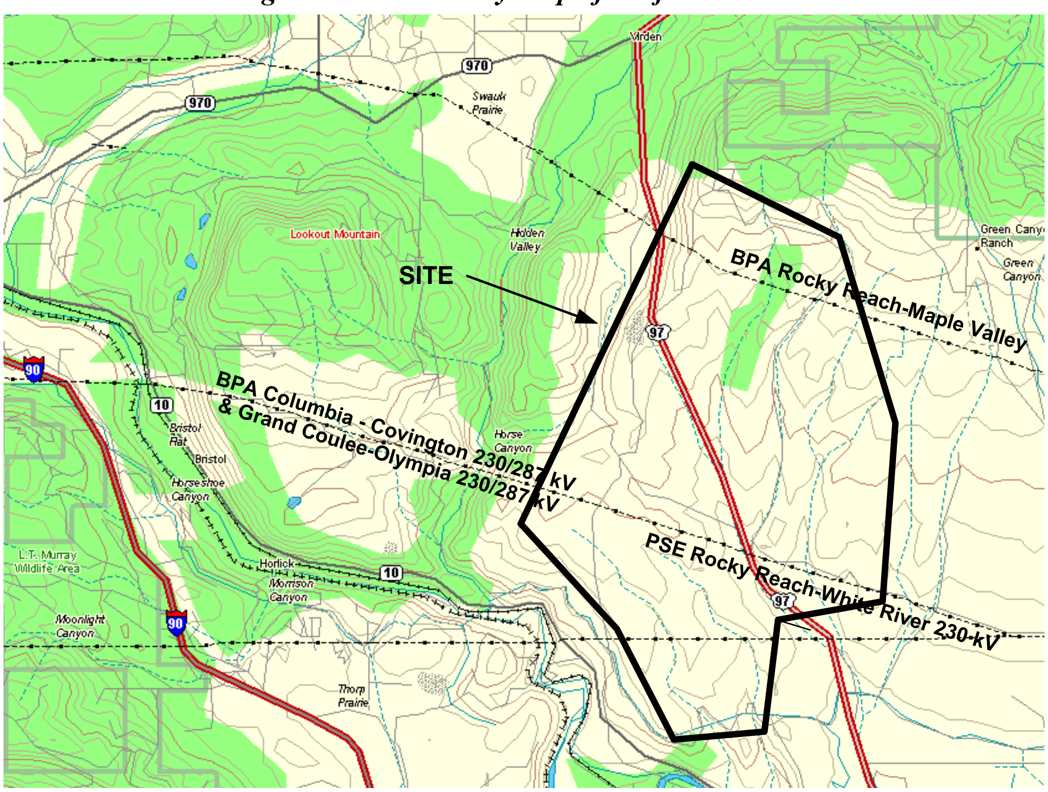
WAC 463-42-125 Proposal—Site description*. The application shall contain a description of the proposed site indicating its location, prominent geographic features, typical geological and climatological characteristics, and other information necessary to provide a general understanding of all sites involved, including county or regional land use plans and zoning ordinances.*

2.1.1 Project Location

The Kittitas Valley Wind Power Project (the "Project") is to be constructed in central Washington's Kittitas County which has long been known for its vigorous winds. The Project will be built on open ridge tops between Ellensburg and Cle Elum at a site located about 12 miles northwest of the city of Ellensburg. The ridges rise as high as 1,300 feet above the surrounding valley floor. The area's strong northwesterly winds are compressed as they pass by Lookout Mountain, and are further accelerated as they pass over the site's ridge tops. The site center is located approximately where the main Bonneville Power Administrations (BPA) and Puget Sound Energy (PSE) east-west transmission line corridors intersect with state Highway 97. Maps showing the locations of Kittitas County and the Project are presented in Figures 2.1.1-1 and 2.1.1-2 respectively.

Figure 2.1.1-1 Location of Kittitas County

Figure 2.1.1-2 Vicinity Map of Project Location



The Project will be located on privately owned open range land and range land owned by the Washington Department of Natural Resources (WDNR) which is zoned as Agriculture-20 and Forest and Range by Kittitas County. The site extends over an area of approximately 3½ miles (east-west) by 5 miles (north-south). The overall Project footprint is roughly 90 acres. The Project site has been selected primarily for its energetic wind resource and access to several sets of power transmission lines which traverse the site and have adequate capacity to allow the wind generated power to be integrated into the power grid.

Surrounding land uses include the highway right-of-way, limited cattle ranching, gravel quarrying and private residences, see Exhibit 2, 'Aerial Photo with Site Layout'. A 2001 amendment to Kittitas County's Comprehensive Plan designates wind power projects as a conditional use in Ag-20 and Forest and Range zoned areas.

The Project area is bisected by five Bonneville Power Administration (BPA) and one Puget Sound Energy (PSE) high-voltage transmission lines. A Project substation, which would connect the Project's output to the regional transmission grid, would be constructed near the center of the Project site, adjacent to the BPA or PSE lines. The output of the Project would be sold under contract to one or more regional utilities for transmission to regional electricity consumers.

In summary, the location of the Project site offers a number of advantages for a wind power plant including the following:

- A rigorous and well proven wind energy resource;
- A local transportation network that supports both construction and operation of the Project;
- Land uses adjacent to the Project site are complementary, i.e. agricultural or ranching;
- Nearby interconnection to transmission systems that facilitate delivery of electric power to markets in the Pacific Northwest.

For these principal reasons the Applicant believes the proposed Project site is a good location for the Kittitas Valley Wind Power Project.

2.1.2 Prominent Geographic Features

The proposed Kittitas Valley Wind Power Project is located in the Kittitas Valley in south-central Washington. Kittitas County is located east of the Cascade Range in the geographical center of the state. It is bounded to the north by Chelan County, to the south by Yakima County, to the west by King County and to the east by Grant County. Comprising a geographic area of 2,308 square miles, Kittitas County ranks eighth in size among Washington counties. See Section 3.1.1.1, 'Regional Geography', for a detailed description of the regional and local geography.

Prominent geographic features in Kittitas County include the Yakima River to the south of the Project, the Wenatchee Mountains to the north, Lookout Mountain to the west, the Cascade Mountains to the far west, and the Kittitas Valley and Columbia River to the east. The immediate Project area is dominated by north-south oriented ridges that slope down from about 3,100 feet in elevation to about 2,200 feet in elevation above the Yakima River towards the south. These ridges are generally dry and wind blown and thus do not support forest cover.

2.1.3 Typical Geological Features

The Kittitas Valley Project area is located at the eastern base of the Cascade Mountain range, at the western edge of the Columbia Basin physiographic province (Franklin and Dyrness 1988). This lowland province, surrounded on all sides by mountain ranges and highlands, covers a vast area of eastern Washington, and extends south into Oregon. The province is characterized by moderate topography incised by a network of streams and rivers which empty into the centrally located Columbia River. The Project area extends over a 3.4 mile by 5.1-mile portion of land which consists primarily of long north-south trending ridges. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River, which is located just south of the Project area.

Slopes within the Project area generally range from 5º to 20º. The soils on the Project area ridgetops east of Swauk Creek are primarily complexes of very shallow to moderately deep durixerolls that formed in alluvium and glacial drift over a duripan. Loess mixed with volcanic ash is typically present at the surface. Ridgetop soils in this portion of the Project area (which includes the majority of the turbines) include the Lablue, Reelow, Sketter, and Reeser series (USDA, 2002*a*). A more detailed geologic description is contained in Section 3.1.2, 'Geology'.

2.1.4 Climate Characteristics

The following summarizes the climate characteristics of the Project site. The Project will be designed to withstand the forces of the local climate as described in more detail in Section 2.15, 'Protection from Natural Hazards'.

The Project site is located in a semi-arid region of south-central Washington, at the western edge of the Columbia Basin physiographic province which includes the Ellensburg Valley, the central plains area in the Columbia Basin south from the Waterville Plateau to the Oregon border and east to near the Palouse River. The elevation increases from approximately 400 feet at the confluence of the Snake and Columbia Rivers to 1,300 feet near the Waterville Plateau and 1,800 feet along the eastern edge of the area. This large province occurs within the rain shadow of the Cascade mountain range, and is characterized by semi-arid conditions, as well as a large range of annual temperatures indicative of a continental climate. However, the relatively close proximity of the Pacific Ocean and the dominant westerly winds of the region combine to moderate the continental influence (Franklin and Dyrness 1988). Annual precipitation ranges from 7 inches in the drier localities along the southern slopes of the Saddle Mountains, Frenchman Hills and east of Rattlesnake Mountains, to 15 inches in the vicinity of the Blue Mountains.

Summer precipitation is usually associated with thunderstorms. During July and August, it is not unusual for four to six weeks to pass without measurable rainfall. The last freezing temperature in the spring occurs during the latter half of May in the colder localities of the Columbia Basin. The first freezing temperature in the fall is usually recorded between mid-September and mid-October. (*Climate of Washington*, Western Region Climate Center: (WRCC)).

The Project site bolsters a strong wind energy resource which is primarily thermally driven. Warm air rises over the desert-like area east of Ellensburg, and cooler air in the Cascades west of Cle Elum, near Snoqualmie Pass, is drawn through the Kittitas Valley over the Project site like a chimney effect. The rapidly moving cooler air mass is further compressed as it is passes by Lookout Mountain and is accelerated further by the Project's ridgelines. The thermal wind mechanism results in a summer peaking wind resource which has been measured at more than 10 different sensor locations around the Project site.

Extreme gust wind speeds have been measured and calculated for Ellensburg in a report prepared by Wantz and Sinclair, (J. Appl. Meteor., 20, 1044-1411, 1981) which indicates that the 100 year expected peak gust is 73 miles per hour (mph). In the 3 ½ years of on-site data collected at the Project site, no extreme wind gusts in excess of the 73 mph have been recorded. The design case for all facility equipment, specifically the turbines and towers, are designed to withstand wind loads far in excess of this gust level as described in more detail in Section 2.15.6, 'Erosion Protection and Storm Design'.

2.1.5 County Land Use Plans and Zoning Ordinances

The Project area is characterized by a hilly rural landscape of rangeland with some scattered residences. The overall population density in the area is very low. Land uses in the area are dominated by open space and cattle grazing. The property on which the wind turbines would be located contains two zoning designations: Agriculture-20 and Forest and Range. The areas east of Highway 97 are zoned Forest and Range while those west of Highway 97 are zoned Agriculture-20. Exhibit 18, 'Project Area Zoning Designation, Aerial Photo', indicates where these County zoning designations fall within the Project area. The County does not anticipate zoning changes in the Project area.

Land use in Kittitas County is guided by the Kittitas County Comprehensive Plan (Kittitas County, 2001), which implements the planning requirements and goals of the 1990 Washington State Growth Management Act. The Kittitas County Comprehensive Plan is not directly applicable to the Project, in that the Plan is implemented through adopted development regulations. The Comprehensive Plan is implemented through the adoption of ordinances and codes designed to achieve the objectives and policies outlined in the Plan. It does not contain policies specifically related to wind power projects. A detailed description of land-use plans, zoning ordinances, and other land-use regulations applicable to the Project site is included in Section 5.1.2.1 'Consistency with Land Use Policies,' and 5.1.2.2 'Consistency with Zoning'.

2.2 LEGAL DESCRIPTIONS AND OWNERSHIP INTERESTS

WAC 463-42-135 Proposal – Legal Descriptions and Ownership Interests

(1) Principal Facility: *The application shall contain a legal description of the site to be certified and shall identify the applicants and all non-private ownership interests in such land.*

(2) Ancillary Facilities: *For those facilities described in RCW 80.50.020(6) and (7), the application shall contain the legal metes and bounds description of the preferred centerline of the corridor necessary to construct and operate the facility contained therein, the width of the corridor, or variations in width between survey stations if appropriate, and shall identify the applicant's and others' ownership interests in lands over which the preferred centerline is described and of those lands lying equidistant for ¼ mile on either side of such centerline.*

2.2.1 Introduction

The Kittitas Valley Wind Power Project will be constructed across a land area of approximately 5,000 acres in Kittitas County, although the actual permanent facility footprint will only comprise approximately 90 acres of land. Proposed turbine strings will be located primarily on the north-south oriented ridges in Township 19 N Range 16E, Township 19N Range 17E, and Township 20N Range 17E.

The core of the Kittitas Valley Wind Power Project site and the proposed interconnect points lie on privately-owned lands and there are also parcels which are owned by the Washington Department of Natural Resources (WA DNR). The Applicant has obtained wind option agreements with landowners for all private lands within the Project site boundary necessary for installation of the plant. Copies of the recorded Memorandums of Wind Option with all private landowners are contained in Exhibit 4.

Approximately one fourth of the proposed turbines lie on WA DNR lands. The Applicant has secured access to all of the DNR lands as well as all of the private lands surrounding the DNR parcels of interest. The Applicant has been coordinating with the WA DNR during the development of this Project. WA DNR published a notice of intent to negotiate a lease agreement for these parcels on June 6, 2002. A letter of intent from WA DNR is attached as Exhibit 5, 'WA DNR Letter of Intent'.

Table 2.2-1
Legal Descriptions of Lands Under Option with Applicant

Noel Andrew
2701 Elk Springs Road
Ellensburg, WA 98926
Phone No. 509-306-5348

Legal Description:
The Property consists of approximately 150 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
Tracts 1, 2 & 3 of Survey No. 501915, (located in the West one-half (W1/2)), Section 11, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No's 19-17-11000-0002, 19-17-11000-0003 & 19-17-11000-0011

Larry L. Tritt
PO Box 725
Roslyn, WA 98941
Phone No.509-649-3611

Legal Description:
The Property consists of approximately 50 Acres of land located in Kittitas County, Washington, State, and more specifically described as follows:
Tract 4, of Survey No. 501915, (located in the West one-half (W1/2)), Section 11, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No. 19-17-11000-0004

Michael and Louise Genson
PO Box 521
Snoqualmie, WA 98065
Phone No. 509-964-9082

Legal Description:
The Property consists of approximately 425 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
Tracts 5 and 6 of Survey No. 501915, located in the Southwest one-quarter (SW1/4), Section 11; and the West one-half (W1/2) of Section 14, Excepting there from that portion lying Southwesterly of the State Highway, and that portion of the West one-half (W1/2), Section 23, lying Northerly of the B.P.A. power line road and being a portion of Tract B of Survey No. 504472.

Kittitas County Tax Parcel No's, 19-17-11000-0005, 19-17-14000-0002, 19-17-14000-0003, 19-17-14000-0004 & 19-17-23000-0014.

Pautzke Bait Co., Inc.
Gerry Williams
PO Box 36
Ellensburg, WA 98926
Phone No. 509-925-9365

Legal Description:
The Property consists of approximately 700 Acres of land located in Kittitas County, Washington State, and more particularly described as follows:
The Northeast one-quarter (NE1/4), and the South one-half (S1/2) of Section 3, excepting there from that portion lying Westerly of the State Highway, and the East one-half (E1/2) of the East one-half (E1/2) of Section 10, and that portion lying Easterly of the State Highway within the Northeast one-quarter (NE1/4) of Section 15. All of the above is located within Township 19 North, Range 17 East, W.M. And together with the South one-half (S1/2) of the Southeast one-quarter (SE1/4) of Section 34, Township 20 North, Range 17 East, W.M.

Kittitas County Tax Parcel No's 19-17-03000-0003, 19-17-10000-0001, 19-17-15000-0003 & 20-17-34000-0004.

Carla L. Thomas
911 Robbins Road
Ellensburg, WA 98926
Phone No. 509-962-8572

Legal Description:
The Property consists of approximately 500 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
All of that portion of the South one-half (S1/2), of Section 3, lying Westerly of the State Highway, and that portion of the Southeast one-quarter (SE1/4) of Section 9, lying Easterly of the County Road, and that portion of Section 15, lying Northerly of the County Road. All of the above is located within Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No's 19-17-03000-0001, 19-17-09000-0003 & 19-17-15000-0001.

Daniel A. and Marcia M. Green
715 Carplake Road
Camano Island, WA 98282
Phone No. 360-387-3495

Legal Description:
The Property consists of approximately 800 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
All of that portion of the Southwest one-quarter (SW1/4), Section 1; and the East one-half (E1/2), Section 11, and the West one-half (W1/2), Section 12, Township 19 North, Range 17 East, W. M.

Kittitas County Tax Parcel No's 19-17-01000-0002, 19-17-01000-0009, 19-17-01000-0010 & 19- 17-01000-0011; 19-17-11000-0001, 19-17-11000-0006, 19-17-11000-0007, 19-17-11000-0008, 19-17-11000-0009 & 19-17-11000-0010; 19-17-12000-0002, 19-17-12000-0006, 19-17-12000- 0007, 19-17-12000-0008, 19-17-12000-0009 & 19-17-12000-0010.

James L. Majors
411 Rustic Road
Ellensburg, WA 98926
Phone No. 509-962-4059

Legal Description:
The Property consists of approximately 50 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
Lot 3, of Survey No. 505298, (located in the East one-half (E1/2)), Section 14, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No. 19-17-14000-0006.

Keith Schober
PO Box 72
Cle Elum, WA 98922
Phone No.509-674-2217

Legal Description:
The Property consists of approximately 785 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
The Southwest one-quarter (SW1/4) of the Northwest one-quarter (NW1/4) and the Northwest one-quarter (NW1/4) of the Southwest one-quarter (SW1/4), and the East one-half (E1/2) of the Southwest one-quarter (SW1/4), Section 22. Also, all of that portion lying Easterly and Northeasterly of Hayward Road, Section 27, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No's 19-17-22000-0003, 19-17-22000-0008 & 19-17-22000-0009, and 19-17-27000-0001.

Cascade Field and Stream Club
Monty D. Miller, Club President
PO Box 424
Cle Elum, WA 98922
Phone No. 509-674-9278

Legal Description:
The property consists of approximately 182 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
All of that portion of Section 21, lying east of the County road and lying East of the Easterly boundary of the Kittitas Reclamation District Canal, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No.19-17-21000-0001.

Jeanice M. Vlasic
9500 NE 137th ST.
Kirkland, WA 98034
Phone No. 425-820-5740

Legal Description:
The Property consists of approximately 50 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
Located within the South one-half (S1/2) of the Northwest one-quarter (NW1/4), Section 13, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No. 19-17-13000-0008.

Karl Krogstad
PO Box 95260
Seattle, WA 98145
Phone No.206-323-6472

Legal Description:
The Property consists of approximately 54 Acres of land located in Kittitas County, Washington State, and more particularly described as follows:
Lot 1, Survey No. 505298, (located within the East one-half (E1/2)), Section 14, Township 19 North, Range 17 East, W.M.

Kittitas County Tax Parcel No. 19-17-14000-0001.

Los Abuelos, Inc.
Pete Bugni, President
361 Ceder Cove Road
Ellensburg, WA 98926
Phone No. 609-925-3902

Legal Description:
The Property consists of approximately 282 Acres of land located in Kittitas County, Washington State, and more particularly described as follows:
All that portion lying South and Southwesterly of the County Road located within Section 15, Township 19 North, Range 17 East, W.M., Kittitas County, State of Washington

---

Merle Steinman
19822-28 Avenue West

Lynnwood, WA 98036
Phone No. 425-774-0790

Legal Description:
The Property consists of approximately 40 Acres of land located in Kittitas County, Washington State, and more particularly described as follows:
Lot 6, of that certain Survey as recorded June 22, 1987 in Book 15 of Surveys at pages 62 and 63 under Auditor's File No. 505298, records of Kittitas County, Township 19 North, Range 17 East, W.M., Kittitas County, State of Washington.

Andrea Steinman
19822-28 Avenue West
Lynnwood, WA 98036
Phone No. 425-774-0790

Legal Description:
The Property consists of approximately 40 Acres of land located in Kittitas County, Washington State, and more particularly described as follows:
Lot 7, of that certain Survey as recorded June 22, 1987 in Book 15 of Surveys at pages 62 and 63 under Auditor's File No. 505298, records of Kittitas County, Township 19 North, Range 17 East, W.M., Kittitas County, State of Washington.

Copies of each of these agreements can be found in **Exhibit 4, 'Memoranda of Option Agreements'**, which includes the signature pages for private landowners who have executed wind energy option agreements with Applicant.

Washington State Department of Natural Resources (DNR)
Milt Johnston, Regional Manager, E. WA
713 Bowers Road
Ellensburg, WA 98926
Phone No. 509-925-8510

The Property consists of approximately 2,080 Acres of land located in Kittitas County, Washington State, and more specifically described as follows:
The East one-half (E1/2), the West one-half of the Southwest one-quarter (W1/2SW1/4), the Southeast one-quarter of the Southwest one-quarter (SE1/4SW1/4), and the Southwest one quarter of the Northwest one-quarter (SW1/4NW1/4), Section 2; The West one-half of the East one-half (W1/2E1/2), and the West one-half (W1/2), Section 10; All of Section 16: The East one-half (E1/2), and the Southwest one-quarter of the Southwest one-quarter (SW1/4SW1/4), and the North one-half of the Northwest one-quarter (N1/2NW1/4), and the Southeast one-quarter of the Northwest one-quarter (SE1/4NW1/4), Section 22; All of the above is located within Township 19 North, Range 17 East, W.M. All of section 36, Township 20 North, Range 17 East, W.M.

Kittitas County Tax Parcel No's 19-17-02000-0001, 19-17-02000-0003 & 19-17-02000-0005; 19-17-10000-0006; 19-17-16000-0001; 19-17-22000-0001, 19-17-22000-0002, 19-17-22000-0005 & 19-17-22000-0007 & 20-17-36000-0001.

2.3 CONSTRUCTION ON-SITE

WAC 463-42-145 Proposal – Construction on-site. *The applicant shall describe the characteristics of the construction to occur at the proposed site including the type, size, and cost of the facility; description of major components and such information as will acquaint the council with the significant features of the proposed project.*

2.3.1 Project Summary/Introduction

2.3.1.1 Introduction

The Kittitas Valley Wind Power Project ("Project") is to be constructed in central Washington's Kittitas Valley that has long been known for its vigorous winds. The Project will be built on high open ridge tops between Ellensburg and Cle Elum at a site located about 12 miles northwest of the city of Ellensburg. A map showing the project location is presented in Section 2.1.1, 'Project Location'. Turbines will be located on open rangeland that is zoned as Agriculture-20 and Forest and Range by Kittitas County. The Project site has been selected primarily for its energetic wind resource and its access to several sets of power transmission lines which traverse the site and have adequate capacity to allow the wind generated power to be integrated into the power grid system.

The Project is designed to provide low cost renewable electric energy to meet the growing needs of the Northwest. The Project has transmission and interconnection requests in review with the Bonneville Power Administration (BPA) and Puget Sound Energy, and is in the process of marketing the electrical energy sales into the local and regional power market consisting of municipalities, cooperatives, investor owned utilities and others.

Detailed descriptions of the types of activities required to construct the Project and the plan for managing the Project during construction and operations are contained in Section 2.14, 'Construction Methodology', and Section 2.13, 'Construction Management', respectively.

2.3.1.2 Overview

The Kittitas Valley Wind Power Project (Project) consists of several prime elements which will be constructed in consecutive phases including roads, foundations, underground and overhead electrical lines, grid interconnection facilities, one or two substations, an operations and maintenance (O&M) center and associated supporting infrastructure and facilities. Approximately 90 acres of land area will be required to accommodate the proposed power plant and related support facilities. A general site layout illustrating these key elements is contained in Exhibit 1, Project Site Layout.

The Project will consist of up to 121 wind turbines for an installed nameplate capacity of up to 200 megawatts (MW). The Project will utilize 3-bladed wind turbines on tubular steel towers each ranging from 1.3 MW to 2.5 MW (generator nameplate capacity) and with dimensions as shown in Figure 2.3.6-1. The Project Site Layout shows turbine spacing based on a 70 meter (230 ft.) rotor diameter. If, at the time of final construction design, a turbine with a larger rotor is utilized, fewer turbines will be installed along the same road pathways shown in the Site Layout with turbines spaced further apart as more fully described in Section 2.3.12, 'Turbine Layout Variances'.

The expected service life of the facility is 20 years. Well-maintained power plants complying with industry standard practices are capable of service lives longer than 20 years, however, due to the rapid advancement in wind turbine technology, it is likely that the turbines will be replaced under a re-powering program similar to what has happened to several of the earlier wind power projects in Europe and California.

2.3.2 Roads and Civil Construction Work

Access to the various rows of turbines will be achieved via graveled access roads branching from state highways 10 and 97 and county roads Bettas and Hayward roads. The roads are designed to allow for heavy equipment to be transported to the Project and will be used throughout the life of the Project to allow access to and from the wind turbines, substations and meteorological monitoring towers. Flat areas, approximately 30 ft. by 60 feet, will be cleared, compacted and graveled as necessary adjacent to each turbine location as a crane pad to facilitate the erection of the wind turbines and towers. Parking facilities and equipment lay-down areas will be limited to a small area adjacent to the operations and maintenance center and substation.

2.3.2.1 Road Footprint

Figure 2.3.2-1 Typical Wind Power Project Gravel Road

The road design has been prepared to minimize the overall disturbance footprint and avoid erosion risks. Wherever practical, existing roads have been utilized to minimize new ground disturbance, see Exhibit 2, 'Aerial Photo with Site Layout'. Approximately 26 miles of gravel road construction will be undertaken for the Project consisting of roughly 19 miles of new road and improvements to roughly 7 miles of existing roads.

The roads will consist of a 20 feet wide compacted graveled surface. In areas of steeper grades, a cut and fill design will be implemented to keep grades below 15% and prevent erosion.

Each substation site with interconnection facilities will require approximately 2-3 acres of land area and the O&M facility, with parking, will require about 2 acres of land area. Overall, the Project will have a ground disturbance footprint of roughly 90 acres.

2.3.2.2 Erosion Control

During construction, depending on topography and soil conditions, hay bales or silt-fence type materials will be used to control erosion and sedimentation as needed. After construction is completed, the area will be returned as closely as possible to its original state. This excludes the service roads, which will remain in place for the life of the facility. On-site construction management will monitor the area for erosion and implement additional control measures if necessary. More details on storm water erosion control are contained in Section 2.10, 'Surface Water Runoff'.

2.3.3 Turbine Tower Foundations

The site conditions prevalent at the Project site provide solid subsurface conditions for the turbine foundations. A formal geotechnical investigation will be performed at each tower location with a drill rig and ground-penetrating radar to analyze soil conditions and test for voids and homogeneous ground conditions. Depending on the results of the geotechnical investigation, either spread footing type foundation, or a vertical mono-pier foundation, as shown in Figures 2.3.3-1 and 2.3.3-2 will be used. The foundation design will be tailored to suit the soil and subsurface conditions at the various turbine sites. The foundation design is certified by an experienced and qualified, state-registered structural engineer who has designed several generations of wind turbine towers and foundation systems that have proven themselves well in some of the most aggressive wind regions of the world.

Figure 2.3.3-1 Spread Footing Type Foundation

Figure 2.3.3-2 Mono-Pier Type Foundation

2.3.4 Electrical Collection System Infrastructure

Electrical power generated by the wind turbines will be transformed and collected through a network of underground and overhead cables which all terminate at the Project substation. It is most likely that only one substation will be constructed for the Project, however, it is possible that two substations be installed allowing access to both the BPA and Puget Sound Energy (PSE) systems.

Figure 2.3.4-1 Typical Underground Cable Trench

Figure 2.3.4-2 Typical Pad Mount Transformer (shown during construction before terminations landed)

Power from the wind turbines will be generated at 575 Volts to 690 Volts (V) depending on the type of wind turbine utilized for the Project. Power from the turbines is fed through a breaker panel at the turbine base inside the tower and is interconnected to a pad-mounted step-up transformer which steps the voltage up to 34.5 kilovolts (kV). The pad transformers are interconnected on the high side to underground cables that connect all of the turbines together electrically. The underground cables are installed in a trench that is typically 3-4 feet deep and runs beside the Project's roadways as shown in Figure 2.3.4-1. Due to the rocky conditions at the site, a clean fill material such as sand or fine gravel will be used to cover the cable before the native soil and rock are backfilled over the top.

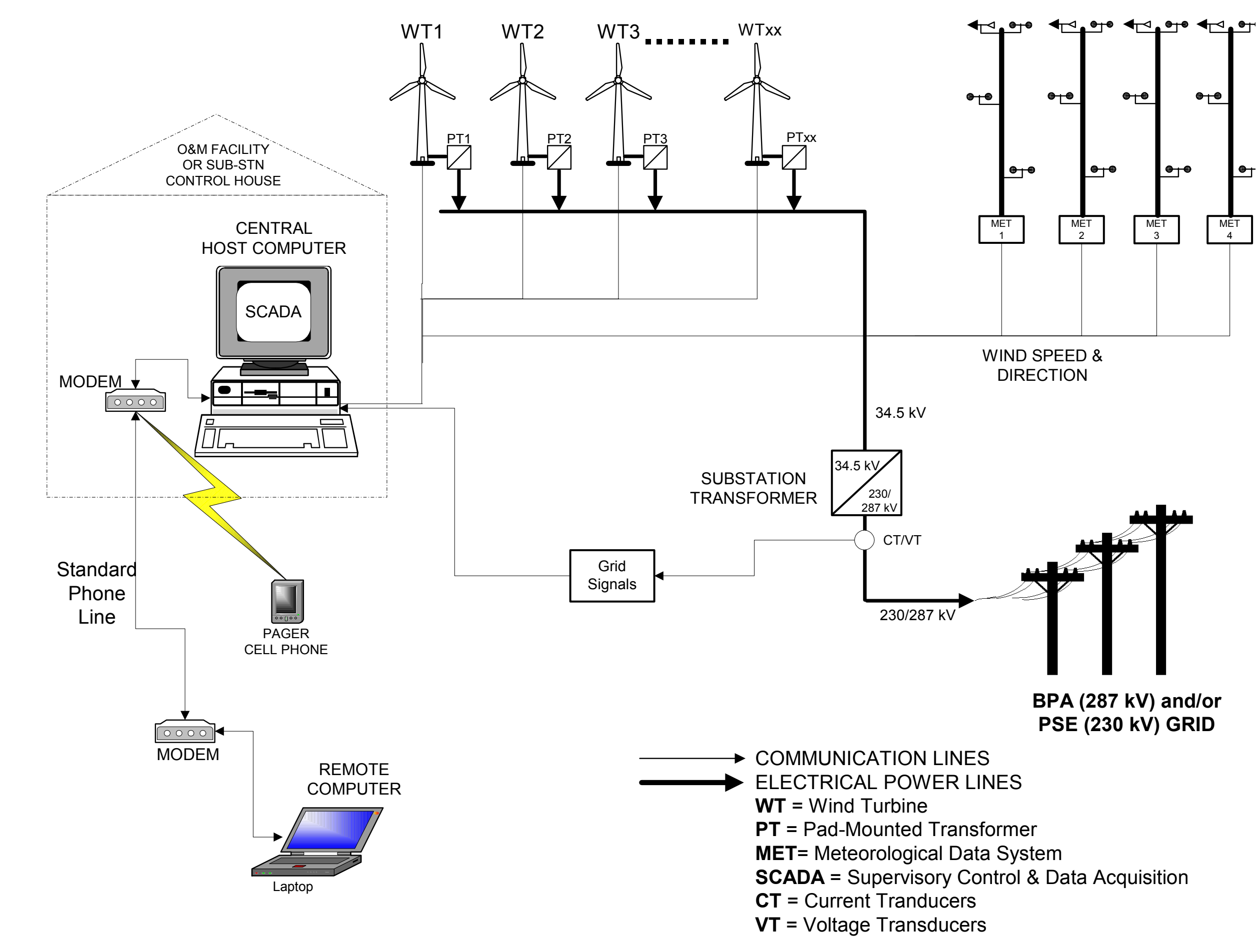
Figure 2.3.4-2 shows a typical pad-mount transformer used at each wind turbine. The underground collection cables feed to larger feeder lines that run to the main substation(s) as shown schematically in Figure 2.3.4-3.

For the few short runs of overhead power lines, a fused, switch-riser pole will be used to run the cables from the underground trench to the overhead conductors. At the substation(s), the electrical power from the entire wind plant is stepped up to transmission level at 230 kV (PSE) or 287 kV (BPA) and delivered to the point(s) of interconnection.

In locations where two or more sets of underground lines converge, underground vaults and/or pad mounted switch panels will be utilized to tie the lines together into one or more sets of larger feeder conductors.

The Project will require approximately 23 miles of underground and 2 miles of overhead 34.5 kV electrical power lines to collect all of the power from the turbines to terminate at the main substation(s).

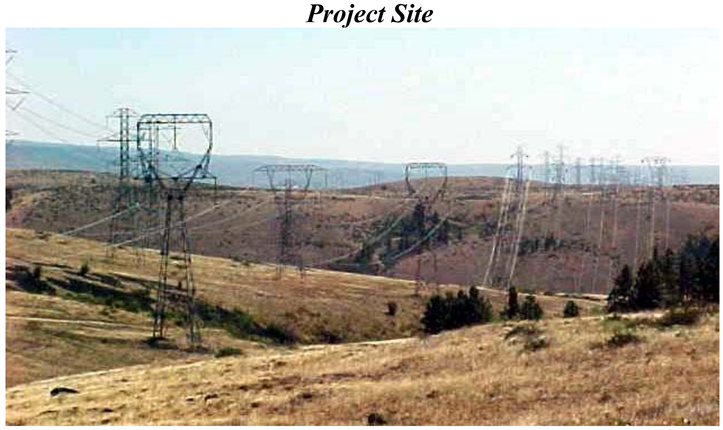
Figure 2.3.4-3 Electrical and Communication Collection System



2.3.5 Interconnection Facilities and Substation

The Project would offer excellent interconnection possibilities with both Bonneville Power Administration (BPA) and Puget Sound Energy (PSE) lines traversing directly across the site. If connected to BPA's system, the Project will interconnect directly with either the Grand Coulee to Olympia or Columbia to Covington 287 kV lines. If connected to PSE's system, the Project will interconnect directly with PSE's Rocky Reach to White River 230 kV line. There is the possibility that power will be fed to both the PSE and the BPA systems resulting in the requirement for 2 substations since the lines are at two different voltages (230 kV and 287 kV). The locations of the substations are indicated on the Project Site Layout contained in Exhibit 1.

Figure 2.3.5-1 Corridor of BPA Transmission Lines Across Project Site



Power flow studies performed to evaluate the amount of transmission outlet capacity indicate that no major system upgrades will be required to either the BPA or PSE power lines to accept the power from the Project onto their grids.

The main function of the substation and interconnection facilities will be to step up the voltage from the collection lines (at 34.5 kV) to the transmission level (230 kV for PSE and 287 kV for BPA), to interconnect to the utility grid and provide fault protection. The basic elements of the substation and interconnection facilities are a control house, a bank of main transformers, outdoor breakers, relaying equipment, high voltage bus work, steel support structures, and overhead lightning suppression conductors. All of these main elements will be installed on concrete foundations that are designed for the soil conditions at the substations sites. The substations and interconnection facilities each consist of a graveled footprint area of approximately 2-3, acres a chain link perimeter fence, and an outdoor lighting system.

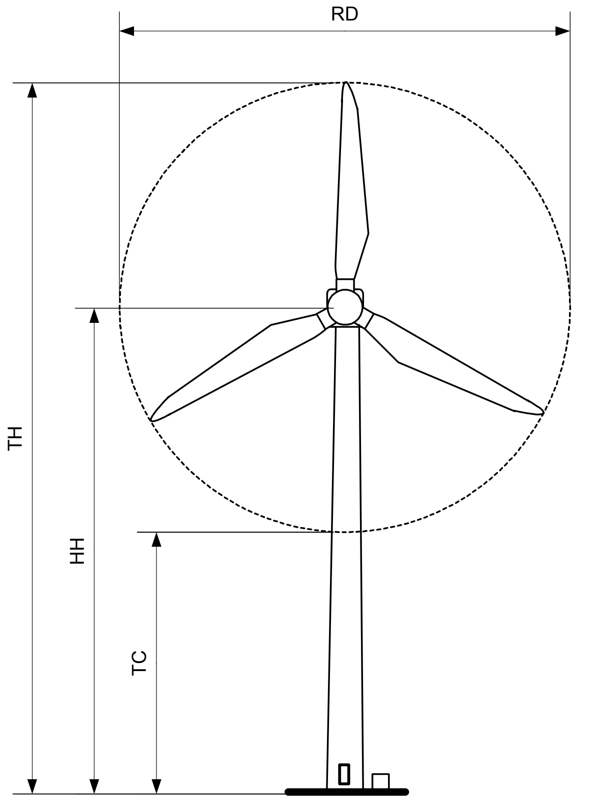
Figure 2.3.5-.2 Typical Substation

A typical one-line diagram of a substation and interconnect system which would be used as a preliminary outline for the Project is included in Exhibit 3. Final adjustment to the substation and interconnect are generally made during design review with the utility and their system protection engineers to accommodate for conditions on the grid at the time of construction.

2.3.6 Wind Turbine Generators and Towers

Several wind turbine generators (WTGs) are under evaluation for the Project. Based on these evaluations, a number of wind turbine vendors have been pre-qualified to supply equipment for the Project including GE Wind Energy, NEG-Micon, Vestas, Nordex, Bonus, and Gamesa Eolica. The Project will consist of up to 150 wind turbines for an installed nameplate capacity of up to 205 megawatts (MW). The Project will implement 3-bladed wind turbines on tubular steel towers each ranging in size from 1.3 MW to 2.5 MW (generator nameplate capacity) and with dimensions as shown in Figure 2.3.6-1.

Figure 2.3.6-1 Wind Turbine Dimensions



	MAX	MIN	Dimension
HH	80 m/262 ft.	46 m/151 ft.	Hub Height
RD	90 m/295 ft.	60 m/197 ft.	Rotor Diameter
TC	40 m/131 ft.	15 m/49 ft.	Tip Clearance
TH	125 m/410 ft.	76 m/249 ft.	Tip Height

The pre-qualified wind turbines all have a minimum design life of 20 years under extreme high wind and high turbulence conditions. Based on the lower turbulence intensities and moderate wind speeds that have been measured on the Project site, it is likely that the original WTGs will operate well into their third decade before a retrofit or replacement program is implemented.

Figure 2.3.6-2 Typical Modern WTG

2.3.6.1 Wind Turbine Basic Configuration

Wind Turbines consist of 3 main physical components that are assembled and erected during construction: the tower, the nacelle (machine house) and the rotor (3-blades).

2.3.6.1.1 Tower

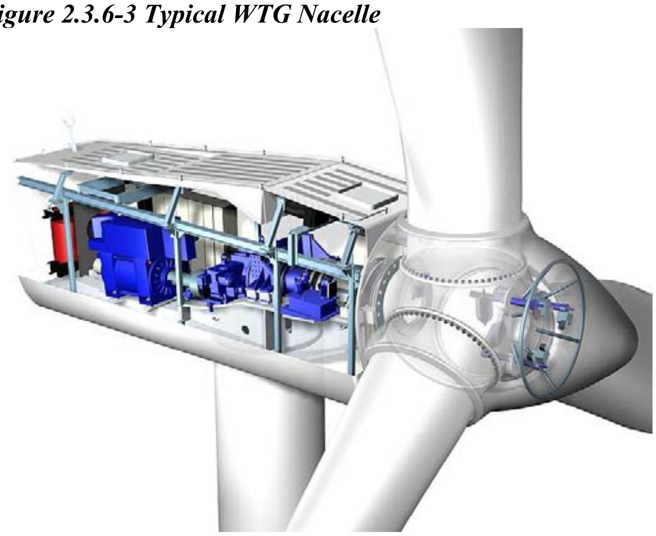
The WTG tower is a tubular conical steel structure that is manufactured in multiple sections depending on the tower height. Towers for the Project will be fabricated, delivered and erected in 2 to 3 sections. A service platform at the top of each section allows for access to the tower connecting bolts for routine inspection. An internal ladder runs to the top platform of the tower just below the nacelle. A nacelle ladder extends from the machine bed to the tower top platform allowing nacelle access independent of its orientation. The tower is equipped with interior lighting and a safety glide cable alongside the ladder.

The tower design is certified by experienced and qualified structural engineers who have designed several generations of turbine towers that have proven themselves well in some of the most aggressive wind regions of the world. The towers and foundations are designed for a survival gust wind speed of 90+ mph with the blades pitched in their most vulnerable position. For the cold-weather winter conditions on the Project site, special material specifications are set to ensure that materials do not go below the brittle transition temperature.

2.3.6.1.2 Nacelle

Figure 2.3.6-3 shows the general arrangement of a typical nacelle that houses the main mechanical components of the WTG. The nacelle consists of a robust machine platform mounted on a roller bearing sliding yaw ring that allows it to rotate (yaw) to keep the turbine pointed into the wind to maximize energy capture. A wind vane and anemometer are mounted at the rear of the nacelle to signal the controller with wind speed and direction information.

Figure 2.3.6-3 Typical WTG Nacelle



The main components inside the nacelle are the drive train, a gearbox and the generator. On some turbines, the step-up transformer is situated at the rear of the nacelle that eliminates the need for a pad-mounted transformer at the base of the tower.

The nacelle is housed by a fully enclosed steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The shroud is designed to allow for adequate ventilation to cool internal machinery such as the gearbox and generator.

2.3.6.1.3 Drive Train

The rotor blades are all bolted to a central hub. The hub is bolted to the main shaft on a large flange at the front of the nacelle. The main shaft is independently supported by the main bearing at the front of the nacelle. The rotor transmits torque to the main shaft that is coupled to the gearbox. The gearbox increases the rotational speed of the high speed shaft that drives the generator at 1200-1800 RPM to provide electrical power at 60 Hertz (Hz).

2.3.6.1.4 Rotor Blades

Modern WTGs have 3-bladed rotors that range in span from 200 to 300 feet in diameter. The rotor blades turn quite slowly at about 20-25 RPM resulting in a graceful appearance during operation. The rotor blades are typically made from a glass-reinforced polyester composite similar to that used in the marine industry for sophisticated racing hulls. Much of the design and materials experience comes from both the marine and aerospace industries and has been developed and tuned for wind turbines over the past 25 years. The blades are non-metallic, but are equipped with a sophisticated lightning suppression system that is defined in detail in Section 2.3.6.1.11, 'Lightning Protection System'.

Figure 2.3.6-4 Rotor Assembly

2.3.6.1.5 Turbine Control Systems

Wind turbines are equipped with sophisticated computer control systems which are constantly monitoring variables such as wind speed and direction, air and machine temperatures, electrical voltages, currents, vibrations, blade pitch and yaw angles, etc. The main functions of the control system include nacelle operations as well as power operations. Generally, nacelle functions include yawing the nacelle into the wind, pitching the blades, and applying the brakes if necessary. Power operations controlled at the bus cabinet inside the base of the tower include operations of the main breakers to engage the generator with the grid as well as control of ancillary breakers and systems. The control system is always running and ensures that the machines are operating efficiently and safely.

2.3.6.1.6 Central SCADA System

Each turbine is connected to a central Supervisory Control and Data Acquisition (SCADA) System as shown schematically in Figure 2.3.4-3. The SCADA system allows for remote control and monitoring of individual turbines and the wind plant as a whole from both the central host computer or from a remote PC. In the event of faults, the SCADA system can also send signals to a fax, pager or cell phone to alert operations staff.

2.3.6.1.7 Safety Systems

All turbines are designed with several levels of built-in safety and comply with the codes set-forth by European standards as well as those of OSHA and ANSI.

2.3.6.1.8 Braking Systems

The turbines are equipped with two fully independent braking systems that can stop the rotor either acting together or independently. The braking system is designed to be fail-safe, allowing the rotor to be brought to a halt under all foreseeable conditions. The system consists of aerodynamic braking by the rotor blades and by a separate hydraulic disc brake system. Both braking systems operate independently such that if there is a fault with one, the other can still bring the turbine to a halt. Brake pads on the disc brake system are spring loaded against the disc and power is required keep the pads away from the disc. If power is lost, the brakes will be mechanically activated immediately. The aerodynamic braking system is also configured such that if power is lost it will be activated immediately using back-up battery power or the nitrogen accumulators on the hydraulic system, depending on the turbine's design.

After an emergency stop is executed, remote restarting is not possible. The turbine must be inspected in-person and the stop-fault must be reset manually before automatic operation will be re-activated.

The turbines are also equipped with a parking brake that is generally used to "park" the rotor while maintenance routines or inspections that require a stationary rotor are performed.

2.3.6.1.9 Built-in Fire Safety

Each turbine's nacelle is equipped with an internal fire detection system with sensors located in the nacelle as well as at the tower base. The fire detection system is interfaced with the main controller and the central SCADA system. In the event of a fire fault, the turbine is immediately halted and an alarm condition is activated in the control system that can send a page or message to a cell phone of the on-call operators and/or the local fire district as required.

2.3.6.1.10 Climbing Safety

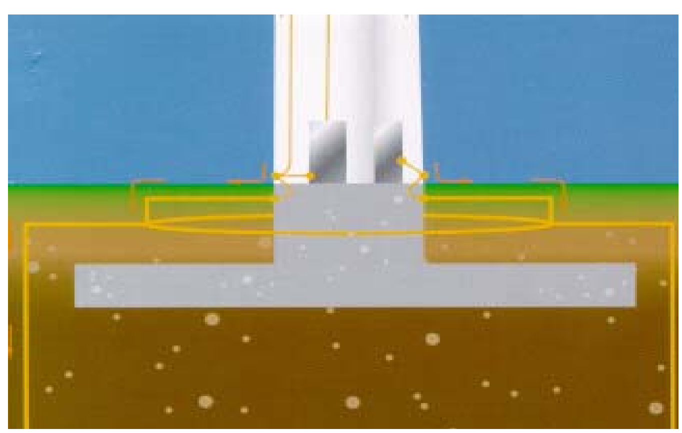
Normal access to the nacelle is accomplished with a ladder inside the tower. Standard tower hardware includes equipment for safe ladder climbing including lanyards and safety belts for service personnel. All internal ladders and maintenance areas inside the tower and nacelle are equipped with safety provisions for securing lifelines and safety belts and conform to or exceed ANSI 14.3-1974 (Safety Requirements for Ladders).

2.3.6.1.11 Lightning Protection System

The WTGs are equipped with an engineered lightning protection system that connects the blades, nacelle, and tower to the earthing system at the base of the tower.

As the rotor blades are nonmetallic, they normally do not act well as a discharge path for lightning, however, as the highest point of the turbine, the blades sometimes provide the path of least resistance for a lightning strike. In order to protect the blades, they are constructed with an internal copper conductor extending from the blade tip down to the rotor hub which is connected to the main shaft and establishes a path through the gearbox, nacelle bed frame etc. to the tower base right down to the grounding system embedded underground. An additional lightning rod extends above the wind vane and anemometer at the rear of the nacelle. Both the rear lightning rod and blades have conductive paths to the nacelle bed frame

Figure 2.3.6-6 Turbine Earthing System at Tower Base



that in turn connects to the tower. The tower base is connected to the earthing system at diametrically opposed points.

Figure 2.3.6-5 shows the general arrangement of the earthing system with respect to the tower and foundation. The earthing system consists of a copper ring conductor connected to earthing rods driven down into the ground at diametrically opposed points outside of the foundation. The earthing system, with a resistance of less than 2 Ohms, provides a firm grounding path to divert harmful stray surge voltages away from the turbine.

The controllers and communication interfaces to the wind farm central control system are through fiber optic cables and optical signal conversion systems protecting these systems from stray surges.

Figure 2.3.6-5 WTG Lightning Diversion Paths

2.3.7 Operations and Maintenance (O&M) Facility

An O&M facility is planned to be located near the corner of state Highway 97 and Bettas Road as indicated on the Project Site Layout in Exhibit 1. The O&M Facility will include a main building with offices, spare parts storage, restrooms, a shop area, outdoor parking facilities, a turn around area for larger vehicles, outdoor lighting and a gated access with partial or full perimeter fencing. The O&M building will have a foundation footprint of approximately 50 ft. by 100 ft. The O&M facility area will be leveled and graded and will serve as a central base of construction operations with up to 8 temporary office trailers and portable toilets parked in place during the construction phase of approximately one year.

2.3.8 Meteorological Monitoring Station Towers

The Project design includes four permanent meteorological (met) towers that are fitted with multiple sensors to track and monitor wind speed and direction and temperatures. The met towers will be connected to the wind plant's central SCADA system as shown in figure 2.3.4-3. The permanent towers will consist of a central lattice structure supported by 3-4 sets of guy wires and will be as tall as the hub height (HH) of the WTGs as shown in Figure 2.3.6-1 which is 46-80m (151-262 ft.).

2.3.9 Feasibility of Technology

The Project will utilize proven utility grade equipment with a minimum design life of 20 years. The most vulnerable equipment are the wear and tear components of the wind turbines. The Project will utilize only well-proven designs that have been approved by reputable third party testing agencies. Modern wind turbines of the type being proposed for the Project have been developed over the past 25 years and have been proven over several generations of equipment. The basic configuration of the 3-bladed up-wind

Figure 2.3.8-1 Met Tower

turbine is the best proven and understood turbine configuration available in the industry and the vast majority of all new wind power generation facilities planned, or under construction in the world utilize this technology. The wind turbine technology used for the design of the Project has proven to be very reliable, efficient, and lower in electrical energy production cost than other commercially available wind power technologies.

Over the past 25-30 years, more than 56,000 wind turbines have been installed around the world for an installed nameplate capacity of about 25,000 MW. More than 18,000 wind turbines (about 4,600 MW) are installed in the USA and there are more than 300 units (200 MW) of wind turbines operating in the state of Washington, near Walla Walla and Pasco.

2.3.10 Wind Power Plant Design Life

Wind Power Projects are designed to meet general utility grade standards as well as a number of other stringent codes and requirements. As a result, the design life of all of the major equipment such as the turbines, transformers, substation and supporting plant infrastructure are all designed to be at least 20 years. Based on the site conditions, it is expected that the proposed turbine technology will continue to perform well into its third decade of operation.

2.3.10.1 Equipment Selection

A very rigorous approach has been taken in an effort to pre-qualify all key equipment suppliers for the Project, especially the wind turbines. Only equipment that has been proven as utility grade with the main emphasis on safety, reliability and competitive pricing will be utilized. This results in a project that delivers energy safely and reliably at the most competitive cost possible over the long haul.

Various factors are taken into consideration in selecting the best technology to implement for a given project. First and foremost are the requirements of the customer. Most utility customers are concerned with purchasing the least expensive available energy with the least amount of integration costs to the transmission system.

2.3.10.2 Wind Turbine Type Certification

European manufacturers, for many years, have been required to meet rigid standards verifying their design criteria, operational characteristics, supervision of construction, transportation, erection, commissioning, testing and servicing. In Europe, Germanischer Lloyd (GL), Det Norske Veritas (DNV), Wind Test GmbH, and Risø (Denmark) are independent testing laboratories, which administer regulations for the design, approval, and certification of wind energy conversion systems. There are no well-established testing agencies in the US that offer the amount of experience, scrutiny and know-how as the European groups. For this reason, the Project will implement turbine technology that, as a minimum, complies with the European standards.

The testing processes involved in the approval of design documentation, include safety and control system concepts, static and dynamic load assumptions, and associated load case definitions. Once approved, specific components, such as blades, drive trains (hubs, gearing, bearings and generators etc.) safety systems, towers, yaw systems, foundations, electrical installations, will be reviewed and approved according to minimum standards established by these testing laboratories. In addition to operating characteristics and design features, the testing groups review construction supervision procedures, including materials testing, QA reports and procedures, corrosion protection, and others. They also review and set standards for supervision during the transportation, erection and commissioning of the turbines.

Operational testing performed by the laboratories includes measurement of power curves, noise emissions, as well as loads and stresses including wind loads imposed on the tower, foundation, drive train, blades, nacelle frame, power quality, etc. Test data are evaluated for plausibility, and compared with the original calculations and mathematical models used for the design.

Neither Germanischer Lloyd nor Risø, nor DNV will issue its certification unless the turbine design has met minimum design standards and performance levels, both calculated and measured. The approval process also applies to the manufacturers' processes and procedures through ISO 9001.

Due to this arduous approval process, European-designed wind turbines have proven to be the most reliable wind energy systems over at least the past decade. In Europe, certification pursuant to these standards is mandatory for both permitting and financing. Partly due to these verification programs, lenders in Europe view wind energy equipment in the same way lenders in the United States might view the purchase of heavy construction equipment.

The Project will implement only turbines that have achieved type certification by a reputable and experienced third party verification institute such as DNV, GL, Risø, or WindTest and demonstrate a design life of at least 20 years.

2.3.11 Reliability/Availability

2.3.11.1 Facility Availability

The Kittitas Valley Wind Power Project will utilize heavy-duty, utility grade equipment. Other wind power projects with similar configurations and grades of high quality, reliable and proven equipment have demonstrated operating availability figures in the mid to high-90 range over the past decade. The availability of wind power projects rivals that of conventional power plants that are generally in the low-90 to mid-90 range.

The Project is expected to operate consistently in the mid-90 to high-90 percent availability range. Facility unavailability is due to several factors and generally is classified as scheduled (planned) or unscheduled (forced) outages.

2.3.11.2 Scheduled Maintenance - Planned Outages

The amount of downtime due to scheduled maintenance is generally very predictable from year to year. The proposed project-operating plan includes a planned outage schedule cycle that consists of WTG inspections and maintenance after the first 3 months of operation, a break-in diagnostic inspection, and subsequent services every 6 months. The 6-month service routines generally take a WTG off-line for just one day. The 6-month routines are very rigorous and consist of inspections and testing of all safety systems, inspection of wear-and-tear components such as seals, bearings, bushings, etc., lubrication of the mechanical systems, electronic diagnostics on the control systems, pre-tension verification of mechanical fasteners and overall inspection of the structural components of the WTGs. Blades are inspected and, if heavily soiled, rinsed once per year to maintain overall aerodynamic efficiency. Blade washing is not anticipated as a requirement for the Project since the fall and spring rains will remove most if not all blade soiling.

Electrical equipment such as breakers, relays, transformers, etc. generally require weekly visual inspections, which does not affect overall availability, and testing or calibrations every 1-3 years which may force outages.

To the extent practical, the short-term off-line routine maintenance procedures are coordinated with periods of little or no generation as to minimize the impact to the amount of overall generation.

2.3.11.3 Unscheduled Maintenance - Forced Outages

Historically, modern wind power projects operate with availabilities in the 95% to 99% range. Several components and systems of an individual wind turbine can be responsible for forced, non-routine outages such as the mechanical, electrical or computer controls. Most of the outages are from auxiliaries and controls and not the heavy rotating machinery. Most developing heavy machinery failures are found prior to failure, during the frequent inspections, so that the failing part is replaced prior to complete failure.

Although the newer control systems have added a high level of detection and diagnostic capability, they normally require frequent minor adjustments in the first few months of operation. As a result availabilities of a wind power project are generally lower in the first few months until they are fully tuned. Once a wind plant is properly tuned, unplanned outages are generally very rare and downtime is generally limited to the routine service schedule.

The O&M facility is always stocked with sufficient spare parts to support high levels of availability during operation. The modular design of modern wind turbines results in the majority of parts being “quick-change” in configuration, especially in the electrical and control systems. This modularity and the fact that all of the turbines are identical allows for the swapping of components quickly between turbines to quickly determine root causes of failures even if the correct spare part is not readily available in the O&M building. As part of their supply agreements, almost all major turbine equipment vendors guarantee the availability of spare parts for 20 years.

2.3.12 Turbine Site Layout Variances

The wind turbines will be installed along the roadways as shown in Exhibit 1, ‘Project Site Layout’. The layout design is based on wind turbines with a rotor diameter of 70 meters. Due to the fact that there are variances that are discovered at the time of performing a final site survey of the exact locations of the Project facilities, some flexibility in determining the facility locations is required to allow for in-field practicalities. Generally, it will not be necessary to relocate roads significantly from their currently shown location on the Site Layout, however, the exact location of the turbines along the planned roadways may need to be altered from the shown plan in Exhibit 1 due to a number of factors including:

- The results of the geotechnical investigations at each surveyed turbine location may reveal underground voids or fault line locations. In this case, the turbine location may need to be altered or eliminated;
- The final on site field survey with the meteorologists may dictate that turbines be spaced slightly closer together in some areas and further apart in other areas;
- If, at the time of construction, a turbine with a larger rotor diameter is to be used, the turbine spacing will be increased and the overall number of turbines would be reduced;
- The final field measurement test surveys of communication microwave paths may require that some turbine locations be adjusted slightly to avoid line-of-sight interferences.

With the range of turbines that are proposed for use on the Project with rotor diameters ranging from 60 to 90 meters (197 to 295 feet), turbine locations would not vary from their shown locations by more than 105 meters (350 feet). Any adjustments to final turbine tower locations would not bring them any closer to public roads, power lines, property lines of non-participating landowners or residences where the set-backs shown currently shown on the Project Site Layout would be not be reduced.

2.3.13 <u>Project Cost Estimate</u>

The total project costs, including the equipment, construction, development, financing, legal, study costs etc. is estimated to be roughly $1,000 per kilowatt of installed nameplate capacity. Therefore, for a project size of 182 MW, the Project will cost approximately $182,000,000.

2.4 Energy Transmission Systems

WAC 463-42-155 Proposal – Energy transmission systems. *The applicant shall discuss the criteria utilized as well as describe the routing, the conceptual design, and the construction schedule for all facilities identified in RCW 80.50.020 (6) and (7) which are proposed to be constructed.*

2.4.1 Introduction

Figure 2.4.1-1 Existing Transmission Lines Across Project Site

The Applicant has reviewed and evaluated multiple prospective wind energy sites in various areas of the Pacific Northwest. The main criteria used for selecting a wind power project site include several considerations. The site for the Kittitas Valley wind Power Project was chosen for several reasons including its strong wind resource, compatible land uses and access to suitable transmission lines. There are several sets of large sized high voltage power lines which cross over the Project site including 5 sets of Bonneville Power Administration (BPA) transmission lines and 1 set of Puget Sound Energy (PSE) transmission lines.

The Project will interconnect with the BPA and/or the PSE transmission lines near Bettas Road as indicated on the site layout contained in Exhibit 1. Since interconnection to the grid will not require the construction of any new major transmission feeder lines, several environmental and other impacts have been avoided. The plant electrical system will be designed and constructed in accordance with the guidelines of the National Electric Code (NEC), National Fire Protection Agency (NFPA) and utility requirements. The general schedule for construction of the interconnection facilities and the substation shall be coordinated with the construction of the rest of the Project as outlined in Section 2.12, 'Construction Schedule and Operation Activities'.

2.4.2 Electrical Collection System Overview

Electrical power generated by the wind turbines is transformed and collected through a network of underground and overhead cables which all terminate at the Project substation. It is most likely that only one substation will be constructed for the Project, however, it is possible that two substations be installed allowing access to both the BPA and Puget Sound Energy (PSE) systems. The Project Site Layout in Exhibit 1 shows the general routing paths of the underground and overhead electrical lines as well as the proposed substation locations.

Power from the turbines is fed through a breaker panel at the turbine base inside the tower and is interconnected to a pad-mounted step-up transformer which steps the voltage up to 34.5 kilovolts (kV). The pad transformers are interconnected on the high side to underground cables which connect all of the turbines together electrically. The underground cables are installed in a trench which is typically 3-4 feet deep and generally runs beside the Project's roadways in order to reduce disturbances to additional ground. Also, due to the rocky conditions at the site, a clean fill material such as sand or fine gravel will be used to cover the cable before the native soil and rock are backfilled over top. In areas where solid rock is encountered and deep trenching is not possible, the underground cables will be installed in a shallower trench and covered in a concrete mix in accordance with acceptable electrical code.

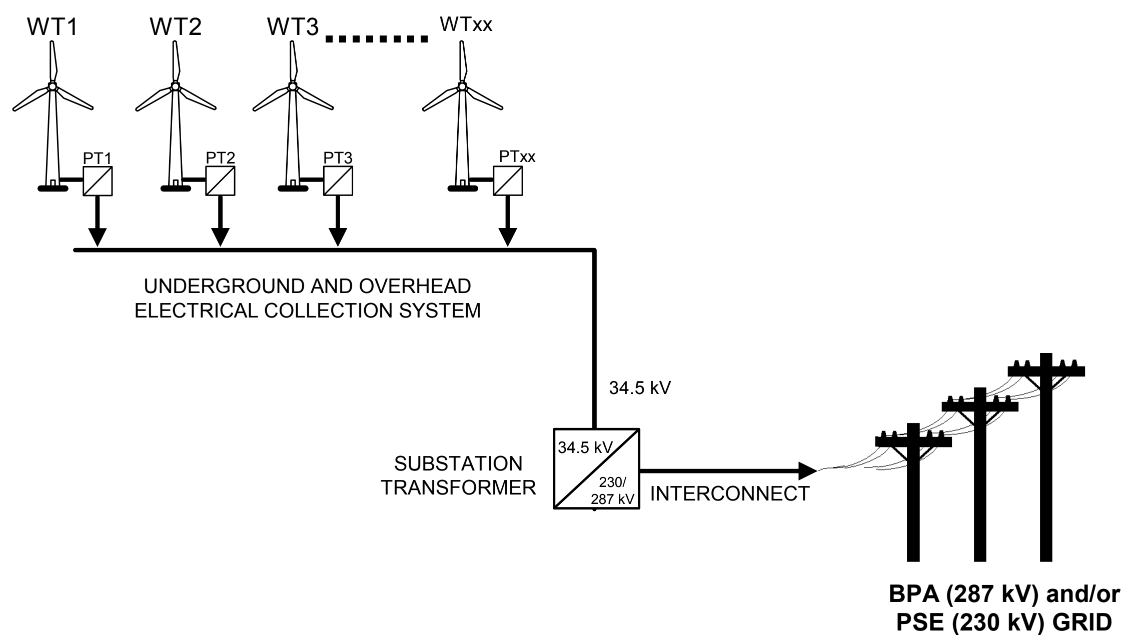
For the short runs of overhead power lines along Bettas Road, a fused, visible, lockable, switched riser pole will be used to run the cables from the underground trench to the overhead conductors. At the substation(s), the electrical power from the entire wind plant is stepped up to transmission level at 230 kV (PSE) or 287 kV (BPA) and delivered to the point(s) of interconnection.

The underground collection cables feed to larger feeder lines which run to the main substation(s) as shown schematically in Figure 2.4.2-1

In locations where two or more sets of underground lines converge, pad mounted junction panels will be utilized to tie the lines together into one or more sets of larger feeder conductors.

The Project requires approximately 23 miles of trenched-in underground and 2 miles of overhead 34.5 kV electrical power lines to collect all of the power from the turbines to terminate at the main substation(s).

Figure 2. 4.2-1 Electrical Collection System and Interconnect



2.4.3 Interconnection Facilities and Substation

If connected to BPA's system, the Project will interconnect directly with either the Grand Coulee to Olympia or Columbia to Covington 287 kV lines. If connected to PSE's system, the Project will interconnect directly with PSE's Rocky Reach to White River 230 kV line. There is the possibility that power will be fed to both the PSE and the BPA systems resulting in the requirement for 2 substations since the lines are at two different voltages (230 kV and 287 kV). The locations of the substations are indicated on the Project Site Plan contained in Exhibit 1.

The main functions of the substation and interconnection facilities is to step up the voltage from the collection lines (at 34.5 kV) to the transmission level (230 kV for PSE and 287 kV for BPA), to interconnect to the utility grid and provide to fault protection. The basic elements of the substation and interconnection facilities are a control house, two main transformers, outdoor breakers, relaying equipment, high voltage bus work, steel support structures, and overhead lightning suppression conductors. All of these main elements will be installed on concrete foundations. The substations and interconnection facilities each consist of a graveled footprint area of approximately 2-3, acres a chain link perimeter fence, and an outdoor lighting system. A photograph of a typical substation is shown in Figure 2.4.3-1.

Figure 2.4.3-1 Typical Substation

A typical one-line diagram of a substation and interconnect system which would be used as a preliminary outline for the Project is included in Exhibit 3, 'Project Electrical One-Line Diagram'. Final adjustment to the substation and interconnect are generally made during design review with the utility and their system protection engineers prior to final construction design and execution.

The Project is working with BPA regarding the review, study, and design, and construction of a power transmission interconnect to BPA's 287 kV lines. If connecting to the BPA system, BPA will be responsible for permitting, constructing, owning and operating facilities interconnecting to their system, which are not subject to EFSEC's jurisdiction. The full details of the Project's BPA interconnection will be included in the BPA's Environmental Impact Statement that is to be prepared in a separate document and reviewed by the public and interested agencies under a joint NEPA/SEPA process.

Direct stroke lighting protections will be provided by the use of overhead shield wires and lightning masts connected to the switchyard ground grid. Overhead shield wires will be high strength steel wires arranged to provide shield zones of protection.

2.4.4 Transmission System Impact Studies (SIS)

In November 2001, the Project contracted with BPA to perform a System Impact Study (SIS) to determine the impact of injecting wind power into the BPA grid at the proposed point of interconnection. In addition, the Project has requested that BPA study the impact for transmitting the power from the point of interconnection to the northwest hub. The studies are still being performed by BPA and will determine the scope and approximate costs of upgrading the BPA system to accept the power from the Project. BPA has completed a preliminary intetrconnection feasibility evaluation which has confirmed that an interconnection can made at the proposed point. Once the SIS is complete, a detailed Facilities Impact Study (FIS) will be performed to determine the basic design, construction costs and schedule for installing the BPA interconnection facilities.

The Project will be undergoing a similar SIS and FIS review with Puget Sound Energy in the first quarter of 2003.

2.4.5 Stand-By Power Consumption

The Project will consume a small amount of power during periods of low wind. On an annual basis, the Project will consume less than 1% of what it generates to support auxiliary systems at the wind turbines such as hydraulic systems, pumps, heaters, fans, controller electronics, lighting, etc. Unlike traditional power plants, the Project does not consume a large amount of power for start-up. Each wind turbine comes on line at random depending upon the local wind speed at each turbine location and power consumption is generally that used for the auxiliary systems at each turbine. As with any power plant, the transformers and auxiliary systems at the substation also consume some power to stay energized and is also generally less than 1% of total plant output over the course of a year.

2.4.6 Step-Up Transformers

2.4.6.1 Pad Mount Transformers

Each of the wind turbines will have a generator step-up transformer mounted on a concrete pad at the tower base. The transformers are typically a mineral oil-filled, liquid-cooled-type, loop-feed, dead front configuration with bay-o-net type fusing, a current limiting fuse and a load break under-oil switch to allow each turbine to be isolated. Each transformer will be sized to carry its respective load without exceeding a 55 °C temperature rise. The step-up transformer impedance will be optimized based on the facility power output requirements, and feeder circuit breaker interrupting ratings and internal fuses. Protection to the transformer and turbine generator is provided by a switchable breaker at the turbine bus cabinet electrical panel inside the turbine tower.

2.4.6.2 Substation Transformers

The Substation is designed to work with either one or two 2 main transformers. The step-up transformer impedances will be optimized based on the facility power output requirements and the protection requirements set-forth by the utility to match the circuit breaker interrupting ratings. The transformers will be liquid-type with cooling fins and fans. Each transformer will be sized to carry its respective load without exceeding a 55 °C temperature rise. Each transformer will be pad-mounted with an oil containment basin consisting of crushed stone for the mineral oil stored in the transformer. The quantity of mineral oil in each transformer is included in Section 2.9, Spill Prevention and Control.

2.4.7 Capacitor Banks and Power Factor Control

Capacitor banks will be installed at each wind turbine in a bus cabinet inside the base of each tower as well as in a central bank at the substation. The capacitor banks at the substation will be sized and configured depending on the utility's requirements and needs for switching and control. Generally, a remote terminal unit (RTU) is installed which allows the utility to switch banks on or off depending the requirements at their systems operations center. The Project anticipates approximately 50 MVArs of capacitors will be installed at the substation to provide power factor control. Capacitor banks have been included in the one-line diagram in Exhibit 3.

2.4.8 Protective Relaying

The substation control house generally houses all of the protective relaying devices. Protective relays are used for switchyard control, indication, metering, recording, instrumentation and annunciation. The relays provide protection of both the utility's and the wind plant's electrical systems by automatically detecting and acting to isolate faulted, or overloaded, equipment and lines. This protection will help to minimize equipment damage and limit the extent of associated system outages in the event of electrical faults, lightning strikes, etc.

2.4.9 Lighting

The substation will be equipped with night-time and motion sensor lighting systems to provide personnel with illumination for operation under normal conditions, for egress under emergency conditions. Emergency lighting with back-up power is also designed into the substations to allow personnel to perform manual operations during an outage of normal power sources. See Section 5.1.4, 'Aesthetics Light and Glare', for additional details.

2 4.10 Substation Grounding System

The electrical system is susceptible to ground faults, lighting and switching surges that may result in high voltage which can constitute a hazard to site personnel and electrical equipment, including protective relaying equipment. The substation will be designed and constructed to have a robust grounding grid which will divert stray surges and faults. Generally, the substation grounding grid consists of heavy gauge bare copper conductor buried in a grid fashion and Cadd welded to a series of multiple underground grounding rods.

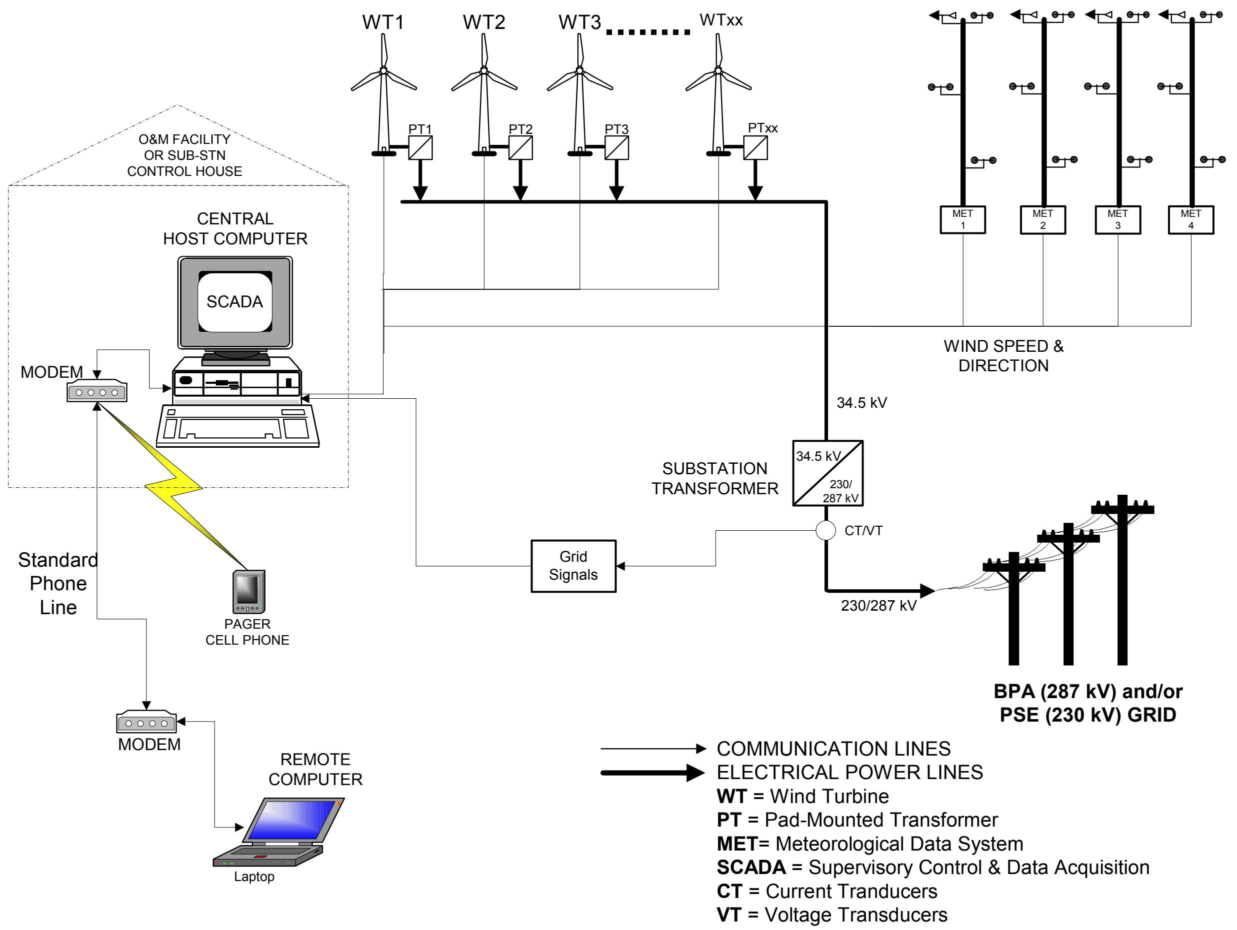
2.4.11 Supervisory Control and Data Acquisition (SCADA) System

Each turbine has its own controller in the tower base and operates independently. Overall wind plant control is achieved through a central Supervisory Control and Data Acquisition (SCADA) System as shown schematically in Figure 2.4.11-1. Each turbine is connected to the SCADA system through communications lines between all of the turbines. The central SCADA computer will be installed either at the substation control house or in the O&M building. The SCADA system allows for remote control and monitoring of individual turbine and the wind plant as a whole from both the central host computer or from a remote personal computer (PC.) In the event of faults, the SCADA system will send messages to a fax, pager or cell phone to alert operations staff.

2.4.12 Energy Transmission System Construction Schedule

The general schedule for construction of the electrical collection system, interconnection facilities and the main substation shall be coordinated with the construction of the rest of the Project as outlined in Section 2.12, 'Construction Schedule and Operation Activities'.

Figure 2.4.11-1   Electrical and Communication Collection System



2.5 WATER SUPPLY SYSTEM

WAC 463-42-165 Proposal – Water supply system. *The applicant shall describe the location and type of water intakes and associated facilities.*

As operation of the Project does not require water for cooling as does a thermal power plant, water needs will be minimal and primarily for bathroom and kitchen use at the O&M facility which is anticipated to be less than 1,000 gallons daily. Water will be obtained from a domestic well that will be installed by a licensed installe. The Applicant will seek and obtain approval for the new well from Kittitas County Environmental Health Department and Washington Department of Ecology.

There will be no discharges to groundwater from Project operations. Wastewater from the O&M facility will be discharged to a domestic septic tank installed pursuant to the requirements of Kittitas County Environmental Health Department.

2.6 SYSTEM OF HEAT DISSIPATION

WAC 463-42-175 Proposal – System of heat dissipation. *The applicant shall describe both the proposed and alternative systems for heat dissipation from the proposed facilities.*

Pursuant to WAC 463-42-115, the Applicant requests a waiver of the information required by WAC 463-42-175, which calls for a description of the heat dissipation systems. Cooling to the operating machinery in side the wind turbines such as the generator and gearbox is achieved with air cooling. Heat dissipation is very minimal and does not generate adverse impacts. The proposed facility uses wind as its source of energy production and not thermal energy, therefore water sources are not used in the process of heat dissipation.

2.7 CHARACTERISTICS OF AQUATIC DISCHARGE SYSTEM

WAC 463-42-185 Proposal – Characteristics of aquatic discharge systems. *Where discharges into a watercourse are involved, the applicant shall identify outfall configurations and show proposed locations.*

Pursuant to WAC 463-42-115 the Applicant requests a waiver of the information required by WAC 463-42-185, which calls for a description of the discharge to a watercourse. There will be no discharge to a watercourse. The proposed facility uses wind as its source of energy production and not thermal energy, therefore water is not used in that process and there will be no discharge. The only water to be used in the operation of the proposed facility will be for domestic purposes from a small domestic, exempt well at the O&M building. This well will provide water for bathroom and kitchen use, and some minor normal maintenance use, and is expected to consume less than 1,000 gallons per day. Wastewater from the O&M facility will be discharged to a domestic septic tank installed pursuant to the requirements of Kittitas County Environmental Health Department.

2.8 WASTEWATER TREATMENT

WAC 463-42-195 Proposal – Wastewater treatment. *The applicant shall describe each wastewater source associated with the facility and for each source, the applicability of all known, available, and reasonable methods of wastewater control and treatment to ensure it meets current waste discharge and water quality regulations. Where wastewater control involves collection and retention for recycling and/or resource recovery, the applicant shall show in detail the methods selected, including at least the following information: Waste source(s), average and maximum daily amounts and composition of wastes, storage capacity and duration, and any bypass or overflow facilities to the wastewater treatment system(s) or the receiving waters. Where wastewaters are discharged into receiving waters, the applicant shall provide a detailed description of the proposed treatment system(s), including appropriate flow diagrams and tables showing the sources of all tributary waste streams, their average and maximum daily amounts and composition, individual treatment units and their design criteria, major piping (including all bypasses), and average and maximum daily amounts and composition of effluent(s).*

Pursuant to WAC 463-42-115 the Applicant requests a waiver of the information required by WAC 463-42-185, which calls for a description of wastewater treatment. There will be no wastewater treatment or discharge to a watercourse. The proposed facility uses wind as its source of energy production and not thermal energy, therefore water is not used in that process and there will be no wastewater treatment or discharge. The only water to be used in the operation of the proposed facility will be for domestic purposes from a small domestic exempt well at the O&M building. This well will provide water for bathroom and kitchen use, and some minor normal maintenance use, and is expected to consume less than 1,000 gallons per day. Wastewater from the O&M facility will be discharged to a domestic septic tank installed pursuant to the requirements of Kittitas County Environmental Health Department.

2.9 SPILLAGE PREVENTION AND CONTROL

WAC 463-42-205 Proposal – Spillage prevention and control. *The applicant shall describe all spillage prevention and control measures to be employed regarding accidental and/or unauthorized discharges or emissions, relating such information to specific facilities, including but not limited to locations, amounts, storage duration, mode of handling, and transport.*

2.9.1 Introduction

This section describes measures that will be taken to prevent and mitigate any accidental spills or discharges. Construction of the Project will require the use of diesel fuel for operating construction equipment and vehicles. Measures to prevent and contain any accidental spills resulting from this fuel storage and use are described below in Section 2.9.2.1, 'Construction Spill Prevention'. Operation of the Project will not require the storage or use of significant quantities of fuel or other materials that could cause a spill or other accidental release. Section 4.1.3, 'Releases or Potential Releases of Hazardous Materials to the Environment', contains additional detail on the quantities of materials to be used in construction and operation of the Project and measures to prevent any releases of these materials to the environment.

2.9.2 Spill Prevention Plan

2.9.2.1 Construction Spill Prevention

Fuel and lubricating oils from construction vehicles and equipment and the mineral oil used to fill the substation transformer(s) are the only potential sources for a spill prevention control program during construction activities. The EPC contractor will be responsible for training its personnel in spill prevention and control and, if an incident occurs, will be responsible for containment and cleanup.

During construction, the EPC contractor will utilize fuel trucks for refueling of construction vehicles and equipment on site. There will be no fuel storage tanks used at the Project site. The fuel trucks will be properly licensed and will incorporate features in equipment and operation, such as automatic shut off devices, to prevent accidental spills.

The Project will have a substation with one or two substations transformers which need to filled with mineral oil on site as they are delivered without oil in the tank. As part of the commissioning process of the main transformers(s), they will filled and tested. The oil truck will be properly licensed and will incorporate several special features in equipment and operation, such as automatic shut off devices, to prevent accidental spills.

Lubricating oils used during construction will mostly be contained in the vehicles and equipment for which they are used. Small quantities of lubricating oils may also be stored in appropriate containers at the construction staging area located at the site of the O&M facility.

It is anticipated that a Construction Spill Prevention Plan will be submitted and approved by EFSEC prior to commencement of construction.

2.9.2.2 Operations Spill Prevention

Project operations will not require the use of a permanent fuel storage tank, as fuel use during operations is limited to maintenance vehicle fueling which will be done at existing licensed gas stations in nearby communities (Ellensburg or Cle Elum.) The potential for accidental spills during Operations is minimal, as the only materials used during Project operations that present any potential for accidental spills are lubricating oils and hydraulic fluids used in the wind turbine generators and transformers.

2.9.2.2.1 Wind Turbine Generator Fluids

Each turbine model has different specifications for lubricating oil and hydraulic fluid quantities. There are three main types of fluid in a wind turbine generator (WTG): Cooling fluid for the generator (a mix of glycol and water, similar to that used in automobile radiators), lubricating oil for the gearbox (typically a synthetic lubricating oil), and hydraulic oil for operating the blade pitch system, yaw mechanism and brakes. The maximum volumes of fluids contained in any of the turbines being considered for this project are listed below in Table 2.9.2.2.1-1.

Table 2.9.2.2.1-1
Maximum Fluid Quantities for Wind Turbine Generators

Turbine Component	Fluid Type	Quantity per WTG (maximum)
Generator cooling system	Glycol-water mix	50 gallons
Hydraulic systems (blades, brake, yaw, etc.)	Hydraulic oil	85 gallons
Gearbox lubrication	Lubricating oil	105 gallons

All of the WTGs being considered for this Project are equipped with sensors to automatically detect loss in fluid pressure and/or increases in temperature which enable them to be shut down in case of a fluid leak, as well as fluid catch basis and containment systems to prevent any accidental releases from leaving the nacelle. Based on the limited quantities of fluids contained in the WTGs and the leak detection and containment systems engineered into their design, the potential for an accidental spill from WTG malfunction is extremely limited. Furthermore, any accidental gear oil or other fluid leaks form the wind turbines will be contained inside the turbine towers which are sealed around the base.

The fluids described in the table above are checked by Operations staff periodically and must be replenished or replaced on an infrequent basis (generally less than once per year and sometimes only once every five years.) When replacing these fluids, Operations staff will climb up to the nacelle and remove the fluids in small (typically 5 gallon) containers and lower them to the ground using a small maintenance crane built into the nacelle itself. The containers are then transferred to a pickup truck for transport to the O&M facility for temporary storage (typically less than one month) before being picked up by a licensed transporter for recycling. Replacement fluids are added in the same method, only in reverse. Small quantities of replacement fluids, typically no more than a few 50 gallon drums, of lubricating oil and hydraulic oil may be stored at the O&M facility for replenishing and replacing spent fluids. These fluids will be stored indoors in appropriate containers. All Operations staff will be trained in appropriate handling and spill prevention techniques to avoid any accidental spills. Because only small quantities of fluids are transported, added or removed at any one time and are stored for short periods of time, the potential for an accidental spill during routine maintenance is extremely limited.

2.9.2.2.2 Transformer Mineral Oil Coolant

Pad Mounted Transformers

As described in Section 2.3, 'Construction On Site', each wind turbine generator has a pad mounted transformer located at its base. These transformers contain mineral oil which acts as coolant. Each pad-mounted transformer contains up to 500 gallons of mineral oil. Thee transformer is designed to meet stringent electrical industry standards, including containment tank weldment and corrosion protection specifications.

Substation Transformer(s)

As described in Section 2.4, 'Energy Transmission Systems', the entire Project will be electrically connected to the grid at the substation which will be equipped with either one or two transformers. Each substation transformer contains up to 12,000 gallons of mineral oil for cooling. Thee transformer is designed to meet stringent electrical industry standards, including containment tank weldment and corrosion protection specifications. The substation transformers are equipped with an oil level sensor that detects any sudden drop in the oil levels, and sends an alarm message to the central SCADA system. Finally, the substation transformers are surrounded by a concrete berm or trough to ensure that any accidental fluid leak does not result in any discharge to the environment.

It is anticipated that an Operation Spill Prevention Control plan will be submitted and approved by EFSEC prior to operation.

2.10 SURFACE WATER RUNOFF

WAC 463-42-215 Proposal – Surface-water runoff. *The applicant shall describe how surface-water runoff and erosion are to be controlled during construction and operation to assure compliance with state water quality standards.*

2.10.1 Introduction and Storm Water Pollution Prevention Plan (SWPPP)

2.10.1.1 Introduction

In general, the Kittitas Valley Wind Power Project (the "Project") wind turbines, site roads, underground cables, and other supporting infrastructure are located on higher ridge tops with good wind exposure and not in wetlands or watercourses. The site construction plans will include detailed provisions and specifications to help minimize erosion and storm water pollution.

2.10.1.2 Storm Water Pollution Prevention Plan (SWPPP)

A detailed construction Storm Water Pollution Prevention Plan (SWPPP) will be developed for the Project to help minimize the potential for discharge of pollutants from the site during construction activities. The SWPPP will be designed to meet the requirements of the Washington State Department of Ecology General Permit to Discharge Storm Water through its storm water pollution control program (Chapter 173-220 WAC) associated with construction activities.

The SWPPP will include both structural and non-structural best management practices (BMPs). Examples of structural BMPs could include the installation of silt curtains and/or other physical controls to divert flows from exposed soils, or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non-structural BMPs include management practices such implementation of materials handling, disposal requirements and spill prevention methods.

A SWPPP meeting the conditions of the Storm Water General Permit for Construction Activities will be prepared and submitted to EFSEC along with a Notice of Intent (NOI) for construction activities prior to the start of Project construction activities.

2.10.1.3 Storm Water Pollution Prevention Plan Design

The SWPPP will be prepared along with detailed Project grading plan design by the Engineering, Procurement and Construction (EPC) Contractor when design level topographic surveying and mapping is prepared for the Project site. The final configuration of proposed improvements will be overlaid onto the detailed topographic maps and the Project civil design engineer will establish the locations and types of construction BMPs to be required of the EPC Contractor. These details will be included on an overall map of the Project site.

A narrative section of the SWPPP will describe the intended installation sequence and function of the selected BMPs, and present the sizing calculations. The plan also will identify the selected minimum standards to which each of the BMPs are to be constructed or installed. When prepared at this level of detail, the document will meet the requirements of the Storm Water Construction Activity NPDES permit system, and will accurately describe to the EPC Contractor, and the Project site construction management team, the improvements and actions required during construction. When complete and submitted to EFSEC, the SWPPP will then be included in the construction bid and contract documents. Implementation of the construction BMPs will be carried out by the EPC contractor, with enforcement supervised by the Project's environmental monitor who will be responsible for implementing the SWPPP.

2.10.2 Site Construction: General Storm Water Pollution Prevention Measures

Site-specific BMPs will be identified on the construction plans for the site slopes, construction activities, weather conditions, and vegetative buffers. The sequence and methods of construction activities will be controlled to limit erosion. Clearing, excavation, and grading will be limited to the minimum areas necessary for construction of the Project. Surface protection measures, such as erosion control blankets or straw matting, also may be required prior to final disturbance and restoration if potential for erosion is high.

All construction practices will emphasize erosion control over sediment control through such non-quantitative activities as:

- Straw mulching and vegetating disturbed surfaces;
- Retaining original vegetation wherever possible;
- Directing surface runoff away from denuded areas;
- Keeping runoff velocities low through minimization of slope steepness and length; and
- Providing and maintaining stabilized construction entrances.

A more detailed description of the materials, methods and approaches used as part of the BMPs for effective storm water pollution prevention and erosion control are as follows:

2.10.2.1 Rain Level Monitoring

The environmental monitor shall be responsible for checking and recording precipitation levels at the Project site using a rain gauge. This benchmark will be used to determine the performance of the SWPPP measures that have been implemented during construction. After construction, the O&M group will also continue to monitor rainfall amounts and monitor the in-place erosion control systems while re-seeded areas become more established. Modifications and additional landscaping will be performed where needed by the O&M group after Project construction is completed.

2.10.2.2 Mulching

Loose straw shall be spread and punched into the ground in all areas where vegetation has been cleared.

2.10.2.3 Temporary Straw Bale and Silt Fence Sediment Barriers

Temporary straw bale barriers and sediment fences shall be inspected by the Contractor immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs, relocations, or additions shall be made promptly. No more than one foot of sediment shall be allowed to accumulate behind straw bales or silt fence sediment barriers. Sediment will be removed and re-graded into slopes. New lines of barriers installed uphill of sediment-laden barriers will be considered based on the rate at which the one foot of sediment accumulates.

Silt fences and straw bale sediment barriers will be maintained throughout the construction period, and beyond, until disturbed surfaces have been stabilized with vegetation. Silt fence construction specifications including fabric type, support spacing, and total length will be determined by local construction conditions during final design of the facilities.

2.10.2.4 Check Structures And Sediment Traps

Check structures, such as rock dams, hay bale check dams, dikes and swales will be used, where appropriate, to reduce runoff velocity as well as to direct surface runoff around and away from cut-and-fill slopes. Swales and dikes will also be used to direct surface water toward sediment traps.

2.10.2.5 Matting And Erosion Control Blankets

Depending upon weather conditions during the construction period, straw or jute matting or other suitable erosion control blankets will be used on the pad slopes and the drainage channel slopes if direct rainfall on the slopes will result in erosion prior to stabilization.

Figure 2.10.2-1 Erosion Control Blankets and Silt Fencing used for Exposed Slope Stabilization as part of a SWPPP

2.10.2.6 Control of Excavation De-Watering

All excavation work requiring de-watering will be discharged to the surrounding surface areas through a hose which will be moved as the water is pumped out to distribute the ground water over a large surface area to avoid causing increased erosion or storm water pollution.

2.10.2.7 Storm Water Pollutants (Waste, Debris, Chemicals)

In addition to erosion and sedimentation control on the Project site, it also is important to reduce potential for chemical pollution of surface waters during construction. Source control is the most effective method of preventing chemical water pollution. All pollutants, including waste materials and demolition debris, that occur on-site during construction will be handled and disposed of in a manner that does not cause contamination of storm water.

The site environmental monitor will be responsible for planning, implementing, and maintaining Best Management Practices (BMPs) for:

- Neat and orderly storage of any construction chemicals and spent containers in lined, bermed areas;
- Prompt clean up of construction phase spills;
- Regular disposal of construction garbage and debris using on-site dumpsters.

2.10.3 Road Construction Storm Water Pollution Control Measures

Work on the access roads will include grading and re-graveling existing roads and construction of new roads. The site will have gravel roadways which will be generally a low profile design allowing water to flow over them in most areas. Erosion control measures to be installed during the work on the access roads includes:

- The maintenance of vegetative buffer strips between the impacted areas and any nearby receiving waterways;
- Installation of sediment fence/straw bale barriers on disturbed slopes and other locations shown on the SWPPP;
- Straw mulching at locations adjacent to the road that have been impacted;
- Providing temporary sediment traps and sedimat type mats downstream of seasonal stream crossings;
- Installation of silt fencing on steeper exposed slopes;
- Planting of designated seed mixes at impacted areas.

At each turbine location, a crane pad area of approximately 3,000 square feet will be graded in place and covered with road rock. During construction, silt fences, hay bails, or matting will be placed on the down slope side of the crane pad areas. Wind turbine equipment such as the blades, tower sections and nacelles will be transported and off-loaded at each turbine location near the foundation and crane pad. After construction, disturbed areas around all crane pad staging areas will re-seeded as necessary to restore the area to its original condition.

The environmental monitor will be responsible for locating any necessary clean fill disposal sites for excess excavation spoils. To control the release of sediment from the disposal sites, silt fence with a straw bale barrier shall be installed on the down slope side of all disposal areas. If additional sediment or erosion control measures are determined to be necessary to control the release of sediment from the disposal sites, the environmental monitor shall be responsible for implementing these measures.

All areas that are impacted by the construction will be seeded when there is adequate soil moisture. They will be re-seeded if healthy cover vegetations do not grow. The sediment fence and check dams will remain in place until the impacted areas are well vegetated and the risk of erosion has been eliminated. The Project operations group will remove the sediment fence at this time.

2.10.4 Foundation Construction Storm Water Pollution Control Measures

Foundation construction will require significant excavation at each wind turbine location. Excavation materials will be stored adjacent to the foundation holes as the forms, rebar and bolts are assembled and as the concrete cures after it is cast in place. Sediment fences, hay bails or matting will be installed on steeper down slopes near the storage piles. Once the concrete cures, excavated materials will be used for back filling. In impacted areas adjacent to pads, mulch will be spread and the area will be re-seeded. Cobbles and rocks too large for backfilling will be disposed of off-site, used in rock check-dams or to support other on-site erosion control measures.

2.10.5 Underground Cable Trenching Storm Water Pollution Control Measures

Underground electrical and communications cables will be placed in 3- to 5-foot-wide trenches along the length of each wind turbine string corridor. In some cases trenches will run from the end of one turbine string to the end of an adjacent turbine string to link turbines via the underground network. Trenches will be excavated from 1.5 to 4 feet deep varying depending on the underlying soil/rock conditions. Excavated materials will be piled alongside the cable trenches for back filling after cable installation. Sediment fences, hay bails or matting will be installed on steeper down slopes near the storage piles. After backfilling, excess excavated soils will be spread around the surrounding area and contoured to the natural grade. Cobbles and rocks too large for backfilling will be disposed of off-site, used in rock check-dams or to support other on-site erosion control measures. Finally, the area will be re-seeded with a designated seed mix, as appropriate to the location.

2.10.6 Overhead Collector Line Construction Storm Water Pollution Control Measures

Construction of the overhead pole line alongside Bettas Road will also require excavation for setting of the poles. Excavated materials will be piled alongside the excavations for back filling after pole installation. Sediment fences, hay bails or matting will be installed on any steep down slopes near the storage piles. After backfilling, excess excavated soils will be spread around the surrounding area and contoured to the natural grade. Cobbles and rocks too large for backfilling will be disposed of off-site, used in rock check-dams or to support other on-site erosion control measures. Finally, the area will be re-seeded with a designated seed mix, as appropriate to the location.

2.10.7 Substation Construction Storm Water Pollution Prevention Measures

The substation is generally flat and the base area will be graded and covered with a sub-base rock and a graveled surface on top. Foundation and underground trenching excavation spoils will be handled in the same manners as described in the above sections regarding foundations and underground cable trenches. Disturbed areas surrounding the substation perimeter shall be contoured to the natural grade covered in straw mulch, protected for erosion control and re-seeded as appropriate to the adjacent slopes. The main substation transformers, which are filled with mineral oil, are equipped with an oil level meter and float switch. The transformers will be surrounded by oil containment catch trenches around the outer perimeter of their foundations.

2.10.8 Final Road Grading and Site Cleanup

The Project will have dumpsters from a local sanitation company to collect recyclable materials and dispose of waste materials that could not be reused. A final site cleanup will be made before turning the Project over to the O&M group. In accordance with the Erosion & Sediment Control Plan for access road improvement and construction, county roads will be restored to at least their pre-Project condition and to the satisfaction of the Kittitas County public works department.

2.10.9 Storm Water Management During Project Operations

As described above, the Project will prepare and define a Storm water Pollution Prevention Plan as part of the final design. The Project operations group will be responsible for monitoring the SWPPP measures that were implemnted during construction to ensure they continue to function properly. Final designs for the permanent BMPs will be incorporated into the final construction plans and specifications prepared by the engineering team's civil design engineer. An operations manual for the permanent BMPs will be prepared by the EPC contractor civil design engineer and the Project's enginering team.

The permanent storm water BMPs will include permanent erosion and sedimentation control through site landscaping, grass, and other vegetative cover. The final designs for these permanent BMPs will conform to the Washington Department of Ecology Storm water Management Manual.

Operational BMPs will be adopted, as part of the SWPPP, to implement good housekeeping, preventive and corrective maintenance procedures, steps for spill prevention and emergency cleanup, employee training programs, and inspection and record keeping practices, as necessary, to prevent storm water pollution.

Examples of good operational housekeeping practices, which will be employed by the Project, include:

- Prompt cleanup and removal of any spillage;
- Restricting vehicle travel to access roads;
- Regular pickup and disposal of garbage and rubbish;
- Regular sweeping of floors;
- Proper storage of containers.

The Project operations group will periodically review the SWPPP against actual practice. The Operations Manager will ascertain that the controls identified in the plan are adequate, and that employees are following them. A summary of these in-house compliance inspections will be kept with the SWPPP, along with any notifications and reports of non-compliance items or areas. If the SWPPP has been followed but still proves to be inadequate to prevent storm water pollution, the SWPPP will be adjusted and/or amended and resubmitted to the Washington Department of Ecology for concurrence.

2.11 EMISSIONS CONTROL

WAC 463-42-225 Proposal -- Emission control. *The applicant shall demonstrate that the highest and best practicable treatment for control of emissions will be utilized in facility construction and operation. In the case of fossil fuel power plants, petroleum refineries, and transmission and associated facilities, the applicant should deal with products containing sulphur,* NO_x*, volatile organics, CO,* CO_2*, aldehydes, particulates, and any other emissions subject to regulation by local, state, or federal agencies. In the case of a nuclear-fueled plant, the applicant should deal with optional plant designs as these may relate to gaseous emissions.*

Pursuant to WAC 463-42-115, the Applicant requests a waiver of the information required by WAC 463-42-225 for operation, which calls for a demonstration that the highest and best practicable treatment for control of emissions will be utilized. The only air emissions arising from the Project will be vehicle and construction equipment emissions during construction. No air emissions will be generated from operation of the Project, as the operation of wind turbine generators does not involve the combustion of any fuels. The Project area is located outside of any air quality non-attainment areas, according to Washington Department of Ecology.

2.11.1 <u>Construction</u>

During construction of the Project, the use and operation of construction equipment and vehicles will result in minor air emissions. The main sources of these emissions are expected to be:

- Earth moving equipment for road construction and site preparation
- Excavating equipment for turbine foundation excavation
- Transport vehicles for delivery of construction materials and equipment
- Worker vehicles
- Small electric generators for on-site power during construction

The primary types of air emissions are expected to be those typically associated with internal combustion engines, e.g. carbon dioxide, nitrogen oxides, sulfur oxides, carbon monoxide and particulate matter.

2.11.2 <u>Mitigation</u>

All construction and operations vehicles and equipment will comply will all applicable state and federal emissions standards. Applicant will instruct the contractors to minimize the idling of engines when not in active use to minimize emissions. Applicant will encourage carpooling among construction workers to further minimize emissions.

As the construction equipment and vehicles will be dispersed across a large, sparsely populated area, no impacts to surrounding residences are anticipated. The construction will take place for a limited duration (approximately one year), therefore total construction emissions will be relatively minor and environmental impacts will be insignificant. The air emissions that will be displaced by the operation of the Project (that would otherwise be generated by an equivalent fossil-fuel power plant) will outweigh the air emissions generated during construction by several orders of magnitude.

2.12 CONSTRUCTION SCHEDULE AND OPERATION ACTIVITIES

WAC 463-42-235 Proposal – Construction and operation activities. *The applicant shall: Provide the proposed construction schedule, identify the major milestones, and describe activity levels versus time in terms of craft and noncraft employment; and describe the proposed operational employment levels.*

2.12.1 Introduction

The construction of the Kittitas Valley Wind Power Project will be performed in several stages and will include the following main elements and activities:

- Grading of the field construction office area (also used for O&M building);
- Construction of site roads, turn-around areas and crane pads at each wind turbine location;
- Construction of the turbine tower foundations and transformer pads;
- Installation of the electrical collection system – underground and some overhead lines;
- Assembly and erection of the wind turbines;
- Construction and installation of the substation;
- Plant commissioning and energization.

The Applicant intends to enter into two primary agreements for the construction of the Project: including an agreement for the supply, erection and commissioning of the wind turbines as well as an Engineering, Procurement and Construction (EPC) contract for the construction of the balance of plant (BOP) which includes all other Project facilities and infrastructure such as the roads, electrical collection system, substation, O&M Facility, etc. The turbine supplier and the EPC Contractor will be selected during the EFSEC Application review process.

The construction schedules discussed below are based on obtaining a site certificate from Washington EFSEC by October 1, 2003.

The construction schedule will closely follow the construction methodologies discussed in Section 2.14, 'Construction Methodology'.

2.12.2 Proposed Construction Schedule, Activities and Milestones

This section describes the engineering, procurement, construction, and start-up schedule milestones for the Project. For wind power projects, the longest lead-time items are typically the substation transformers, usually requiring from 8-12 months from time of order to delivery and the wind turbines, generally requiring from 5 to 7 months. These long lead time items will be ordered as soon as possible immediately following obtaining site certification from EFSEC.

The proposed Project construction schedule summary showing the major tasks and key milestones is included below in Table 2.12.2-1. Also shown in Table 2.12.2-1 is the number of expected on-site personnel to perform each of the key tasks. It is expected that Project construction will occur over a period of approximately 1 year from the time of site certification to commercial operation and will require the involvement of more than 250 personnel.

Table 2.12.2-1 Proposed Project Construction Schedule Summary				
	TASK / MILESTONE	***START***	***FINISH***	***Approx. On-Site Manpower for Task***
1	Obtain EFSEC Site Certification	*TARGET*	10/1/03	
2	Engineering/Design/Specifications/Surveys	8/6/03	9/30/03	18
3	Order/Fabricate Wind Turbines	10/1/03	3/16/04	0
4	Order/Fabricate Substation Transformer	10/1/03	6/1/04	0
5	Road Construction	10/1/03	1/20/04	30
6	Foundations Construction	10/22/03	4/6/04	60
7	Electrical Collection System Construction	11/19/03	5/4/04	40
8	Substation Construction	1/14/04	6/1/04	20
9	Wind Turbine Assembly and Erection	3/17/04	9/21/04	40
10	Plant Energization and Commissioning	5/12/04	9/28/04	30
11	Plant Substantial Completion	*TARGET*	9/28/04	0
12	Construction Punchlist Clean-Up	8/25/04	11/16/04	15
			TOTAL	**253**

2.12.3 Construction Workforce and Employment Levels

The amount of craft and noncraft employment is outlined in Table 2.12.3-1 “Labor Force Mix”. Overall, the Project anticipates the involvement of more than 250 on-site personnel.

Table 2.12.3-1 “Construction Labor Resource Loading” presents the estimated total workforce resource loading, by month, for the construction of the Project. At peak, it is expected that about 160 personnel will be on-site at once as multiple disciplines of contractors complete their work simultaneously. All employees are assumed to work single 10-hour shifts, 5 or 6 days per week, as the work demands, for the duration of Project construction. During turbine erection, both stand-by days and days with double shifts are anticipated to allow for turbine erection in low wind conditions.

A detailed discussion of where the construction workforce originates, where they will be housed and how they will travel to the Project site is included in Section 8.1 ‘Socioeconomic Impact’.

Table 2.12.3-1
Construction Labor Force Mix (Approximate # Personnel)

Construction Phase	Project Management &Engineers	Field Technical Staff	Skilled Labor & Equip Operators	Unskilled Labor	TOTAL
Engineering/Surveying/Design	6	12	0	0	18
Road Construction	5	5	15	5	30
Foundations Construction	3	4	23	30	60
Electrical Collection System Construction	2	3	23	12	40
Substation Construction	5	3	8	4	20
Wind Turbine Assembly and Erection	4	6	15	15	40
Plant Energization and Commissioning	5	10	15	0	30
Construction Punchlist Clean-Up	1	1	3	10	15
TOTALS	**31**	**44**	**102**	**76**	**253**

Table 2.12.3-2
Construction Labor Resource Loading
(Approximate # Personnel)

Month Before Commercial Operation	Project Management &Engineers	Field Technical Staff	Skilled Labor & Equipment Operators	Unskilled Labor	TOTAL
14	6	0	0	0	**6**
13	6	12	0	0	**18**
12	5	5	15	5	**30**
11	8	9	38	35	**90**
10	10	12	61	47	**130**
9	10	12	61	47	**130**
8	10	10	54	46	**120**
7	10	10	54	46	**120**
6	14	16	69	61	**160**
5	14	19	38	19	**90**
4	9	16	30	15	**70**
3	9	16	30	15	**70**
2	9	16	30	15	**70**
1	5	10	15	0	**30**
0	5	10	15	0	**30**
CLEAN UP	1	1	3	10	**15**

2.12.4 Operations and Maintenance Labor Force

The Project will be operated and maintained by a team of approximately 16 to 18 personnel consisting of the following staff positions:

Position	Number of Personnel
Plant/Site Manager	1
Operations Manager	1
Operating Technicians	8-10
Administrative Manager	1
Administrative Assistant	1
TOTAL	16-18

The Operations and Maintenance (O&M) team will staff the Project during core operating hours 8 hours per day, 5 days per week, with weekend shifts and extended hours as required. The Project's central Supervisory Control and Data Acquisition (SCADA) system stays on-line full time, 24 hours per day, 365 days per year. In the event of turbine or plant facility outages, the SCADA system will send alarm messages to on-call technicians via pager or cell phone to notify them of the outage. The Project will always have a local, on-call local technician who can respond quickly in the event of any emergency notification or critical outage. Operating technicians will rotate the duty of being on-call for outages.

2.13 CONSTRUCTION MANAGEMENT

WAC 463-42-245 Proposal - Construction management. *The applicant shall describe the organizational structure including the management of project quality and environmental functions.*

2.13.1 Construction Management Organization

The Applicant intends to enter into two primary agreements for the construction of the Project including an agreement for the supply, erection and commissioning of the wind turbines as well as an Engineering, Procurement and Construction (EPC) contract for the construction of the balance of plant (BOP) which includes all other Project facilities and infrastructure such as the roads, electrical collection system, substation, O&M Facility, etc.

2.13.1.1 Project Construction Management

The Project Management organizational structure will include two support groups: An engineering and design specifications team and the field site management team. Figure 2.13.1-1 illustrates the construction management organizational structure for the Project. The Project Manager will handle contractual aspects of the agreements with the project managers of the wind turbine vendor and the EPC contractor. This organizational chart represents a typical structure for wind power projects. The exact organization may change after award of the turbine supply contract, EPC contract and other subcontracts.

2.13.1.2 Engineering and Design Specifications Team

The engineering and design specifications team is responsible for establishing the design and construction specifications for the various portions of the Project. The engineering team acts a third party verification group in conjunction with the Project's field QA/QC team. The engineering team will review proposals from the various turbine suppliers and EPC contractors for equipment supply and construction work. The turbine supplier and EPC contractor will be responsible for the detailed design work for the Project and for submitting these designs and equipment specifications to the Project engineering team for review. Review by the Project engineering team ensures that the detailed construction plans will meet the required design specifications, codes and standards for the Project.

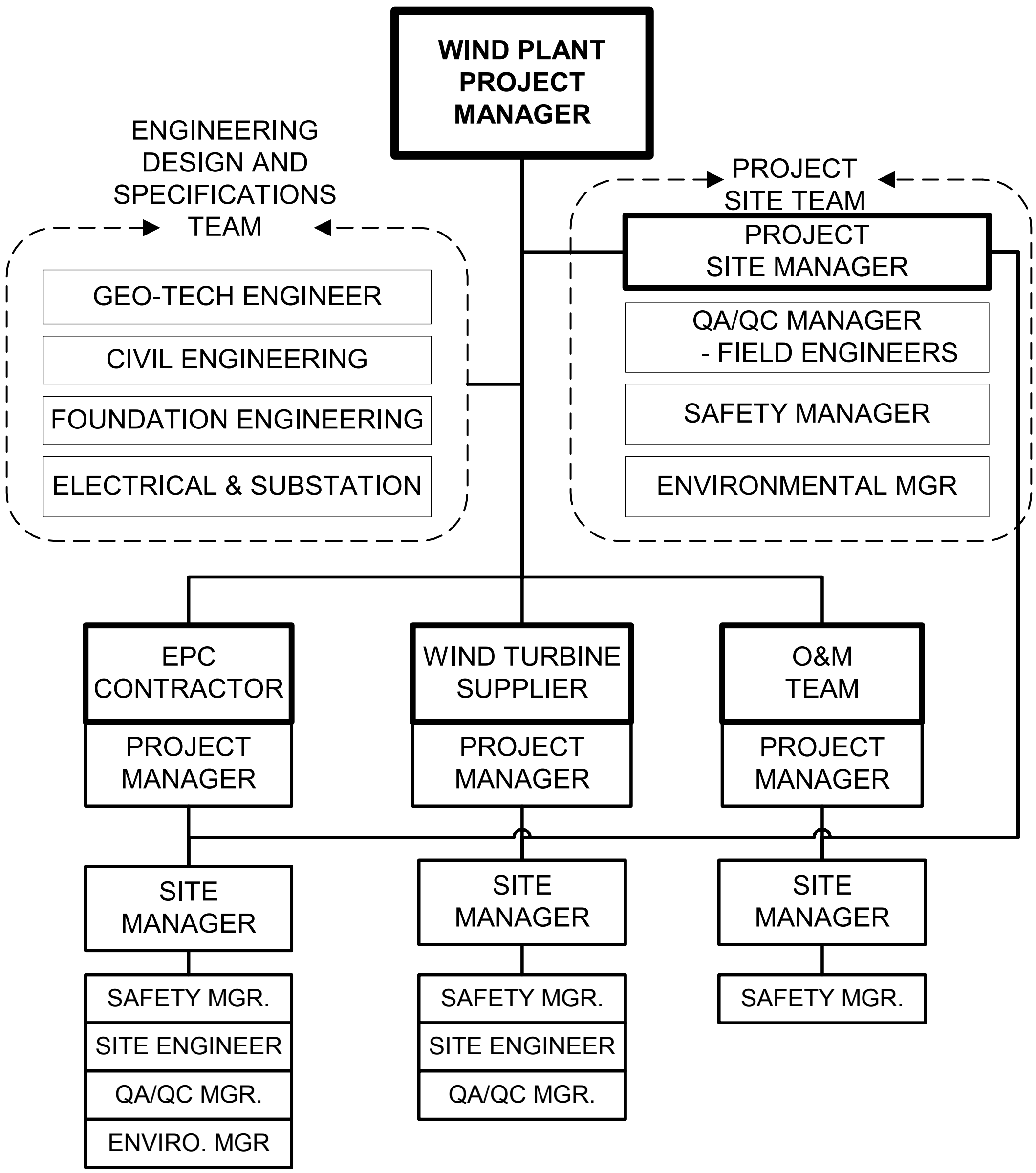
2.13.1.3 Field Site Management Team

The field site management team will oversee construction on-site and will ensure that construction on-site is done in accordance with the engineering plans and specifications, environmental requirements and good industry practice. The field site team will generally be involved in day-to-day issues as they arise throughout the construction phase. The Project Site Manager will have a support team consisting of quality assurance and quality control (QA/QC) specialists, environmental inspectors, and site safety officers. The site team will also rely on the engineering team for in the field support during critical operations such as for energizing of the substation and for technical issues as they arise during Project construction.

2.13.1.4 EPC Contractor's Construction Management Team

The EPC Contractor will be responsible for managing several construction subcontractors including those all of the BOP items such as the roads, electrical and communications system infrastructure, substation and O&M Facility. The EPC Contractor will have a lead Project Manager, a Project Engineer and a Site Manager supported by their own field engineering team, quality assurance and quality control specialists, environmental monitors, and site safety officers. The EPC Contractor will be required to implement and perform a safety plan, a QA/QC plan and an environmental protection plan including the storm water pollution prevention plan (SWPPP).

Figure 2.13-1 Project Construction Management Organizational Structure



2.13.1.5 Wind Turbine Vendor's Construction Management Team

The wind turbine supplier will be responsible for the supply, delivery, erection and commissioning of the wind turbines. The turbine supplier's construction team will include a lead Project Manager, a Site Manager, transportation specialists and several lead technicians. The turbine vendor's site team will be supported by their own quality assurance and quality control specialists and site safety officers. The EPC Contractor will be required to implement and perform a safety plan, a rigorous QA/QC plan and a detailed commissioning plan.

2.13.1.6 Project Operations and Maintenance (O&M) Team

The Project O&M group will be on site during the commissioning and start-up phase of construction. Once a turbine is commissioned, it is turned over to the O&M group control. The O&M team generally consists of a Project site manager, a team of wind turbine field technician specialists, and administrative support staff.

2.13.2 Quality Assurance, Quality Control, Environmental and Health And Safety Compliance

2.13.2.1 QA/QC Program Characteristics

2.13.2.1.1 QA/QC Program

A Quality Assurance (QA) and Quality Control (QC) Program will be implemented during all phases of the Project to ensure that the engineering, procurement, construction, and startup of the facility is completed, as specified. The EPC Contract will require that a Project construction procedures manual be submitted prior to any site construction for review and approval. The manual will describe how the contractors will implement and maintain QA/QC, Environmental Compliance Programs, Health and Safety Compliance Programs and intergrate their activities with the other contractors during all phases of the work. The EPC contractor and turbine supplier will be responsible for enforcing compliance to the construction procedures program of all of its subcontractors.

In the QA/QC Program, the contractor will describe the activities and responsibilities within its organization, and the measures to be taken to assure quality work in the project. Some of the topics that will be covered are design control, configuration management and drawing control. Independent QA/QC personnel will review all documentation (design, engineering, procurement, etc.) and witness field activities as a parallel organization to that of the construction contractors to assure compliance with the specifications. In the installation, alignment and commissioning of all major equipment, field inspectors' acceptance will be required.

2.13.2.1.2 Environmental Protection

The Environmental Compliance program will ensure that construction activities meet the conditions, limits and specifications set in environmental standards established in the Site Certification Agreement and all other environmental regulations.

Copies of all applicable construction permits will be kept on-site. The lead project construction personnel and construction Project Managers will be required to read, follow and be responsible for all required compliance activities. A project Environmental Monitor will be responsible for ensuring that all construction permit requirements are adhered to, and that any deficiencies are promptly corrected. The Environmental Monitor will ultimately report to the Project Manager and will provide weekly reports on environmental problems reported or discovered as well as corrective actions taken to resolve these problems. The Environmental Compliance Program will cover avoidance of sensitive areas during construction, waste handling and storage, stormwater management, spill prevention and control and other components required by state and county regulation. Upon identification of an environmental noncomplience issure, the EPC contractor Environmental Monitor will work with the responsible subcontractor or direct hire workers to correct the violation; if not corrected in a reasonable period of time a “stop work” request can be issued for that portion of the work not in compliance with the Project environmental requirements.

2.13.2.1.3 Safety Program

The EPC contractor, and each subcontractor, will be responsible for construction health and safety issues. The EPC contractor, and each subcontractor, will provide a Health and Safety Coordinator who will ensure that all laws, ordinances, regulations and standards concerning health and safety issues are complied with and that any identified deficiences are corrected as fast as possible. The EPC contractor Health and Safety Coordinator will report back to EPC contractor corporate management and has the authority to “stop work” when health and safety issues, including EPC subcontractor safety issues, are violated and the health and safety of constuction personnel are in danger. Under the EPC contract, the Health and Safety Coordinator position is full time; for the subcontractors it is assumed that this will be a part time responsibility. For health and safety “stop work” orders, the action may only be for a portion of the work that endangers a limited portion of the project site or activities. The project construction proceedures will clearly spell out the “stop work” proceedures which will require a written action request with justification on the part of the Health and Saftey Coordinator. Upon identification of a health and safety issue, the EPC contractor Health and Safety Coordinator will work with the responsible subcontractor or direct hire workers to correct the violation; if not corrected in a reasonable period of time the “stop work” request can be issued.

The “stop work” authority is also given to the project Construction Manager for commercial actions and health and safety issues.

2.13.2.2 QA/QC, Safety and Environmental Inspections, Checks And Reviews

Saftey, Environmental Protection and QA/QC inspections of the major facilities and equipment listed below will typically include, but not be limited to, the following operations, checks and review:

Safety

- Review of safety procedures;
- Observation and attendance of safety training for supervisors and field staff (tail gate meetings);
- Review of construction safety techniques and implementation;
- Verification of safety incident reports and statistical data.

Environmental Protection

- Review of erosion control and storm water pollution prevention plans;
- Witness of construction implementation;
- Witness of erosion control performance;
- Ensuring sensitive areas are flagged and avoided;
- Inspection of spill sites and cleanup and review of spill reports;
- Continuous inspection for trash and debris removal from the Project site.

Wind Turbine Generators and Towers

- Inspection of turbines at manufacturer's facilities;
- Review and inspection of manufacturer's QA/QC procedures;
- Manufacturing drawing review and verification;
- Verification of welding procedure specifications (WPS) compliance ;
- Material mill certificates tracking system and verification;
- Overall visual inspection (including assembly, fastening systems and welding);
- Inspection of flange interface flatness measurements, finishing and protection;
- Witness or review of turbine run-in load testing;
- Inspection of paint finishing and protection;
- Inspection of painting/marking/preparation for shipment;
- Verification of field wiring and tagging;
- Pre-Commissioning field testing and verification.

Road Construction and Site Preparation

- Field verification of road locations to site plan and survey markings;
- Review of clearing and grubbing process;
- Verification of adequate road materials and compaction to engineer's specifications;
- Verification of road grade to plans.

Concrete/Structural

- Inspection of batch plant facilities, engineer's review of mix design and break test verification;
- Inspection of forms, structural steel and rebar prior to backfilling and prior to casting;
- Field engineer's witness of concrete pouring;
- Inspection of concrete testing during pour (slump) and verification of break tests results.

Electrical Collection System

- Inspection of cables and trenches prior to burial and backfilling;
- Witness of proper backfilling procedures;
- Inspection of terminations and termination hardware at pad transformers,jucntion bxes, pad switches, risers, etc.;
- Witness and/or review of polarity, cable marking and phase rotation tests;
- Witness and/or review of grounding system resistance measurements;
- Inspection of all lock-out tag-out locations and energization sequences and plan.

Pad-Mount Transformers and Main Substation Transformers

- Inspection of trasformers at manufacturer's facilities;
- Witness and/or review of winding resistance, polarity and phase displacement tests;
- Witness and/or review of no load losses and excitation current at rated voltage and frequency;

- Witness and/or review of impedance voltage and load losses at rated current and rated frequency;
- Witness and/or review of high potential and induced potential tests;
- Witness and/or review of impulse tests, reduced full wave, chopped wave and full wave tests;
- Witness and/or review of regulation and efficiency calculations;
- Verification of compliance to engineering specifications;
- Inspection of painting/tagging/preparation for shipment;
- Verification of field wiring and tagging.

Substation Breakers

- Witness and/or review of rated continuous current and short circuit tests;
- Witness and/or review of dielectric withstand tests;
- Witness and/or review of switching tests;
- Witness and/or review of insulator tests;
- Witness and/or review of mechanical life tests;
- Witness and/or review of terminal loading tests;
- Witness and/or review of partial discharge tests;
- Verification of compliance to engineering specifications;
- Inspection of painting/tagging/wiring/preparation for shipment;
- Verification of field wiring and tagging.

Substation Relaying and Instrumentation

- Inspection of manufacturer's facilties
- Verification of instrument and relay compliance to specifications;
- Verification of installation in accordance with drawings;
- Witness and/or review of instrument and relaying calibration;
- Verification of field wiring and tagging.

Substation Structural Steel Work

- Inspection of manufacturer's facilities;
- Review and inspection of manufacturer's QA/QC procedures;
- Manufacturing drawing review and verification;
- Verification of welding procedure specifications (WPS) compliance ;
- Material mill certificates tracking system and verification;
- Overall visual inspection (including assembly, fastening systems and welding);
- Inspection of flange interface flatness measurements, finishing and protection;
- Inspection of paint finishing and protection.

2.14 CONSTRUCTION METHODOLOGY

WAC 463-42-255 Proposal – Construction methodology. *The applicant shall describe in detail the construction procedures, including major equipment, proposed for any construction activity within watercourses, wetlands and other sensitive areas.*

2.14.1 Introduction

In general, the Project's wind turbines, site roads, underground cables, and other supporting infrastructure are located on the higher ridge tops with good wind exposure and not in wetlands or watercourses. Environmental mitigation activities include the installation of erosion, drainage, and storm water systems along disturbed slopes. No special water rerouting or dewatering is required for construction. Several pieces of large construction equipment will be required to complete Project construction as described in each of the sections below regarding the specific phase and discipline of construction.

The construction of the Kittitas Power Project will be performed in a manner that will incorporate the impact mitigation methods outlined in other sections of this application, including, but not limited to erosion control measures (see Section 3.1, 'Earth'); emission controls (see Section 3.2, 'Air'); surface-water control measures (see Section 2.10, 'Surface Water Runoff' And Section 3.3, 'Water'); spillage prevention and control measures (see Section 2.9, 'Spillage Prevention and Control'); environmental health mitigation measures (see Section 4.1, 'Environmental Health'); traffic control measures (see Section 5.2, 'Transportation'); and other construction practice measures (see Section 5.3, 'Public Services And Utilities') that will minimize the Project's impact on the environment and the surrounding area.

Project construction will be performed in several stages and will include the following main elements and activities:

- Grading of the field construction office and substation areas (also used for O&M building);
- Construction of site roads, turn-around areas and crane pads at each wind turbine location;
- Construction of the turbine tower foundations and transformer pads;
- Installation of the electrical collection system – underground and some overhead lines;
- Assembly and erection of the wind turbines;
- Construction and installation of the substation;
- Plant commissioning and energization.

The Applicant intends to enter into two primary agreements for the construction of the Project including an agreement for the supply, erection and commissioning of the wind turbines as well as an Engineering, Procurement and Construction (EPC) contract for the construction of the balance of plant (BOP) which includes all other Project facilities and infrastructure such as the roads, electrical collection system, substation, O&M Facility, etc. The turbine supplier and the EPC Contractor will be selected during the EFSEC application review process.

2.14.2 Existing Conditions

The Project will be located on open rangeland which is zoned as Ag-20 and Forest & Range by Kittitas County. The Project area has undergone thorough examination by wildlife and plant biologists to map and study the types of areas that will be disturbed by Project construction. An aerial view of the Project site layout is contained in Exhibit 2 which illustrates the type of overall land types and proximity of the

Project facilities to slopes and creek beds. The Project site is predominantly grassland and sparse to moderate shrub steppe with thin soil coverage due to high wind erosion and exposed fractured basalt. No wetlands or known jurisdictional waters have been identified where Project facilities will be constructed.

2.14.3 Construction Procedures

2.14.3.1 Engineering, Surveying and Design Specifications

2.14.3.1.1 Field Survey and Geotechnical Investigations

Before construction can commence, a site survey will be performed to stake out the exact location of the wind turbines, the site roads, electrical cables, access entryways from public roads, substation areas, etc.

Once the surveys are complete, a detailed geotechnical investigation will be performed to identify subsurface conditions which will dictate much of the design work of the roads, foundations, underground trenching and electrical grounding systems. Typically, the geotechnical investigation involves a drill rig which bores to the engineer's required depths (typically 8 inch diameter drill to 30-40 feet deep) and a backhoe to identify the subsurface soil and rock types and strength properties by sampling and lab testing. Testing is also done to measure the soil's electrical properties to ensure proper grounding system design. A geotechnical investigation is generally performed at each turbine location, at the substation location and at the O&M building location.

2.14.3.1.2 Design and Construction Specifications

Using all of the data that has been gathered for the Project including geotechnical information, environmental and climatic conditions, site topography, etc. applicant's engineering group will establish a set of site-specific construction specifications for the various portions of the Project. The design specifications are based on well proven and established sets of construction standards set forth by the various standard industry practice groups such as the American Concrete Institute (ACI), Institute for Electrical and Electronic Engineers (IEEE), National Electric Code (NEC), National Fire Protection Agency (NFPA), and Construction Standards Institute (CSI), etc. The design and construction specifications are custom tailored for site-specific conditions by technical staff and engineers. The Project engineering team will also ensure that all aspects of the specifications as well as the actual on-site construction comply with all of the applicable federal, state and local codes and good industry practice.

Equipment procurement will also be undertaken using the Project site specifications. The primary EPC Contractor will use the design specifications as a guideline to complete the detailed construction plans for the Project. The design basis approach ensures that the Project will be designed and constructed to meet the minimum 20 year design life.

2.14.3.2 Site Preparation and Road Construction

Construction activities will begin with site preparation, including the construction of Project site access entry ways from public roads, rough grading of the roads, leveling of the field construction site office parking area and the installation of about 6 to 8 temporary site office trailers with

temporary power adjacent to the PSE substation area on the northwest corner of Bettas Road and Highway 97 as shown on the Project Site Layout in Exhibit 1.
The Project roads will be gravel surfaced and generally designed with a low profile without ditches to allow storm water pass over top. Road construction will be performed in multiple passes starting with the rough grading and leveling of the roadway areas. Once rough grade is achieved, base rock will be trucked in, spread and compacted to create a road base. A capping rock will then be spread over the road base and roll-compacted to finished grade.

Once heavy construction is complete, a final pass will be made with the grading equipment to level-out road surfaces and more capping rock will be spread and compacted in areas where needed. Water bars, similar to speed bumps, will be cut in to the roads in areas where needed to allow for natural drainage of water over the road surface and to prevent road washout. This will be done in accordance to a formal storm water pollution prevention plan for the Project as outlined in Section 2.10, 'Surface Water Runoff'.

The Project is located on open agricultural and forest and rangeland. Excavated soil and rock that arises through grading will be spread across the site to the natural grade and will be reseeded with native grasses to control erosion by water and wind. Larger excavated rocks will be disposed of off-site or crushed and re-used on-site as backfill or roadway material.

Project road construction will involve the use of several pieces of heavy machinery including bulldozers, track-hoe excavators, front-end loaders, dump trucks, motor graders, water trucks and rollers for compaction. Storm water controls, such as hay bales and diversion ditches in some areas will control storm water runoff during construction. Access from public roads will have locked gates as agreed upon with the landowners.

2.14.3.3 Foundation Construction

The Project will require several foundations including bases for each turbine and pad transformer, the substation equipment and the O&M facility. Often, separate subcontractors are mobilized for each type of foundation they specialize in constructing.

Once the roads are complete for a particular row of turbines, turbine foundation construction will commence on that completed road section. Foundation construction occurs in several stages including drilling, blasting and hole excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, construction of the pad transformer foundation, and foundation site area restoration.

Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations. Portions of the work may require over excavation and/or shoring. Foundation work for a given excavation will commence after excavation of the area is complete. Backfill for the foundations will be installed immediately after approval by the engineer's field inspectors. The Applicant plans on using on-site excavated materials for backfill to the extent possible.

Based on preliminary calculations and depending on the type of foundation design used, approximately 125 cubic yards of excavated soil will remain from each turbine foundation excavation. The excess soils not used as backfill for the foundations will be used to level out low spots on the crane pads and roads consistent with the surounding grade and reseeded with a designated mix of grasses and/or seeds around the edges of the disturbed areas. Larger cobbles will be disposed of off-site, or crushed into smaller rock for use as backfill or road material. All excavation and foundation construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 2.10, 'Surface Water Runoff'.

The foundation work requires the use of several pieces of heavy machinery including track-hoe excavators, drill rigs, front-end loaders, dump trucks, transportation trucks for materials, cranes and boom trucks for off-loading and assembly, compactors, concrete trucks, concrete pump trucks, backhoes and small Bob-Cat type loaders.

2.14.3.4 Electrical Collection System Construction

Once the roads and turbine foundations and transformer pads are complete for a particular row of turbines, underground cables will be installed on that completed road section. First of all, a trench is cut to the required depth with a rock trencher. Due to the rocky conditions at the site, clean fill will be placed above and below the cables for the first several inches of fill to prevent cable pinching. All cables and trenches are inspected before backfilling. Once the clean fill is covering the cables, the excavated material is then used to complete the backfilling. In areas where solid rock is encountered close to the surface, blasting will be done or a shallower trench will be cut using rock cutting equipment and the cables will be covered with a concrete slurry mix to protect the cables and comply with code and engineering specifications.

The high voltage underground cables are fed through the trenches and into conduits at the pad transformers at each turbine. The cables run to the pad transformers' high voltage (34.5 kV) compartment and are connected to the terminals. Low voltage cables are fed through another set of underground conduits from the pad transformer to the bus cabinet inside the base of the wind turbine tower. The low voltage cable will be terminated at each end and the whole system will be inspected and tested prior to energization.

The two short runs of overhead pole line will require a detailed field survey to determine the exact pole locations. Once the survey and design work are done, the installation of poles and cross-arms to support the conductors can commence. The poles are first assembled and fitted with all of their cross-arms, cable supports and insulator hardware on the ground at each pole location. Holes for each pole will then be excavated or drilled and the poles will be erected and set in place using a small crane or boom truck. Once it is set in place, concrete will be poured in place around the base of the tower, or a clean fill will be compacted around the tower base according to the engineer's specifications. The overhead lines will connect to underground cables at each end through a switchable, visible, lockable riser disconnect with fuses.

Excavated soil and rock that is not reused in backfilling the trenches will be spread across the site to the natural grade to be reseeded with native grasses to control erosion by water and wind. Larger excess excavated rocks will be disposed of off-site. All excavation, trenching and electrical system construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 2.10, 'Surface Water Runoff'.

The electrical construction work will require the use of several pieces of heavy machinery including a track-hoe, a rock trencher, rock cutting equipment, front-end loaders, drill rigs for the pole-line, dump trucks for import of clean back fill, transportation trucks for the materials, small cranes and boom trucks for off-loading and setting of the poles and pad transformers, concrete trucks, cable spool trucks used to un-spool the cable, man-lift bucket trucks for the pole-line work and a winch truck to pull the cable from the spools onto the poles.

2.14.3.5 Substation and Interconnect and Construction

The construction schedule for the substation and interconnection facilities is largely dictated by the delivery schedule of major equipment such as the main transformers, breakers, capacitors, outdoor relaying equipment, the control house, etc.

The utility (PSE or BPA) is generally responsible for the construction of the interconnection facilities, as they will remain under utility control and jurisdiction. Generally, the high-side of the substation remains under the control of the utility and the low-side of the substation generally belongs to the Project. A fence may be installed between the high and low voltage sections to maintain clarity and there will likely be 2 control houses: One for the utility high side relaying and interconnection facilities controls and one for the Project substation low-side relaying and controls.

The substation and interconnection facilities construction involves several stages of work including, but not limited to, grading of the area, the construction of several foundations for the transformers, steel work, breakers, control houses, and other outdoor equipment, the erection and placement of the steel work and all outdoor equipment, and electrical work for all of the required terminations. All excavation, trenching and electrical system construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 2.10, 'Surface Water Runoff'. Once physical completion is achieved a rigorous inspection and commissioning test plan is executed prior to energization of the substation.

The substation and interconnection facilities construction work requires the use of several pieces of heavy machinery including a bulldozer, drill rig and concrete trucks for the foundations, a trencher, a back-hoe, front-end loaders, dump trucks for import of clean back fill, transportation trucks for the materials, boom trucks and cranes for off-loading of the equipment and materials, concrete trucks for areas needing slurry backfill, man-lift bucket trucks for the steel work and pole-line work, etc.

2.14.3.6 Wind Turbine Assembly and Erection

The wind turbines consist of 3 main components: the towers, the nacelles (machine house) and the rotor blades. Other smaller components include hubs, nose cones, cabling, control panels and tower internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Project site on flatbed transport trucks and main components will be off-loaded at the individual turbine sites.

Turbine erection is performed in multiple stages including: setting of the bus cabinet and ground control panels on the foundation, erection of the tower (usually in 3-4 sections), erection of the nacelle, assembly and erection of the rotor, connection and termination of the internal cables, and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection involves mainly the use of large truck or track mounted cranes, smaller rough terrain cranes, boom trucks, rough terrain fork-lifts for loading and off-loading materials and equipment, flat bed and low-boy trucks for transporting materials to site.

2.14.3.7 Plant Energization and Commissioning (Start-Up)

Plant commissioning follows mechanical completion of the Project, and it does not require the use of heavy construction machinery.

2.14.3.8 Project Construction Clean-Up

Since Project clean up generally consists of landscaping and earthwork, it is very weather and season sensitive. Landscaping clean up is generally completed during the first allowable and suitable weather conditions after all of the heavy construction activities have been completed. Disturbed areas outside of the graveled areas will be reseeded to control erosion by water and wind. All construction clean-up work and permanent erosion control measures will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 2.10, 'Surface Water Runoff'.

Other Project clean-up activities might include interior finishing of the O&M building, landscaping around the substation area, washing of towers, painting of scratches on towers and exposed bolts as well as other miscellaneous tasks that are part of normal construction clean-up.

Construction clean-up will require the use of a motor grader, dump trucks, front-end loaders, and light trucks for transportation of any waste materials, packaging, etc.

2.15 Protection from Natural Hazards

WAC 463-42-265 Proposal - Protection from natural hazards. *The applicant shall describe the means employed for protection of the facility from earthquakes, volcanic eruption, flood, tsunami, storms, avalanche or landslides, and other major natural disruptive occurrences*

Introduction
Natural hazards that reasonably could be expected to occur at the Project site include geologic hazards, such as seismic hazards (earthquakes), volcanic eruptions, and landslides. Floods and tsunami's are not hazards to the site because of the Projects high elevation on ridgelines. The following section describes the types of potential natural hazards that could occur in the area, the probability of the event occurring at the Project site, and the measures used to protect the Project from the hazard. Other natural hazards that could occur in the Project area include wildfires. A discussion of the measures used to protect the Project from wildfires is presented in Section 5.3, 'Public Services and Utilities'. Because Project facilities would be located significantly outside the floodplain of the Yakima River (the closest road or turbine location to the Yakima River is more than 500 feet in elevation above the level of river) and other water bodies, the risk of flood impacts is insignificant and is therefore not discussed here.

2.15.1 Seismic Hazards

The seismic hazards in the region results from three seismic sources: interplate events, intraslab events, and crustal events. Each of these events has different causes, and, therefore, produces earthquakes with different characteristics (peak ground accelerations, response spectra, and duration of strong shaking).

Two of the potential seismic sources 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 in the subducting tectonic plate, away from its edges, when built-up stresses in the subducting plate are released. These source mechanisms are referred to as the Cascadia Subduction Zone (CSZ) source mechanism. The CSZ originates off the coast of Oregon and Washington and subducts beneath both states. The two source mechanisms associated with the CSZ currently are thought to be capable of producing moment magnitudes of approximately 9.0 and 7.5, respectively (Geomatrix, 1995).

Earthquakes caused by movements along crustal faults, generally in the upper 10 to 15 miles, result in the third source mechanism. In Washington, these movements occur on the crust of the North American tectonic plate when built-up stresses near the surface are released. According to the Washington Division of Geology and Earth Resources (WDGER), all earthquakes recorded in eastern Washington have been shallow, with most measured at depths less than 3.7 miles. The largest earthquake in eastern Washington since 1969 was a shallow, magnitude 4.4 event northwest of Othello on December 20, 1973 (WDGER, 2002).

2.15.2 Historical Seismicity and Earthquake Risk and Probability

To provide background on the magnitude and location of earthquakes in the vicinity of the Project site, three earthquake databases managed by the U.S. Geological Survey (USGS) National Earthquake Information Center were searched to identify historical seismic events that have occurred within 60 miles of the Project site (USGS, 2001a). The databases searched were "USGS/NEIC 1973-Present," "Significant U.S. Earthquakes (1568-1989)," and "Eastern, Central, and Mountain States of U.S., 1534-1986." These searches identified 73 seismic events of all magnitudes and intensities that occurred between 1887 and 2000. Table 2.15.2-1 identifies only those seismic events that meet the following criteria:

- Magnitude and/or intensity data are available;
- The magnitude of the event is 3.0 or higher;
- The intensity using the Modified Mercalli (MM) Intensity Scale of the event is III or higher, or the event was actually "felt." For reference, an intensity of MM III is associated with shaking that is "felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake" (USGS, 2002) In comparison a event with an intensity of MM VII would produce the follow effects "Damage negligible in building of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars"(USGS, 2002);
- The seismic event was not an aftershock associated with a larger quake at the same location.

Table 2.15.2-1
Historical Seismic Events That Have Occurred Within 60 miles of the Project Site[1]

Year	Month	Day	Latitude (° North)	Longitude (° West)	Magnitude[2]	Intensity[3] or felt (F)	Miles from the Project Site
1959	08	06	47.82	120.00	4.4	VIF	54
1966	07	23	47.02	119.50	4.3	V	56
1969	10	09	46.90	121.60	4.4	V	56
1973	12	20	46.94	119.25	4.8	--F	55
1974	4	20	46.76	121.52	4.9	VF	55
1974	7	14	47.6	120.7	3.3	IV	43
1975	4	10	46.93	121.59	3.7	--	55
1975	4	18	46.94	121.64	3.9	IIIF	57
1977	7	13	47.06	120.96	3.6	VF	25
1978	6	27	46.86	120.96	3.7	IIF	27
1979	7	28	46.66	120.66	3.1	IVF	25
1979	12	10	46.7	120.6	3.2	VF	22
1981	2	2	46.28	120.88	4	IVF	53
1981	2	18	47.21	120.9	4.2	VID	27
1981	5	28	46.53	121.42	4.3	--F	57
1981	5	28	46.53	121.42	4.8	IVF	57
1982	1	23	46.55	121.41	3.5	--	56
1983	11	14	46.66	120.57	3.1	VF	24
1983	12	5	46.93	120.7	3.3	IIIF	14
1984	4	11	47.54	120.16	3.6	V	39
1985	1	9	47.06	120.06	3.2	--	17
1985	6	17	47.06	120.05	3.3	--	17
1987	6	11	46.82	120.59	3	--	14
1987	12	2	46.67	120.68	4.1	VF	25
1987	12	2	46.68	120.67	4.3	IVF	25
1988	2	6	47.67	120.02	3	--F	49
1988	5	5	47.65	120.32	3.3	IIIF	45
1988	5	28	46.81	119.43	3.5	--	48
1988	7	9	46.84	119.69	3.7	--	36
1988	7	14	46.89	119.41	3.3	--	48
1990	3	1	47.77	120.96	3.1	--	59
1990	4	22	46.54	119.73	3.3	--	45

Table 2.15.2-1
Historical Seismic Events That Have Occurred Within 60 miles of the Project Site[1]

Year	Month	Day	Latitude (° North)	Longitude (° West)	Magnitude[2]	Intensity[3] or felt (F)	Miles from the Project Site
1990	6	19	46.84	119.32	3.3	--	53
1990	12	15	46.8	119.99	3.1	--	24
1990	12	22	46.8	119.99	3.4	--	24
1991	2	1	46.81	120.56	3.4	--	14
1991	2	22	46.87	120.65	3.2	--	14
1991	2	26	46.72	119.88	3	--	32
1991	3	28	47.68	120.33	3.3	IVF	47
1991	7	6	46.94	120.34	3.4	--	6
1991	7	7	46.93	120.34	3.3	--	6
1991	11	24	47.6	120.24	3.2	--	42
1992	1	24	47.66	120.13	3.4	IIIF	47
1992	10	26	46.86	120.72	3.5	VF	17
1994	4	1	47.66	120.14	3	-F	47
1994	6	18	47.62	121.27	4.3	VF	58
1994	6	25	46.87	119.31	3	--	53
1994	8	7	47.66	120.17	3.1	--	47
1994	11	13	46.59	119.59	3.3	--	48
1995	1	13	46.58	120.71	3.2	--	32
1995	3	9	47.19	120.95	3	--	28
1995	6	30	47.11	120.5	3	--	9
1995	8	29	46.21	119.91	3.1	--	60
1995	12	17	47.6	120.22	3.1	--	42
1996	6	25	47.2	119.51	3	--	45
1997	1	1	46.77	120.46	3.7	--	16
1997	5	27	46.83	119.36	3.3	--	51
1997	7	4	47.72	120.02	3.6	--F	53
1997	9	3	47.69	120.27	3.3	--	48
1997	9	18	47.69	120.02	3.3	--	51
1997	11	6	46.53	119.71	3.3	--	46
1997	11	18	46.14	120.47	3.8	--F	59
1997	11	18	46.14	120.46	3.3	--	59
1998	10	9	46.2	120.71	4	--	57
1998	10	10	46.2	120.7	3.2	--	57
1999	9	19	46.44	119.63	3.1	--	53
1999	9	19	46.39	120.11	3.2	--	44
1999	12	25	47.63	120.2	3	--	45
2000	12	24	47.74	120.28	3.5	IVF	52
2001	2	28	47.75	120.03	3.2	IIIF	55
2001	5	11	47.23	119.35	3.3	--	53
2002	6	6	47.72	120.29	3.4	--F	50

[1] The approximate center of the Project site is located at latitude 147° 08' 52" N, longitude 120° 42' 39" W.
[2] Magnitude values calculated by the U.S. Geological Survey (see http://eqint.cr.usgs/neic/cgi-bin/epic.awk).
[3] Maximum intensity on the Modified Mercalli Intensity Scale of 1931.

According to the Uniform Building Code Seismic Risk Map of the United States, the Project site, along with all of eastern Washington and Eastern Oregon, is located in Seismic Zone 2B. This corresponds to an intensity VII earthquake of the MM Scale, which can produce moderate damage, should one occur. However, in comparison to Alaska and California Seismic Zone 2B is a relatively low hazard zone.

An earthquake magnitude of 5.5 to 6.0 was selected as being the dominating event at the Project site. The earthquake magnitude selected for the Project site was based on USGS deaggregation seismic hazard mapping for the Umatilla, Oregon, and Walla Walla, Washington, areas. These locations were selected as the closest locations with available data that are representative of the Ellensburg, Washington area's seismology. The USGS seismic hazard maps present the average magnitude of all potential sources at a given location, and provide the percent contribution at discrete locations of the overall seismic hazard. However, as shown in Table 2.15.2-1, seismograph records since 1959 indicate the Project area itself has been essentially a-seismic in historical time. The closest recorded seismic event with a magnitude of 3.0, or MM intensity of III or greater, had an epicenter about 5.6 miles from the Project site. The largest recorded seismic event occurred 56.5 miles from the Project site and had a magnitude of 4.9.

Seismic ground acceleration for the Project site was determined according to the National Earthquake Hazards Reduction Program (NEHRP) maps for probabilistic ground motion (FEMA, 1997), and the USGS National Seismic Hazard Mapping Project database. One of the values generally used to determine an earthquake's relation to building damage is peak ground acceleration (PGA). According to USGS, a PGA of 0.10 g (g equals the acceleration as a result of gravity) may be the approximate threshold of damage to older (pre-1965) dwellings or dwellings not made to resist earthquakes. In comparison, some post-1985 dwellings, built to California earthquake standards, have experienced severe shaking (0.60 g) with only chimney damage and damage to dwelling contents.

The PGA at the site corresponding to a 10 percent probability of exceedance in 50 years (approximately 500-year return period) is between 0.119 g and 0.121 g at the bedrock surface. This value of PGA on rock is an average representation of the acceleration most likely to occur at the site for all seismic events (crustal, intraplate, or subduction) for the 500-year return period.

2.15.3 Earthquake Hazard Protection Measures

The State of Washington's current regulations for design use the 1997 Uniform Building Code (UBC). Pertinent design codes as they relate to geology, seismicity, and near surface soils are in Chapter 16, Divisions IV and V, Earthquake Design and Soil Profile Types, respectively (UBC, 1997). All facilities for the Project must be designed to at least these minimum standards.

Current engineering standards (that is, UBC) will be used in the design of the Project facilities. These standards require that under the design earthquake, the factors of safety or resistance factors used in design exceed certain values. This factor of safety is introduced to account for uncertainties in the design process and to ensure that performance is acceptable. Application of the UBC in Project design will provide adequate protection for the Project facilities and ensure protection measures for human safety, given the relatively low level of risk for the site.

As noted in Section 3.1.2, 'Geology', the only fault that crosses the Project site, crosses under the H, I, and J turbine strings (Exhibit 6). Given the lack of evidence of late Quaternary surface displacement along the fault, and geologic evidence that Holocene displacement has not occurred, this fault is not considered to pose a significant hazard to the proposed Project and further investigation or other mitigation measures are not warranted.

The Project area is not generally susceptible to liquefaction or lateral spreading. This is because liquefaction and lateral spreading require saturated soils. The Project would be located in the unsaturated uplands, above the water table, with rainfall. In addition, the probability of a significant earthquake event occurring during the construction activities is extremely remote. Seismic impacts hazard during construction is negligible. The probability that the crustal faults in the Project area are active is relatively low, and, therefore, the potential for fault offsets during a large earthquake also appears to be low.

2.15.4 Volcanic Hazards

Within the State of Washington, the USGS recognizes five volcanoes as either active or potentially active: Mount Baker, Glacier Peak, Mount Rainier, Mount Adams, and Mount St. Helens. In the last 200 years, only Mount St. Helens has erupted more than once (USGS, 2000a). Impacts to the Project from volcanic activity can be either direct or indirect.

Direct impacts include the effects of lava flows, blast, ash fall, and avalanches of volcanic products (Waldron, 1989). Indirect effects include mudflows, flooding, and sedimentation (Waldron, 1989). Data accumulated as a result of the 1980 Mount St. Helens eruption indicates that there could be ash fallout in the geographic region surrounding the Project site if one of the five regional volcanoes were to erupt.

In the event that a volcanic eruption would damage or impact Project facilities, the Project facilities would be shut down until safe operating conditions return. If an eruption occurred during construction, a temporary shutdown would most likely be required to protect equipment and human health.

2.15.5 Landslide Potential and Avoidance

Project facilities would not be located on unstable slopes or landslide-prone terrain. The turbine structures would be located on relatively flat ground and, therefore, sliding of the soil and alluvial materials is not expected to be a design consideration for these structures, as the geometry of slope movement is not expected to be greater than the setback distance. Unstable areas prone to landslides as a result of seismic events would require steep slopes exceeding 10 feet in height, comprised of thick soils.

In addition, the Project is located in areas with a relatively thin veneer of soil covering consolidated alluvium and basaltic rock. Areas of steep slopes exceeding 10 feet in height and comprised of thick soils generally are not present at the Project site. Therefore, risk of a seismically induced landslide in the soils and rock is minimal. Furthermore, observations of near surface (less than 10 feet in depth) site stratigraphy conducted during a geotechnical investigation, and visual observations of the landscape and surface geology in the immediate Project area, indicate that potential landslide-prone terrain is not visually apparent on the Project site.

In the event that facilities such as roads are constructed below slopes steeper than 21 to 30 degrees, soil movement and rock fall from alluvium overburden exposed along road cut banks could impact these roads if the cut bank slope were to fail (i.e., during an earthquake.) However, the proposed site layout does not include any roads below such steep slopes. Furthermore, because Project access roads are used infrequently, the risk associated with rock fall and/or slope movement to a vehicle and driver is low.

2.15.6 Erosion Potential and Storm Design

Impacts to the geologic formations during construction would be moderate to low. The Project would alter the landscape with minor cuts-and-fills for roadways and leveling for turbine foundations. These alterations would result in minimal impact to existing topography and surface drainage and not cause any significant change.

Because the construction of roads, turbine foundations and other Project facilities would be engineered, these facilities would be subject to the requirements of a National Pollutant Discharge Elimination System (NPDES) storm water construction permit and other pertinent construction and project operation permits and pollution control regulations. These regulations would require the development of an erosion control plan and implementation of erosion control best management practices (BMPs) during Project construction and operation. As a result, it is likely that Project facilities would be constructed with more protections against erosion than existing farm roads in the Project area. (A more detailed discussion of Surface Water Runoff and Stormwater Management is found in Section 2.10, 'Surface Water Runoff'.)

A detailed construction Storm Water Pollution Prevention Plan (SWPPP) will be developed for the Project to help minimize the potential for discharge of pollutants from the site during construction activities. The SWPPP will be designed to meet the requirements of the Washington State Department of Ecology General Permit to Discharge Storm water through its storm water pollution control program (Chapter 173-220 WAC) associated with construction activities.

The SWPPP will include both structural and non-structural best management practices (BMPs). Examples of structural BMPs could include the installation of silt curtains and/or other physical controls to divert flows from exposed soils, or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non-structural BMPs include management practices such as implementation of materials handling, disposal requirements and spill prevention methods.

The SWPPP will be prepared along with a detailed Project grading plan design by the Engineering, Procurement and Construction (EPC) Contractor when design level topographic surveying and mapping is prepared for the Project site. Implementation of the construction BMPs is carried out by the EPC Contractor, with enforcement supervised by the Project's resident Site Environmental Protection Manager (SEPMA) who will be responsible for implementing the SWPPP.

Site-specific BMPs will be identified on the construction plans for the site slopes, construction activities, weather conditions, and vegetative buffers. The sequence and methods of construction activities will be controlled to limit erosion. Clearing, excavation, and grading will be limited to the minimum areas necessary for construction of the Project. Surface protection measures, such as erosion control blankets or straw matting, also may be required prior to final disturbance and restoration if potential for erosion is high.

All construction practices will emphasize erosion control over sediment control through such non-quantitative activities as:

- Straw mulching and vegetating disturbed surfaces;
- Retaining original vegetation wherever possible;
- Directing surface runoff away from denuded areas;
- Keeping runoff velocities low through minimization of slope steepness and length; and
- Providing and maintaining stabilized construction entrances.

A more detailed description of the materials, methods and approaches used as part of the BMP for effective storm water pollution prevention and erosion control is provided in Section 2.10, 'Surface Water Runoff'.

2.15.7 Rain Level Monitoring

The SEPMA shall be responsible for checking and recording precipitation levels at the Project site using a rain gauge. This benchmark will be used to determine the performance of the SWPPP measures that have been implemented during construction. After construction, the O&M group will also continue to monitor rainfall amounts and monitor the in-place erosion control systems while re-seeded areas become more established. Modifications and additional landscaping will be performed where needed by the O&M group after Project turnover.

2.16 SECURITY CONCERNS

WAC 463-42-275 Security Concerns. *The applicant shall describe the means employed for protection of the facility from sabotage, vandalism and other security threats.*

2.16.1 <u>Introduction</u>

The Kittitas Valley Wind Power Project (the "Project") generally consists of a substation, an O&M building and graveled site access roads which lead to the wind turbines. Security is primarily a function of controlled access to the Project areas and lock-out provisions to major equipment and controls.

Through review with WindPro Insurance of Palm Desert, CA, a major insurer of wind power projects around the world, there are no recorded cases of terrorism, sabotage or other similar security threats in the past 15 years of their knowledge for more than 17,000 wind turbines operating in 14 different countries. Vandalism has occurred on some wind power projects which is generally limited to petty theft of tools and/or equipment.

A full time security plan will be implemented during Project construction and once construction is completed, a comprehensive operations security plan will be prepared along with a detailed emergency plan which is more fully described in Section 7.2, 'Emergency Plan'.

2.16.2 <u>Construction Phase Security</u>

2.16.2.1 Security Check-in

During construction, a full time bonded security officer will be on duty at the Project site 24 hours per day, 7 days per week. All site staff and subcontractors will be required to wear an identity badge and display vehicle clearance tags at all times. Newcomers to the Project site will have to check in, log in and log out at the main site construction trailers. The main site construction trailers will be equipped with outdoor lighting and motion sensor lighting as required.

2.16.2.2 Secured Lay-down Areas

Construction materials will be stored at the individual turbines locations, or at the lay-down area around the perimeter of the Operations and Maintenance (O&M) facility and site construction trailers. Temporary fencing with a locked gate will be installed for a roughly 1.5 acre area adjacent to the site trailers for the temporary storage of any special equipment or materials. After construction is completed, the temporary fencing will be removed and the area re-seeded with an appropriate seed mix.

2.16.2.4 Security Plan

The Site Project Manager will work with a security contractor to develop a plan to effectively monitor the overall site during construction including drive-around security and specific check points. The security inspection and monitoring plan will be changed throughout the course of construction based on the level of construction activity and amount of sensitive or vulnerable equipment and materials in specific area. Much of the security monitoring activities will be straight forward since all site access ways will be accessible from paved state and well maintained county roads.

2.16.3 <u>Operational Phase Security</u>

Site visitors including vendor equipment personnel, maintenance contractors, material suppliers and all other third parties will require permission for access from authorized Project staff prior to entrance. The Plant Operations Manager, or designee, will grant access to any critical areas of the site on an as-needed basis. Arrangements will be made with adjacent landowners having legal ingress and egress easements across areas where Project facilities will be located to ensure their continued access.

Currently, almost all existing field access driveways in the area are equipped with lockable gates. Similarly, access ways to the main O&M facility area and site trailers as well as all wind turbine string roads will be constructed with lockable access gates. The access gates will be open during working hours and be secured by project site security personnel after working hours.

Both the O&M facility and the main substation will be equipped with outdoor lighting and motion sensor lighting. The main substation will be also visible from the O&M facility. The substation will be surrounded by an 8 foot tall chain-link fence with razor wire along the top. All wind turbines, pad transformers, pad mounted switch panels and other outdoor facilities will all have secure, lockable doors.

The plant operations group will prepare a detailed security plan to be implemented to protect the security of the Project and Project personnel.

2.16.4 <u>Emergency Response</u>

The Project will establish an Emergency Response Plan for the power plant to ensure employee safety for the following emergencies:

- Personnel injury;
- Downed power system hazards with specific attention to power lines and the substation
- Construction emergencies;
- Project evacuation;
- Fires and explosions;
- Floods and other weather abnormalities;
- Emergency freeze protection;
- Earthquakes;
- Volcanic eruption.

The Emergency Response Plan will cover all Project employees, site visitors and on-site contractors. The Emergency Response Plan will be administered by the Project O&M Manager or designee and is described, in detail, in Section 7.2, ‘Emergency Plans’.

Please refer to Section 5.3, ‘Public Services and Utilities’ for a discussion of the law enforcement agencies in the local area and their coordination with the Project.

2.17 STUDY SCHEDULES

WAC 463-42-285 Proposal – Study schedules. *The applicant shall furnish a brief description of all present or projected schedules for additional environmental studies. The studies descriptions should outline their scope and indicate projected completion dates.*

Additional Rare Plant Studies
A follow up rare plant survey is planned for spring 2003 to confirm that no rare plants are present in the areas that have not yet been intensively surveyed for rare plants. Due to changes in the final Project layout between the time the initial rare plant survey was conducted and the present, some areas have not yet been surveyed for rare plants. These will be surveyed at the appropriate time in spring 2003, based on the timing of occurrence of the target specie(s). It is unlikely, though, that significant rare plant populations exist within these unsurveyed corridors. In all cases, the habitat in the unsurveyed corridors is similar to that encountered in the surveyed areas (where no threatened or endangered plant species were found.) This study is described in greater detail Section 3.4.1, 'Vegetation'. The results of this study will be submitted to EFSEC as soon as they are completed.

Additional Television Reception Studies
As described in Section 5.3.3.7, 'Public Services-Communications', the Applicant plans a baseline field study to precisely measure the current level of off-air television reception in an area northwest of the Project site. This will be done to evaluate potential impacts to television reception from the Project. This study is planned for spring 2003.

After the Project is built, the Applicant plans a follow-up field study to determine if the quality of television reception is degraded in this area by the Project. In the unlikely event that the Project does create any significant television reception problems for people in this area, the Applicant will develop a solution in cooperation with affected residents.

Additional Avian Monitoring Study
After construction of the Project, a monitoring study is planned to evaluate any impacts to birds from the Project. The monitoring study will include the following components:

- Fatality monitoring involving standardized carcass searches, scavenger removal trials, searcher efficiency trials, and reporting of incidental fatalities by maintenance personnel and others;
- A minimum of one breeding season raptor nest survey of the study area and a 1 mile buffer to locate and monitor active raptor nests potentially affected by the construction and operation of the wind plant.

The results of this monitoring will be submitted to EFSEC and other interested parties as they become available. Monitoring plans are described in greater detail in Section 3.4.7, 'Proposed Mitigation Measures for Potential Impacts to Plants and Animals'.

2.18 POTENTIAL FOR FUTURE ACTIVITIES AT SITE

WAC 463-42-295 Proposal – Potential for future activities at site. *The applicant shall describe the potential for any future additions, expansions, or further activities which might be undertaken by the applicant on or contiguous to the proposed site.*

No expansions or additional activities are currently planned for this site. However, expansion of the Project requires simply extending roads and collector cable to serve additional turbines. If market, technology or other conditions evolve in a manner that encourages expansion, there is potential for adding additional wind turbines within or adjacent to the existing project boundary in the future.

3.1 EARTH RESOURCES

WAC 463-42-302 Natural environment – Earth. *The applicant shall provide detailed descriptions of the existing environment, project impacts, and mitigation measures for the following:*

(1) Geology *– The applicant shall include the results of a comprehensive geologic survey showing conditions at the site, the nature of foundation materials, and potential seismic activities.*

(2) Soils *– The applicant shall describe all procedures to be utilized to minimize erosion and other adverse consequences during removal of vegetation, excavation of borrow pits, foundations and trenches, disposal of surplus materials, and construction of earth fills. The location of such activities shall be described and quantities of material shall be indicated.*

(3) Topography *– The applicant shall include contour maps showing the original topography and any changes likely to occur as a result of energy facility construction and related activities. Contour maps showing proposed shoreline or channel changes shall also be furnished.*

(4) Unique physical features *– The applicant shall list any unusual or unique geologic or physical features in the project area or areas potentially affected by the project.*

(5) Erosion/Enlargement of the land area (accretion) *– The applicant shall identify any potential for erosion, deposition, or change of any land surface, shoreline, beach, or submarine area due to construction activities, placement of permanent or temporary structures, or changes in drainage resulting from construction or placement of facilities associated with construction or operation of the proposed energy project.*

3.1.1 Geography

3.1.1.1 Regional Geography

The proposed Kittitas Valley Wind Power Project (Project) is located in the Kittitas Valley area of Kittitas County in south central Washington. Comprising a geographic area of 5,978 square kilometers (2,308 square miles), Kittitas County ranks eighth in size among Washington counties. The county is located east of the Cascade Range in the geographical center of the state and is bounded to the north by Chelan County, to the south by Yakima County, and to the east by Grant County. The Pacific Crest Trail, high in the Cascade Range, forms its boundary to the west with King County.

The terrain in the county’s northwest corner is in the southern extension of the Wenatchee National Forest and consists of rugged and heavily forested wilderness. At higher elevations, a series of major rivers carries precipitation and snow-melt out of the Cascades and into the Kittitas Valley. The Cooper and Waptus Rivers feed into the Cle Elum River while the North, West, and Middle Forks of the Teanaway River converge and become the main stem of the Teanaway River. Descending out of the mountains, the Cle Elum and Teanaway Rivers then feed into the Yakima River, which flows across the remaining expanse of Kittitas County (including Ellensburg) before winding south into Yakima County.

The Wenatchee Mountains extend from the Cascade Range and run the length of the county's northern border. Surface waters that originate in this area of the Wenatchee Mountains include Naneum and Caribou Creeks, both of which eventually join the Yakima River south of Ellensburg. To the south, the Saddle Mountains and the Manastash and Umtanum ridges are a physical barrier that runs east and west to form the county's southern border with Yakima County.

3.1.2 Geology

3.1.2.1 Regional Geology

The Project area is located on the Columbia Plateau, a broad expanse of land located at the eastern base of the Cascade Range, and at the western edge of the Columbia Intermontane Physiographic Province (Freeman and others, 1945). This lowland province, surrounded on all sides by mountain ranges and highlands, covers a vast area of eastern Washington, and extends south into Oregon. The province is characterized by moderate topography incised by a network of streams and rivers that empty into the centrally located Columbia River.

The Columbia Plateau is underlain by a series of layered basalt flows extruded from vents (located mainly in southeastern Washington and northeastern Oregon) during the Miocene epoch (between 7 and 26 million years before present [B.P.]). Collectively, these basalt flows are known as the Columbia River Basalt Group. Individual basalt flows range in thickness from a few millimeters to as much as 300 feet.

A variety of sedimentary materials (overburden) from Pliocene (2 to 7 million years B.P.) to Holocene (the last 0.01 million years B.P.) are intermixed and overlie the Columbia River Basalt Group. Along the borders of the plateau, the basalts are underlain by Precambrian (more than 570 million years B.P.) to early Tertiary (65 million years B.P.) rock, which is mostly volcanic and metamorphic in origin. Sedimentary rocks are generally thought to underlie the basalts in the Project area (USGS, 2000).

The Columbia Plateau was divided into three informal physiographic subprovinces by Myers and Price (1979) – the Yakima Fold Belt, Blue Mountains, and Palouse subdivisions.

3.1.2.2 Local Geology

The Project site is located in the Yakima Fold Belt subprovince, an area that includes most of the western half of the Columbia Plateau north of the crest of the Blue Mountains. Structurally, the Yakima Fold Belt subprovince is characterized by long, narrow anticlines with intervening narrow to broad synclines that trend in an easterly to southeasterly direction from the western margin of the plateau to its center. The anticlines are generally asymmetrical with the steepest limb to the north. Most major faults are thrust or reverse faults whose strikes are similar to the anticlinal fold axes; the faults are probably contemporaneous with the folding. Northwest- to north-trending shear zones and minor folds commonly transect the major folds (USGS, 2000).

The bedrock underlying the Project site consists of interbedded Miocene basalt flows and weakly lithified volcaniclastic siltstone and sandstone of the Ellensburg Formation. Pliocene to Holocene alluvium, glacial, flood, and mass-wastage deposits constitute the surface materials or overburden that directly overlies the bedrock.

The basaltic bedrock underlying the Project site consists of lava flows of the Grande Ronde Basalt. This basalt is the most abundant and widespread formation of the Columbia River Basalt Group. It consists of about 120 individual flow units and makes up about 90 percent of the total volume of the Columbia River Basalt Group. The thickness of the basalt below the site is not known, but may be as much as 1,000 feet.

A single fault is mapped in the Project area, trending east-west near the intersection of Highway 97 and Bettas Road. This fault is a high-angle fault with its north side downthrown, and crosses Highway 97 approximately 2,493 feet north of Bettas Road. Running east, the fault is inferred in a location that intersects the H, I, and J turbine strings. The fault location underlies the southernmost turbine in turbine string H (H_{23}). It passes beneath turbine I_{19} on the I turbine string, and approximately between turbines J_{10} and J_{11} on the J turbine string. The fault is estimated to have last been active during the Miocene epoch . The total length of the fault is approximately 2.5 miles, and is illustrated in Exhibit 6, 'Geotechnical Data Report'. Prior to final project design, a detailed geotechnical investigation and turbine location field survey will be performed to ensure that no turbine locations lie immediately above a high risk fault line.

While it is possible that there may have been displacement on some of these inferred faults between 700,000 and 140,000 years B.P., the geologic deposits present on the ground surface of the Kittitas Valley do not allow this to be determined. Reidel and others (1994) indicate that the most recent movement on faults in Kittitas Valley may have been during the Pleistocene (between 11,000 and 1.8 million years B.P.). However, they reference the work of Waitt (1979) and do not present any new data to support Landau's inference that displacement could be as recent as 10,000 to 13,000 years ago (Molinari, 1999).

Mineral resources in the immediate vicinity of the Project site includes active and inactive commercial and private rock quarries. In addition, the area is a known resource for a rare type of agate known as the "Ellensburg Blue," which is classified by some gemologists as a precious gem. It is possible that the Ellensburg Blue agate could be found on public lands (Washington Department of Natural Resources [DNR] parcels) where Project facilities would be located. However, most of the areas where the Project would coexist with potential deposits of the Ellensburg Blue agate are on privately owned land, or DNR land which has no public access and therefore is closed to the public except by special permission of the adjacent landowner(s).

3.1.3 Project Area Soils

Soils in the Project area along the ridgetops primarily consist of complexes of shallow to moderately deep mineral soils (known as durixerolls) that formed in alluvium and glacial drift over a duripan (a silica-cemented subsurface horizon). Loess mixed with volcanic ash is typically present at the surface. Ridgetop soils in this portion of the Project area (which includes the turbine areas) include the following series (USDA, 2002*a*):

<u>Lablue Series</u>
The Lablue series consists of shallow, well-drained soils that formed in alluvium and glacial drift over a duripan with an influence of loess mixed with volcanic ash in the surface. Lablue soils are on old uplifted fan remnants, old terraces, and old till plains and are 7 to 10 inches to a duripan. Slopes are 3 to 15 percent.

Reelow Series
The Reelow series consists of shallow, well-drained soils that formed in alluvium and glacial drift over a duripan with an influence of loess mixed with volcanic ash in the surface. They are on old uplifted fan remnants, old terraces, and old till plains and are 10 to 20 inches to a duripan.

Sketter Series
The Sketter series consists of moderately deep, well-drained soils formed in alluvium and glacial drift over a duripan with an influence of loess mixed with volcanic ash in the surface. They are on old uplifted fan remnants, old terraces, and old till plains. Slopes are 2 to 15 percent.

Reeser Series
The Reeser series consists of moderately deep, well-drained soils that formed in alluvium and glacial drift over a duripan with an influence of loess mixed with volcanic ash in the surface. They are on old uplifted fan remnants, old terraces, and old till plains. Slopes are 2 to 15 percent.

For information on project area soils and stormwater runoff, see section 3.3.2, ‘Runoff/Absorption’. For information on Project area soils as they relate to construction, see Exhibit 6, ‘Geotech Data Report’.

3.1.4 Local Geography and Topography

The Kittitas Valley Wind Power Project is located east and north of the Yakima River, to the west of Green Canyon. The Project will be built on the ridges that slope south from Table Mountain, which is part of the Wenatchee Mountains. Although these ridges slope gently southward along their spines, their transverse slopes are steep. The Project site and adjacent lands range in elevation from approximately 2,200 to 3,100 feet above mean sea level.

The Project area extends across a 3.5- by 5 mile portion of land that consists primarily of long north-south trending ridges. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River, which is located just south of the Project area. Slopes within the Project area generally range from 5 degrees to 20 degrees, but can reach 40 degrees or more in some of the stream canyons. Exhibit 1, ‘Project Site Layout’ presents a topographic map of the Project site.

3.1.5 Project Area Vegetation

As noted above, the Project area and adjacent lands range in elevation from approximately 660 to 1,050 meters (2,165 to 3,445 feet). The lowest elevation is within the shrub-steppe zone. Open range with minimal vegetation comprises the majority of the Project area. The vegetation is dominated by native bunchgrass and low shrubs, such as bitterbrush and stiff sage. Most of the ridgetops proposed for development consist of dry, rocky grassland. Plant life in the Project area is described in further detail in Section 3.4.1, ‘Vegetation’.

3.1.6 Unusual Physical Features

There are no unique or unusual features in project or areas affected by the Project.

3.1.7 Erosion Potential and Storm Design

Impacts to the geologic formations during construction would be moderate to low. The Project would alter the landscape with minor cuts-and-fills for roadways and leveling for turbine foundations. These alterations would result in minimal impact to existing topography and surface drainage and not cause any significant change.

Because the construction of roads, turbine foundations and other Project facilities would be engineered, these facilities would be subject to the requirements of a National Pollutant Discharge Elimination System (NPDES) storm water construction permit and other pertinent construction and project operation permits and pollution control regulations as described in Section 7.1, 'National Pollutant Discharge Elimination System Permit Application' and Section 2.10, 'Surface Water Runoff'. These regulations would require the development of an erosion control plan and implementation of erosion control best management practices (BMPs) during Project construction and operation. As a result, it is likely that Project facilities would be constructed with more protections against erosion than existing farm roads in the Project area.

For more information on runoff absorption, see section 3.3.2, 'Runoff/Absorption'.

3.1.8 Disposal of Surplus Materials and Construction of Earth Fills

Most surplus materials generated during Project construction will be earthen materials that originate from road cuts, cable trenching and excavations of pits for turbine foundations. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations. Portions of the work may require over excavation and/or shoring. Foundation work for a given excavation will commence after excavation of the area is complete. Backfill for the foundations will be installed immediately after approval by the engineer's field inspectors. The Applicant plans on using on-site excavated materials for backfill to the extent possible.

Based on preliminary calculations and depending on the type of foundation design used, approximately 125 cubic yards of excavated soil will remain from each turbine foundation excavation. The excess soils not used as backfill for the foundations will be used to level out low spots on the crane pads and roads consistent with the surounding grade. The edges of the disturbed areas will be reseeded with a designated mix of grasses and/or seeds around. Larger cobbles will be used a road edge perimeter boundaries, disposed of off- site, or crushed into smaller rock for use as backfill or road material. All excavation and foundation construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 2.10, 'Surface Water Runoff'.

3.2 AIR

WAC 463-42-312 Natural environment -- Air. *The applicant shall provide detailed descriptions of the affected environment, project impacts, and mitigation measures for the following:*

(1) Air quality - *The applicant shall identify all pertinent air pollution control standards. The application shall contain adequate data showing air quality and meteorological conditions at the site. Meteorological data shall include, at least, adequate information about wind direction patterns, air stability, wind velocity patterns, precipitation, humidity, and temperature. The applicant shall describe the means to be utilized to assure compliance with applicable local, state, and federal air quality and emission standards.*

(2) Odor - *The applicant shall describe for the area affected, all odors caused by construction or operation of the facility, and shall describe how these are to be minimized or eliminated.*

(3) Climate - *The applicant shall describe the extent to which facility operations may cause visible plumes, fogging, misting, icing, or impairment of visibility, and changes in ambient levels caused by all emitted pollutants.*

(4) Dust *- The applicant shall describe for any area affected, all dust sources created by construction or operation of the facility, and shall describe how these are to be minimized or eliminated.*

3.2.1 Introduction

The fuel source for the Project is wind that is transformed from kinetic energy into electrical energy by wind turbine generators. No air emissions will be generated from operation of the wind turbine generators at the Project. The operation of the Project will have no effect on the climate (visible plumes, fogging, misting, icing, or impairment of visibility, and changes in ambient levels caused by emitted pollutants). There are no emissions from the operation of the project, and thus none to be regulated. For a description of the meteorological conditions at the site, see Section 2.1.4, 'Climate Characteristics'.

The vast majority of new power plants proposed and constructed in the Pacific Northwest in recent years have been fossil fuel fired plants, primarily using natural gas as fuel. Fossil fuel fired plants, in contrast to wind power projects, emit significant quantities of carbon dioxide that is the primary cause of anthropogenic climate change. Natural gas fired plants also emit sulfur oxides and nitrogen oxides, which contribute to both ground-level air quality problems and acid rain. By producing electricity without generating air emissions, which would otherwise be produced by fossil fuel fired plants, the Project will have a significant beneficial impact on overall air quality and climate.

3.2.2 Emissions

3.2.2.1 Air Quality Attainment Status

According to the Washington Department of Ecology's regional air quality office in Yakima, there are no areas within Kittitas County that are currently designated as non-attainment areas for air quality.

3.2.2.2 Construction

Construction of the Project will result in air emissions from the following sources:

- Exhaust from the diesel construction equipment used for project site preparation, grading, excavation, and construction of onsite structures;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from diesel trucks used to deliver equipment, concrete, fuel, and construction supplies to the construction site;

- Exhaust from pickup trucks and diesel trucks used to transport workers and materials around the construction site and from vehicles used by workers to commute to the construction site;
- Exhaust from diesel-powered welding machines, electric generators, air compressors, etc.

These emissions will be similar in nature to those produced by any large construction project that involves heavy equipment and transportation of materials to the project site.

3.2.2.3 Operation

Operation of the Project will produce no air emissions as no fuel is being burned to produce energy. Operation of the Project will therefore have no negative impact on air quality. According to the US Environmental Protection Agency, air emissions from fossil fuel combustion for electricity production is a leading source of air pollution nationally, accounting for:

- 67% of sulfur dioxide emissions
- 28% of nitrogen oxide emissions
- 36% of carbon dioxide
- 3% of mercury

The most likely alternative to wind energy generated by the Project would be electricity generated from the combustion of fossil fuels. Fuel combustion from electric utilities generated 417,000 tons of carbon monoxide and 6.1 million tons of nitrogen oxides in 1998. Total fossil fuel combustion produced 1,500 million metric tons carbon-equivalent of carbon dioxide in 1997 (EPA, 2000). It is assumed that if the Project were not built, the power produced by the Project would be replaced by a natural gas-fired gas turbine sized to generate 60 average MW (the Project has a nameplate capacity of 180 MW and is expected to have a 33% net capacity factor). The following analysis of anticipated air quality impacts associated with a gas-fired turbine sized to generate 60 average MW is calculated based on the analysis presented in the *Final SEPA EIS for FPL Energy's Stateline Wind Project,* Section 1.1.4 (Walla Walla County, 2000.)

In the analysis conducted for the Stateline EIS, CH2M HILL air quality engineers reviewed permits of two facilities currently in operation in the Boardman, Oregon, area: the PGE Coyote Springs plant, and the Hermiston Generating plant. Each of these plants currently operates two gas-fired turbines of approximately 250 MW each. Using EPA's standard emission factor document *Compilation of Air Pollutant Emission Factors,* Fifth Edition, Section 1.4 (EPA, 2000) CO_2 emissions are estimated at 120,000 lbs per million cubic feet of gas burned. Using this emission factor, the information in the operating permit for each facility, and scaling down to a 60-MW plant, CO_2 emissions would be in excess of 2,000,000 tons per year. Similarly, nitrogen dioxide emissions would be in excess of 30 tons per year. Carbon monoxide emissions would be in excess of 50 tons per year. It should be noted, however, that in addition to the emissions from generation itself, a gas turbine generation facility also would have emissions of sulfur oxides, nitrogen oxides, and particulates associated with the extraction and transportation of natural gas.

Therefore, as the energy produced by the Project displaces the need for other energy produced by fossil fuel combustion, operation of the Project will have a positive effect on air quality and climate change by reducing overall air emissions.

3.2.3 Odor

Construction of the Project will produce limited odors associated with exhaust from diesel equipment and vehicles. Mitigation efforts are described in section 3.2.5 'Mitigation Measures'.

Operation of the Project will create no odors as no combustion is involved and no odor-producing materials are used in Project operations.

3.2.4 Dust

Construction of the Project will create fugitive dust emissions from construction-related traffic and additional wind-blown dust as a result of ground disturbance. The Applicant will implement an effective dust control program to minimize any potential disturbance from construction-related dust. Dust suppression will be accomplished through application of either water or a water-based, environmentally safe dust palliative such as lignin, in accordance with the Proposed Dust Abatement Policy developed by Kittitas County Public Works Department (this draft policy has not been formally adopted by the Board of County Commissioners.) The use of a dust palliative such as lignin (a non-toxic, non-hazardous compound derived from trees) would result in the use of substantially less water for dust suppression (see Section 3.3.7 'Water Use During Construction and Operations') and therefore less traffic from water trucks to the construction site. The final decision regarding dust suppression techniques will be made by the EPC contractor in consultation with local authorities.

Operation of the Project will result in minimal or no increase in dust levels. Project related-traffic increases on gravel access roads will generate small amounts of additional fugitive dust. This increased traffic is expected to consist largely of weekly or less frequent trips to turbines in service vehicles for maintenance and repair activities. Upgrading existing roads from dirt to gravel surfaces will, however, result in some reduction in dust levels from current traffic on existing dirt roads.

3.2.5 Mitigation Measures

The following mitigation measures for construction-related air emissions and dust are proposed:

- All vehicles used during construction will comply with applicable Federal and state air quality regulations;
- Operational measures such as limiting engine idling time and shutting down equipment when not in use will be implemented;
- Active dust suppression will be implemented on unpaved construction access roads, parking areas and staging areas, using water-based dust suppression materials in compliance with state and local regulations;
- Traffic speeds on unpaved access roads will be kept to 25 mph to minimize generation of dust;
- Carpooling among construction workers will be encouraged to minimize construction-related traffic and associated emissions;
- Disturbed areas will be replanted or graveled to reduce wind-blown dust;
- Erosion control measures will be implemented to limit deposition of silt to roadways.

Mitigation measures for construction impacts are described in greater detail in Section 2.3, 'Construction On-Site' and Section 1.4, 'Mitigation Measures'.

No mitigation is proposed for Project operations as there will be no air or odor emissions.

3.3 WATER

WAC 463-42-322 Natural environment – Water. *The applicant shall provide detailed descriptions of the affected natural water environment, project impacts and mitigation measures and shall demonstrate that facility construction and/or operational discharges will be compatible with and meet state water quality standards. The applicant shall indicate the source and the amount of water required during construction and operation of the plant and show that it is available for this use and describe all existing water rights, withdrawal authorizations, or restrictions which relate to the proposed source.*

(1) Surface water movement/quality/quantity *– The application shall set forth all background water quality data pertinent to the site, and hydrographic study data and analysis of the receiving waters within one-half mile of any proposed discharge location with regard to: Bottom configuration; minimum, average, and maximum water depths and velocities; water temperature and salinity profiles; anticipated effluent distribution and dilution, and plume characteristics under all discharge conditions; and other relevant characteristics which could influence the impact of any wastes discharged thereto.*

(2) Runoff/absorption *– The applicant shall describe how surface water runoff and erosion are to be controlled during construction and operation, how runoff can be reintroduced to the ground for retention to the ground water supply, and to assure compliance with state water quality standards.*

(3) Floods *– The applicant shall describe potential for flooding, identify the five, fifty, one hundred, and five hundred year flood boundaries, and all protective measures to prevent possible flood damage to the site and facility.*

(4) Ground water movement/quantity/quality *– The applicant shall include the results of a comprehensive hydrologic survey, describe the ground water conditions on and near the site and any changes in groundwater movement, quantity, or quality which might result from project construction or operation.*

(5) Public water supplies *– The applicant shall provide a detailed description of any public water supplies which may be used or affected by the project during construction or operation of the facility.*

3.3.1 Surface Water

Operation of the Project will not require the use of any water for cooling or any other use besides the domestic well serving the limited needs of the Operations and Maintenance facility described below in Section 3.3.5, 'Groundwater'. Therefore, operation of the Project is not expected to result in any discharges to surface water. Most Project facilities will be located on exposed ridge tops away from surface waters, as shown in Exhibit 1, 'Project Site Layout'. The southern portion Strings A and B, are within approximately one half mile of the Yakima River, and other portions of the Project are located within one half mile Dry Creek (an ephemeral creek), other unnamed ephemeral creeks, the North Branch Canal of the Kittitas Reclamation District, and livestock watering ponds. However, the Project will not generate process water and there will be no point source discharge to nearby surface waters. For this reason, a detailed description of surface water quality conditions is not relevant and therefore not provided here.

Precipitation could result in surface runoff from Project facilities during Project construction and operation. However, the Project site grading plan and roadway design will incorporate measures in line with the storm water pollution prevention plan (SWPPP) and Best Management Practices (BMPs) to ensure that most surface runoff will infiltrate directly into the surface soils surrounding Project facilities. Potential surface water impacts resulting from runoff related to construction and operations of the Project and measures to control such runoff are described below in Section 3.3.2, 'Runoff/Absorption', and in greater detail in Section 2.10, 'Surface Water Runoff'. The Project will implement a formal SWPPP and BMPs as described in detail in Section 2.10, 'Surface Water Runoff', to reduce and/or eliminate the discharge of suspended sediment and turbidity above the turbidity criteria stipulated in the Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A).

3.3.2 Runoff/Absorption

In general, surface soils on the Project site consist of silty loess that has slow permeability. This material is dry to moist, and contains locally clayey zones that retain more moisture. These soils are typically present in the upper 12 inches, although interbedded layers are also present in the upper 10 feet. At most locations on the Project, a cemented layer of alluvium was encountered below the surface loess. This cemented material also has a slow permeability. The presence of both of these slow permeability soils at the site results in a relatively high runoff potential.

3.3.2.1 Construction

Surface water runoff potential will be greatest during the construction of the Project, when large quantities of soil will be disturbed for construction of roads, tower foundations and other infrastructure.

Storm Water Pollution Prevention Plan (SWPPP)
A detailed construction Storm Water Pollution Prevention Plan (SWPPP) will be developed for the Project to help minimize the potential for discharge of pollutants from the site during construction activities. The SWPPP will be designed to meet the requirements of the Washington State Department of Ecology General Permit to Discharge Storm water through its storm water pollution control program (Chapter 173-220 WAC) associated with construction activities, as described in Section 7.1 'National Pollutant Discharge Elimination System (NPDES) Permit Application'.

The SWPPP will include both structural and non-structural best management practices (BMPs). Examples of structural BMPs could include the installation of silt curtains, mats, hay bails, check dams, silt traps and/or other physical controls to divert flows from exposed soils, or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non-structural BMPs include management practices such implementation of materials handling, disposal requirements and spill prevention methods.

A SWPPP meeting the conditions of the Storm Water General Permit for Construction Activities will be prepared and submitted to EFSEC along with a Notice of Intent (NOI) for construction activities prior to the start of Project construction activities, as described in Section 2.10.1 'Stormwater Pollution Prevention Plan (SWPPP).

3.3.2.2 Operations

As described above, the Project will prepare and define a SWPPP as part of the final design. The Project operations group will be responsible for monitoring the SWPPP measures that were implemnted during construction to ensure they continue to function properly. Final designs for the permanent BMPs will be incorporated into the final construction plans and specifications prepared by the Engineering Team's civil design engineer. An operations manual for the permanent BMPs will be prepared by the EPC Contractor civil design engineer and the Project's Enginering Team.

The permanent storm water BMPs will include permanent erosion and sedimentation control through site landscaping, grass, and other vegetative cover. The final designs for these permanent BMPs will conform to the Washington Department of Ecology Storm water Management Manual.

Operational BMPs will be adopted, as part of the SWPPP, to implement good housekeeping, preventive and corrective maintenance procedures, steps for spill prevention and emergency cleanup, employee training programs, and inspection and record keeping practices, as necessary, to prevent storm water pollution.

Examples of good operational housekeeping practices, which will be employed by the Project, include:

- Prompt cleanup and removal of spillage;
- Regular pickup and disposal of garbage and rubbish;
- Regular sweeping of floors;
- HAZMAT data sheet cataloguing and recording; and
- Proper storage of containers.

The Project operations group will periodically review the SWPPP against actual practice. The plant operators will ascertain that the controls identified in the plan are adequate, and that employees are following them. Measures to prevent and mitigate stormwater runoff during both construction and operations are also described in detail in section 2.10, 'Surface Water Runoff'.

3.3.3 Floods

Since Project facilities will be located significantly outside the floodplain of the Yakima River and other water bodies, (the closest road or turbine location to the Yakima River is more than 500 feet in elevation above the level of river) the risk of flood impacts is insignificant and is therefore not discussed here.

3.3.4 Groundwater

Operation of the Project will have minimal impacts to groundwater. For operations, a domestic well will be installed by a licensed installer to serve the operations and maintenance facility. A well using less than five thousand gallons of water a day exempt pursuant to RCW 90.44.040 will be installed to provide water for domestic type use to the operation and maintenance building. The well will be installed by a licensed well contractor, licensed pursuant to Chapter 173-162 WAC, and in compliance with the requirements and standards of Chapter 173-160 WAC. The well will be installed consistent with Kittitas County Environmental Health Department and Washington Department of Ecology requirements for the new domestic wells. This well will provide water for bathroom and kitchen use and is expected to consume less than 1,000 gallons per day. It is unlikely that the Project water use, therefore, would have a direct effect on groundwater quantity, quality, and flow direction in the immediate area below the proposed facilities.

There will be no discharges to groundwater from Project operations. Wastewater from the O&M facility will be discharged to a domestic septic tank installed pursuant to the requirements of Kittitas County Environmental Health Department.

The tower foundations and other facilities are sufficiently above the water table to avoid any significant impacts to subsurface hydrology. The following section 3.3.5.6, ‘Impacts from Project Activities’, provides greater detail on this subject.

3.3.4.1 Groundwater Resources

In the State of Washington, groundwater quantity is protected by surface water and groundwater rights, and groundwater quality standards are defined in WAC 173-200.

3.3.4.2 Aquifer Description and Hydraulic Characteristics

As noted in the Earth Resources section, the Project is located within the Yakima Fold Belt subprovince of the Columbia Plateau Physiographic Province. The variation in the geology of the overburden, multiple basalt flows, and interbedded sedimentary units provides complexity to the groundwater situation in the region. As a result, numerous hydrologic units exist within the complex geology of the Yakima Fold Belt and the greater Columbia Plateau aquifer system. However, to simplify the description of the area’s hydrogeology, the aquifers in the vicinity of the Project have been grouped into two main hydrologic units: the overburden and the basalt aquifers discussed below.

3.3.4.3 Overburden Aquifer

The overburden in the structural basins of the Columbia Plateau Physiographic Province readily transmits water and comprises water table aquifers. These aquifers are generally coarse-grained and highly permeable in their upper sections and fine-grained and less permeable at depth. However, where the overburden is thick, such as in the structural basins in the Yakima Fold Belt, extensive coarse-grained layers exist deeper in the section and function as water-producing zones.

In the Yakima Fold Belt, groundwater movement in the overburden is downward from the anticlinal ridges toward the streams and rivers (i.e., Yakima River) in the intervening synclinal basins (USGS, 2000). The water-level contours for the overburden aquifer roughly parallel land surface (Whiteman, 1986; Lane and Whiteman, 1989; Hanson and others, 1994). Recharge is mainly from infiltration of applied irrigation water and from precipitation (USGS, 2000), with precipitation acting as the predominant source of recharge (Bauer and Vaccaro, 1990). Discharge is to rivers, lakes, drains, and waterways and to the underlying basalt unit. Downward movement of water to the underlying basalts is controlled by intervening fine-grained sedimentary layers and by head difference between the units (USGS, 2000).

3.3.4.4 Basalt Aquifers

Groundwater in the basalts occurs in joints, vesicles, fractures, and in intergranulated pores of the intercalated sedimentary interbeds. The basalt forms an extremely complex heterogeneous aquifer system with interflow zones that potentially function as small semiconfined to confined aquifers. The basalt transmits water most readily through these interflow zones, which represent about 5 to 10 percent of the total thickness of a typical basalt flow (USGS, 1994). Deeper basalt units are generally confined. However, because the hydraulic connection between units is sufficient to allow continuous vertical movement of water between them, the confined units are referred to as being semiconfined (USGS, 2000).

Water-level data indicate that over most of the plateau, the vertical component of regional flow in basalts is downward except near discharge areas, located generally along streams and rivers (Lane and Whiteman, 1989). Localized anomalies to this pattern are caused primarily by geologic structures of both known and uncertain nature and secondarily by groundwater pumping and irrigation (USGS, 2000). Similar to the overburden aquifer, groundwater movement in the basalt aquifers of the Yakima Fold Belt, is from the anticlinal ridges toward the streams and rivers (i.e., Yakima River) in the intervening synclinal basins (USGS, 2000).

3.3.4.5 Groundwater Quality and Beneficial Use

Groundwater in the area below the proposed Project facilities is used for domestic, irrigation, and other uses. A review of 39 well descriptions in the sections surrounding and within the Project area indicate that while some wells potentially draw water from the overburden aquifer, most of the area's wells penetrate and draw water from the basalt aquifer. A list of the wells in the Project area is provided as Exhibit 13, 'Department of Ecology Well Logs for the Project Area'. Groundwater in the basalt aquifer system is generally suitable for most uses. The dominant water type is calcium magnesium bicarbonate, and sodium bicarbonate is the next most prevalent water type. However, sodium concentrations increase with residence time and the largest concentrations are found in samples from the deepest wells (USGS, 1994).

3.3.4.6 Impacts from Project Activities

A review of available literature indicates that groundwater in the Project area is generally available in large quantities. However, water for Project construction activities will not be obtained from groundwater resources directly below the Project site. Instead, water for the Project will be trucked in by the construction contractor from local providers. For operations, a domestic well will be installed by a licensed installer to serve the operations and maintenance facility. This well will provide water for bathroom and kitchen use and is expected to consume less than 1,000 gallons per day. It is unlikely that the Project water use, therefore, would have a direct effect on groundwater quantity, quality, and flow direction in the immediate area below the proposed facilities.

Excavation, drilling, and blasting to construct foundations for the wind turbine generators (WTGs) could penetrate to depths of 35 feet into the overburden and basalt units below the Project site. In the event of a significant rainfall, the foundation excavations could provide a temporary conduit for surface seepage, thus resulting in accelerated recharge to the overburden and basalt aquifers in the immediate vicinity of the foundation site. This in turn could cause a temporary rise in turbidity in groundwater in the vicinity of the foundation excavations. Construction of the WTG foundations, however, is expected to occur during the dry season (late May to late July) and potential impacts to groundwater are considered low because of the short duration of the construction period.

Perched or shallow groundwater zones could be encountered at various places along the turbine strings. In this case, dewatering activities could result in a temporary impact to groundwater resources in the overburden and upper units of the basalt aquifer. However, groundwater was not observed in test pits excavated to depths ranging from 5 to 10 feet at the site during a geotechnical investigation at the Project site (see Exhibit 6, 'Geotech Data Report). In addition, descriptions of local water wells show that even though there are a number of shallow wells in the Project area (i.e., some wells have been drilled to depths ranging from 57 to 116 feet), most of the wells in the area have been drilled deeper than 150 feet and in some cases are as deep as 720 feet, thus, indicating a correspondingly deep water table for most of the Project area. If dewatering were to occur, the impact to groundwater would be temporary and it is unlikely to affect water wells in the Project area.

3.3.4.7 Hazardous Materials Use and Handling

As noted in Section 4.1.3, ‘Releases or Potential Releases of Hazardous Materials to the Environment’, minimal quantities of hazardous materials will be present at the Project site during construction and operations. In most cases the presence of these materials would be limited to vehicle and equipment maintenance and refueling. Impacts to groundwater from construction can occur as a result of small spills associated with refueling and maintenance of construction equipment. However, minor spills would be contained and cleaned up immediately by construction crews pursuant to the requirements of a Construction Phase Spill Prevention and Contingency Plan, which will be required, approved and enforced by EFSEC.

3.3.5 Public Water Supplies

Operation of the Project will not result in additional demands on public water supplies. Construction of the Project will require some water from public water supplies for dust suppression, concrete wetting, soil compaction, and other construction activities. Dust control will be provided by the General Contractor or a subcontractor. This temporary demand will not result in a significant increase over current demand.

3.3.6 Water Use During Construction and Operation

Construction of the Project will require considerably more water use than Operation of the Project. Operation of the Project will require only minimal amounts of water use, as detailed below.

3.3.6.1 Construction

Construction of the Project will require water use for road construction, wetting of concrete, dust control, and other activities. During construction, the EPC contractor will arrange for delivery of water to the site via water trucks from a source with an existing water right. Estimated water use for all construction-related needs other than dust control is one million gallons.

The amount of water required for dust control is highly dependent on whether a dust palliative such as lignin (see Section 3.2.4 ‘Dust’) is used as well as timing and weather. If lignin or another environmentally safe, non-toxic dust palliative is used, the amount of water used for dust control is estimated to be roughly one million gallons. If plain water is used for dust suppression, the estimated water use for dust control is four million gallons, depending on the timing of construction and weather (i.e. the need for dust control would be far greater in dry, windy summer conditions than during other times of year.) This large potential difference in water use is largely to the fact that the frequency of dust control application is greatly reduced by using lignin or other palliatives instead of plain water. Total construction water use is thus estimated to be either two million gallons (if lignin is used for dust control) or five million gallons (if plain water is used for dust control.)

3.3.6.2 Operation

As operation of the Project does not require water for cooling, water needs will be minimal. As described in Section 3.3.5, “Groundwater”, water will be obtained from an exempt well that will be installed by a licensed installer to serve the operations and maintenance O&M facility. The well will be installed consistent with Kittitas County Environmental Health Department and Washington Department of Ecology requirements. This well will provide water for bathroom and kitchen use, and general maintenance purposes and is expected to consume less than 1,000 gallons per day.

3.4 PLANTS AND ANIMALS

WAC 463-42-332 Natural environment – Plants and animals.

(1) Habitat for and number or diversity of species of plants, fish, or other wildlife *– The applicant shall describe all habitat types, vegetation, wetlands, animal life, and aquatic life which might reasonably be affected by construction, operation, or cessation of construction or operation of the energy facility and any associated facilities. Assessment of these factors shall include density and distribution information. The application shall contain a full description of each measure to be taken by the applicant to protect all habitat types, vegetation, wetlands, animal life, and aquatic life from the effects of project construction, operation, abandonment, termination, or cessation of operations.*

(2) Unique species *– Any endangered species or noteworthy species or habitat shall receive special attention.*

(3) Fish or wildlife migration routes – *The applicant shall identify all fish or wildlife migration routes, which may be affected by the energy facility or by any discharge to the environment.*

3.4.1 Vegetation

This section describes the biological resources of the Project area, assesses the potential impacts of the proposed Kittitas Valley Wind Power Project on these resources, and describes the mitigation planned for the Project. A complete report of the rare plant investigation and habitat characterization is provided as Exhibit 8,'Rare Plant Report'. Relevant agencies were contacted to initiate informal consultation and to identify potential concerns relating to the Project. Plant resources were assessed within 1,000 feet of proposed Project infrastructure sites (e.g. roads, turbine strings, substation site, operations and maintenance facility, etc.) The information presented below was gathered from published literature, resource management agencies, local biologists, and on-the-ground surveys.

Habitat maps of the Project area have been developed based on recent aerial photos of the Project area obtained from the Kittitas County Public Works Department and verified with field observations by botanists from CH2MHill and Eagle Cap Consulting. This information has been entered into a GIS database to allow accurate calculations to be made of the total land area occupied by different habitat types (shrub steppe, wetlands, coniferous forest, riparian, etc.) and has been provided in Exhibit 9, 'Project Habitat Map'.

The Project site, as described in detail in Section 2.1 'Site Description', will be built on areas of exposed ridge tops, most of which is classified as shrub steppe and much of which is degraded due to historic grazing practices. No development is planned for any wetland areas.

3.4.1.1 Physiography and Soils

The Kittitas Valley Project area is located at the eastern base of the Cascade Mountain range, at the western edge of the Columbia Basin physiographic province (Franklin and Dyrness, 1988). This lowland province, surrounded on all sides by mountain ranges and highlands, covers a vast area of eastern Washington, and extends south into Oregon. The province is characterized by moderate topography incised by a network of streams and rivers which empty into the centrally located Columbia River.

The Project area extends over a nine by six kilometer portion of land which consists primarily of long north-south trending ridges. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River, which is located just south of the Project area. Slopes within the Project area generally range from 5º to 20º, but can reach 40º or more in some of the stream canyons. Elevations in the Project area range from 670 m above mean sea level along Highway 97, to 960 m at the top of String G.

The soils on the Project area ridgetops are primarily complexes of very shallow to moderately deep durixerolls that formed in alluvium and glacial drift over a duripan. Loess mixed with volcanic ash is typically present at the surface. Ridgetop soils in this portion of the Project area (which includes the majority of the turbines) include the Lablue, Reelow, Sketter, and Reeser series (USDA, 2002*a*).

3.4.1.2 Climate

The Kittitas Valley Project area is located at the western edge of the Columbia Basin physiographic province. This large province occurs within the rain shadow of the Cascade mountain range, and is characterized by semi-arid conditions, as well as a large range of annual temperatures indicative of a continental climate. However, the relatively close proximity of the Pacific Ocean and the dominant westerly winds of the region combine to moderate the continental influence (Franklin and Dyrness, 1988).

The Cle Elum, WA weather station is located in the Yakima River valley, approximately 14 km northwest of the Project area. The coldest average monthly temperatures at this station occur in January, with an average minimum of -6.7º Centigrade (C), and a maximum of 1.6º C. The warmest average monthly temperatures occur in July, when the minimum is 10.6º C and the maximum is 27.3º C. The average total annual precipitation for Cle Elum is 56.5 centimeters (cm). The wettest month is December with an average total monthly precipitation of 10.6 cm, while the driest month is July with an average total monthly precipitation of 0.89 cm. Snowfall typically occurs from November through March, with the heaviest average monthly snowfall of 62.2 cm occurring in January. The total annual average snowfall is 205 cm (WRCC, 2000*a*).

In the other direction, the Ellensburg, WA weather station is located downstream from the Project area along the Yakima River, approximately 20 km to the southwest. The coldest average monthly temperatures at Ellensburg also occur in January, and are similar to Cle Elum, with a minimum of -7.6º C, and a maximum of 1.2º C. Likewise the warmest average monthly temperatures in Ellensburg occur in July, when the minimum is 11.5º C and the maximum is 29.0º C. The average total annual precipitation at Ellensburg, is 22.6 cm, less than half that of Cle Elum. Similarly, Ellensburg's average annual snowfall (71.4 cm) is nearly one third that of Cle Elum (WRCC, 2000*b*).

It should be noted that the highest point in the Project area is over 400 m higher in elevation than the reporting station in both Ellensburg and Cle Elum. Therefore the Project area would likely experience cooler temperatures, and perhaps receive slightly more precipitation, than is reported for either station.

3.4.1.3 Existing Plant Communities

The project area is at the western edge of the Central Arid Steppe zone defined by the Washington State Gap Analysis (Cassidy *et al.,* 1997). Their classifications for Eastern Washington steppe vegetation closely follow Daubenmire (1970). The Central Arid Steppe zone typically contains plant communities dominated by big sagebrush (*Artemisia tridentata*), bluebunch wheatgrass (*Pseudoroegnaria spicata*), and Sandberg's bluegrass (*Poa secunda*). In many areas of the zone, the introduced species cheatgrass (*Bromus tectorum*) is common due to past and present disturbance factors (Cassidy *et al.,* 1997). The higher portions of the Project area, border the Ponderosa Pine (*Pinus ponderosa*) zone.

The Project area lies at the western edge of the big sagebrush/bluebunch wheatgrass vegetation zone as defined by Franklin and Dyrness (1988). They describe a number of other shrub species that may be present in the zone (all in small numbers), in addition to big sagebrush. These include: rabbitbrushes (*Chrysothamnus* spp. and *Ericameria* spp.), threetip sagebrush (*Artemisia tripartita*), and spiny hopsage (*Grayia spinosa*). The bluebunch wheatgrass is supplemented by variable amounts of needle-and-thread grass (*Hesperostipa comata*), Thurber's needlegrass (*Achnatherum thurberianum*), Cusick's bluegrass (*Poa cusickii*), and bottlebrush (*Elymus elymoides*). They also describe a low layer of plants consisting of Sandberg's bluegrass, cheatgrass, and flatspine stickseed (*Lappula occidentalis*).

Franklin and Dyrness (1988) also describe a number of plant associations that occur on lithosols (shallow soils) within the shrub-steppe region. These are particularly important for the purposes of this investigation, as lithosolic habitats occur commonly on the ridgetops within the Project area. Daubenmire (1970) recognizes a variety of lithosolic plant associations. All are typically composed of a uniform layer of Sandberg's bluegrass, over a crust of mosses and lichens, with a low shrub layer above. The primary difference in these communities is in the composition of the shrub layer. Within the Project area, the shrub layer on these lithosols is principally composed of several different buckwheat (*Eriogonum*) species.

The above descriptions of generalized vegetation zones and associations are based on climax communities, which typically develop over time in the absence of anthropogenic disturbance. Within the Project area (as in most of the shrub-steppe region) many of the plant communities have been significantly modified due to numerous disturbance factors. Some of this disturbance is visible in Exhibit 2, 'Aerial Photo with Project Site Layout'. Disturbance is especially pronounced in the valley bottoms and side slopes. Cattle grazing, wildfire frequency changes, introduction of exotic plant species, ground disturbance from development activities, and a host of other factors have resulted in plant communities that are kept at an early- to mid-seral stage of development. Non-native aggressive invader species are common, and often dominate the community. Within the Project area, the effects of these anthropogenic disturbances are common, although most of the communities are still dominated by native species. In many places, however, cheatgrass and bulbous bluegrass (*Poa bulbosa*) dominate the grass layer, and noxious weeds, such as diffuse knapweed (*Centaurea diffusa*), are common.

Several riparian areas associated with springs, seeps, and creeks are also present in the Kittitas Valley project area. These habitats are typically degraded from heavy cattle use, and much of the riparian vegetation has been removed. Common native riparian associates include chokecherry (*Prunus virginiana*), golden current (*Ribes aureum*), various rush species (*Juncus* spp.), various speedwell species (*Veronica* spp.), and yellow monkeyflower (*Mimulus guttatus*).

Table 3.4.1-1 below describes the general cover types and habitat conditions found along the proposed turbine string ridgetops. In addition, a cover type map for the entire Project area has been prepared and is shown in Exhibit 9, 'Project Habitat Map'.

Habitat quality within the Project area ranges from 'poor' in many of the valley bottoms, to 'good' along some of the ridgetops and flats (see the legend at the bottom of Table 3.4.1.3 for a description of habitat quality rating criteria). Generally, the ridgetop habitats are in 'fair' to 'good' condition. More specifically, the ridgetop lithosols are typically in 'good' condition, containing a relatively intact vegetative structure and few non-native species. The deeper-soiled ridgetop habitats are generally in 'fair' condition, with certain areas dominated or co-dominated by non-native species in the grass layer.

The non-ridgetop habitats are generally more degraded from past disturbance than the ridgetop areas. This is especially true in the valley bottoms, where cattle grazing and road impacts have created large areas dominated by non-native invader species. Overall, the non-ridgetop habitats within the potential impact corridors are in 'fair' condition. However, habitat quality ranges from 'poor' in many of the valley bottoms, to 'good' on some of the canyon slopes.

Table 3.4.1-1
Summary of Habitats Associated with the Proposed Turbine Strings of the Project

Facility	Habitat Description[1]
Turbine String 'A'	Shallow-soiled lithosol alternates with deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils.
Turbine String 'B'	The north half of this string is located on a mosaic of shallow-soiled rocky areas and deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. Various limited ground and vegetation disturbance has occurred here from recreational activities (gun club). One noxious weed population was observed along a jeep trail which runs along this section of the proposed string. The south half of this string contains the same mosaic of shallow and deeper soils, however, a fire within the last 10 years has removed most of the shrubs, and the habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs. Habitat quality is generally fair. Weedy species are more common in the deeper-soiled areas, and several populations of noxious weeds are present.
Turbine String 'C'	Shallow-soiled grassland and lithosol alternates with deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils.
Turbine String 'D'	The north half of this string is similar to String C with alternating lithosols and deeper-soiled habitats in generally good condition. The south half of this string is a continuation of the same deeper-soiled shrub-steppe habitat.

Table 3.4.1-1
Summary of Habitats Associated with the Proposed Turbine Strings of the Project

Facility	Habitat Description[1]
Turbine String 'E'	This string consists mainly of deeper-soiled shrub-steppe habitat, with inclusions of shallow-soiled lithosol in the north half, and small patches of non-native species throughout. Much of the habitat in the string is in fair to good condition (i.e., dominated by native shrubs and forbs, and a mix of native and non-native grasses), although some areas have been burned recently, and one noxious weed population is present along the jeep trail, which runs the length of the ridgetop.
Turbine String 'F'	This string contains mainly shallow-soiled lithosol, with some areas of deeper-soiled shrub-steppe in the south half. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, a large gravel pit operation at the north end of this string has completely displaced the lithosol habitat in that area. A rough jeep trail runs the length of this proposed string.
Turbine String 'G'	This string consists almost entirely of shallow-soiled lithosol habitat, with small areas of deeper-soiled shrub-steppe and deciduous thicket habitats in the north half and at the south end. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. Two noxious weed populations were observed, one along a road at the north end of the string, and another in a small draw near the south end of the string. A well-developed jeep trail is present along the north half of the corridor.
Turbine String 'H"	This string also consists almost entirely of shallow-soiled lithosol habitat, with areas of deeper-soiled shrub-steppe habitat at the north end, midpoint, and the south end. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, there are two areas of major soil disturbance (blading) near the midpoint of the string, where the lithosol species have been largely replaced by non-native forbs and grasses. In addition, three populations of noxious weeds were observed along this string, near roads. Finally, one portion of the lithosol in the south end shows signs of heavy livestock use, although native plants continue to dominate. A well-developed two-lane gravel access road runs the length of this ridgetop, providing access for local landowners.
Turbine String 'I'	This string consists primarily of shallow-soiled lithosol habitat, although portions of the middle section, and all of the southern tip, contain deeper-soiled shrub-steppe habitat, as well as small inclusions of grassland. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, the areas of grassland are only fair quality, dominated by non-native grasses and forbs, and one noxious weed population was observed at the south end of the string.

Table 3.4.1-1
Summary of Habitats Associated with the Proposed Turbine Strings of the Project

Facility	Habitat Description[1]
Turbine String 'J'	The south half of the string is located mainly on deeper-soiled shrub-steppe habitat, with one area of shallow-soiled lithosol. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, the south tip of the string consists of fair quality, shallow-soiled grassland dominated by non-native grasses and forbs. Two populations of noxious weeds were observed in this half of the string. The north half of this string contains the same general pattern of shallow and deeper soils, however, a fire within the last 5-10 years removed most of the shrubs, and the deeper-soiled habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs. Although overall habitat quality is fair, several small inclusions of generally good quality lithosol are present in this half of the string.
Intervening Facilities (access roads, electric lines, O&M facilities, etc., located between turbine strings)	Over 40% of the potential project impact corridor is located off of the ridgetops, between the turbine strings. Primarily, these are connecting facilities such as access roads and electrical lines, but include O&M areas also. These non-ridgetop habitats are typically deeper-soiled, and are generally more degraded from past disturbance than the ridgetop habitats. This is especially true in the valley bottoms, where cattle grazing and road impacts have created large areas dominated by non-native invader species. Overall, the non-ridgetop habitats within the impact corridors are in fair condition. However, habitat quality ranges from poor in many of the valley bottoms, to good on some of the canyon slopes.

Legend: Habitat Description[1]: In the habitat descriptions, ratings of habitat quality are based on general observed patterns of plant species diversity, native versus non-native ratios, and overall vegetative structure. The habitat ratings are qualitative only, based on general visual observations. Quantitative habitat quality information was not collected. The following categories were used: 'Excellent' (high species diversity with negligible amounts of non-native weedy species, along with well developed native vegetative structure); 'Good' (moderate to high species diversity dominated by native plants, with significant inclusions of non-native species in certain areas, and fair to well-developed native plant structure); 'Fair' (moderate diversity with non-native species dominance or co-dominance in some or all layers, and fair native structure); and 'Poor' (low species diversity, dominated by non-native, weedy invaders in some or all layers, and poor native plant structure.

3.4.1.4 Existing Land Uses

The majority of lands within the Project area are privately owned, although several parcels are owned and administered by the State of Washington Department of Natural Resources (DNR). Cattle grazing is the primary land use, although some rural homesite development has also taken place. The area is also used, on a much more limited basis, for recreational activities (primarily hunting). In addition, communications antenna clusters are located at several points within the Project area. A high-voltage transmission line corridor crosses on a roughly east-west axis through the middle of the Project area. This corridor contains four BPA steel-tower electrical transmission lines. Additionally, there is a PSE wood-pole transmission line that roughly parallels the four-line corridor, and a BPA steel-tower line running through the northern portion of the project area.

Several paved roads run through the Project area. Highway 97 parallels the proposed turbine strings in the eastern portion of the Project area, and Highway 10 runs along the Yakima River, just to the south of the Project area. In addition, numerous smaller unpaved roads and jeep trails are located within the Project area boundaries. These range from all-weather gravel roads, to two-track trails.

3.4.1.5 Rare Plant Investigation Methodology

3.4.1.5.1 Study Area

For the purposes of the rare plant investigation, the study area included all lands within 50 m of the centerline of proposed facilities, as defined through July of 2002. This included proposed turbine strings, underground and overhead electrical lines, access roads, staging areas, and substation sites. In most cases, the resultant study corridors were 100 m wide, although in many areas, several Project facilities are proposed to be located along side each other, resulting in a wider study corridor.

The study area was designed to take in all ground potentially disturbed by the Project, however, changes to proposed facilities layouts occurred in late 2002, after the botanical field survey season. Approximately seventy-five percent of the present layout was surveyed.

County-maintained roads were not analyzed, as these roads are not proposed for upgrade by the Project. All other proposed new or existing access roads likely to be upgraded by the Project were included in the rare plant study area.

Although for the purposes of impact analysis, only the study corridors were considered, a larger area was addressed during the prefield review in determining which rare plant species had potential for occurrence within the Project area. This was necessary to analyze the Project area in a regional context, and ensure that the target species list for the investigation was complete.

3.4.1.5.2 Target Species

For the rare plant investigation, the target species included all plant taxa listed as 'Endangered', or 'Threatened' by the US Fish and Wildlife Service (USFWS). In addition, taxa that have been formally proposed, or are candidates for such federal listing, were also considered target species. Target species also included all plant taxa defined as 'Endangered', ‘Threatened’, ‘Sensitive’, ‘Review’, or ‘Extirpated’ by the Washington Natural Heritage Program (WNHP). Taxa meeting the above criteria were targeted by the investigation to determine their presence or absence within the study area. Determinations of status for rare plant species were based on the WNHP’s list of tracked plant species (WNHP 2002*a*), and entries published in the US Federal Register.

3.4.1.5.3 Prefield Review

As part of the investigation, a review of available literature and other sources was conducted to identify the rare plant species potentially found within the Project area. As per Section 7(c)(1) of the US Endangered Species Act of 1973 (16 USC 1531, *et seq.*, as amended), a letter was sent to the USFWS requesting a list of federally Threatened, Endangered, or Proposed taxa which have potential to occur within the Project area. In addition, the WNHP was contacted to obtain element occurrence records for any known rare plant populations in the vicinity. To supplement the information provided by the above agencies, a number of other sources were consulted. These sources provided additional information on the potential rare plant species for the Project, including critical information such as habitat preferences, morphological characteristics, phenologic development timelines, and species ranges. Sources included: taxonomic keys and species guides (Flora ID Northwest, 2001; USFWS, 2001; WNHP, 1999; Hickman, 1993; Hitchcock and Cronquist, 1973; Hitchcock *et al.,* 1964); online databases of common and rare plant species (ECCI, 2002; USDA, 2002*b*); species lists from nearby areas (PNL 2000); environmental documents from other energy projects in the area (BPA, 2002; USFS, 1998; Dames and Moore Consultants, 1998*a,b*); and Natural Resources Conservation Service (NRCS) soils data (USDA, 2002*a*). Agency, university, and private botanists with local knowledge of the region were also contacted (Beck, 2001; Downs, 2001; Simmons, 2001).

Using data collected during the prefield review, a list of rare plant species potentially occurring in the project area was compiled, Table 3.4.1-2 below. Habitat preferences and identification periods were derived from the literature for each potential species. Using this information, along with topographic maps of the Project area, a field survey plan was developed to guide the timing and intensity of the field surveys.

Table 3.4.1-2
Rare Plant Species with Potential for Occurrence in the Kittitas Valley Wind Power Project Area

Name		Status1	Typical Habitat	ID Period
Agoseris elata	**Tall agoseris**	S	Meadows, open woods, and exposed rocky ridgetops	June-August
Anemone nuttalliana	**Pasque flower**	S	Prairies to mountain slopes, mostly on well-drained soil	May-August
Astragalus arrectus	**Palouse milk-vetch**	S	Grassy hillsides, sagebrush flats, river bluffs, and openings in open ponderosa pine and Douglas fir forests	April-July

Table 3.4.1-2
Rare Plant Species with Potential for Occurrence in the Kittitas Valley Wind Power Project Area

Astragalus columbianus		LT (SC)	Sagebrush-steppe	March-June
Astragalus misellus var. *pauper*	**Pauper milk-vetch**	S	Open ridgetops and slopes Aprilmid	June
Camissonia pygmaea	**Dwarf evening-primrose**	LT	Unstable soil or gravel in steep talus, dry washes, banks and roadcuts	June-August
Camissonia scapoidea	**Naked-stemmed eveningprimrose**	S	Sagebrush desert, mostly in sandy, gravelly areas	May-July
Carex buxbaumii	**Buxbaum's sedge**	S	Peat bogs, marshes, wet meadows, and other wet places	June-August
Carex comosa	**Bristly sedge**	S	Marshes, lake shores, and wet meadows	May-July
Carex hystricina	**Porcupine sedge**	S	Wet ground near creeks, seeps, and springs	May-June
Collomia macrocalyx	**Bristle-flowered collomia**	S	Dry, open habitats late Mayearly	June
Corydalis aurea	**Golden corydalis**	R1	Varied habitats, moist to dry and well drained soil	May-July
Cryptantha leucophaea	**Gray cryptantha**	S (SC)	Unstable sandy substrate along the Columbia River	May-June
Cryptantha rostellata	**Beaked cryptantha**	S	Very dry microsites within sagebrush steppe	late April –mid June
Cyperus bipartitus	**Shining flatsedge**	S	Streambanks and other wet, low places in valleys and lowlands	August-September
Cypripedium fasciculatum	**Clustered lady's slipper**	S (SC)	Mid- to late seral Douglas fir or ponderosa pine forest	early May-mid June
Delphinium viridescens	**Wenatchee larkspur**	LT (SC)	Moist meadows, moist microsites in open coniferous forest, springs, seeps, and riparian areas	July
Eatonella nivea	**White eatonella**	LT	Dry, sandy, or volcanic areas within sagebrush-steppe	May
Erigeron basalticus	**Basalt daisy**	LT (C)	Crevices in basalt cliffs on canyon walls	May-June
Erigeron piperianus	**Piper's daisy**	S	Dry, open places, often with sagebrush	May-June
Hackelia hispida var. *disjuncta*	**Sagebrush stickseed**	S	Rocky talus	May-June

Table 3.4.1-2
Rare Plant Species with Potential for Occurrence in the Kittitas Valley Wind Power Project Area

Iliamna longisepala	**Longsepal globemallow**	S	Sagebrush-steppe and open ponderosa pine and Douglas fir forest	June-August
Lomatium tuberosum	**Hoover's desert-parsley**	LT (SC)	Loose talus and drainage channels of open ridgetops within sagebrush-steppe	March-early April
Mimulus suksdorfii	**Suksdorf's monkey-flower**	S	Open, moist to rather dry places within sagebrush-steppe	mid April-July
Nicotiana attenuata	**Coyote tobacco**	S	Dry, sandy bottom lands, dry rocky washes, and other dry open places	June-September
Oenothera cespitosa ssp.*cespitosa*	**Cespitose evening-primrose**	S	Open sites on talus or other rocky slopes, roadcuts, and the Columbia River terrace	late April-mid June
Ophioglossum pusillum	**Adder's-tongue**	LT	Terrestrial in pastures, old fields, roadside ditches, and flood plain woods, in seasonally wet soil	June-September
Pediocactus simpsonii var.*robustior*	**Hedgehog cactus**	R1	Desert valleys and low mountains	May-July
Pellaea breweri	**Brewer's cliff-brake**	S	Rock crevices, ledges, talus slopes, and open rocky soil	April-August
Penstemon eriantherus var.*whitedii*	**Fuzzytongue penstemon**	R1	Dry open places	May-July
Phacelia minutissima	**Least phacelia**	S (SC)	Moist to fairly dry open places	July
Polygonum polygaloides ssp.*kelloggii*	**White-margin knotweed**	R1	Meadows and vernal pools	June-August
Pyrrocoma hirta var. *sonchifolia*	**Sticky goldenweed**	R1	Meadows and open or sparsely wooded slopes	July-August
Sidalcea oregana var. *calva*	**Oregon checker-mallow**	LE (PE)	Moist meadows, open coniferous stands, and along the edge of shrub and hardwood thickets	mid June-late July
Silene seelyi	**Seely's silene**	LT (SC)	Shaded crevices in ultramafic to basaltic cliffs and rock outcrops, and among boulders in talus	May-August
Spiranthes porrifolia	**Western ladies-tresses**	S	Wet meadows, streams, bogs, and seepage slopes	May-August

Table 3.4.1-2 Rare Plant Species with Potential for Occurrence in the Kittitas Valley Wind Power Project Area				
Tauschia hooveri	**Hoover's tauschia**	LT (SC)	basalt lithosols within sagebrush-steppe	March-mid April

3.4.1.5.4 Field Investigation

All fieldwork was performed by trained botanists who have experience performing rare plant surveys in the region. Exhibit 8, 'Rare Plant Report', contains a summary of each investigator's education and experience.

Immediately prior to the first rare plant survey of the site in April, the surveyors visited a known population of Hoover's tauschia (*Tauschia hooveri*) near Fort Simcoe south of Yakima. This visit served to confirm assumptions regarding identification characteristics for the species, and verified the timing of the early-season surveys.

Three pedestrian field surveys were performed during the 2002 growing season to locate rare plant species within the study area. The first of these took place on April 25 and 26, and was designed to located populations of Hoover's tauschia and other early-blooming species. Only habitats capable of supporting these early-blooming target species were searched (primarily the shallow-soiled ridgetops and talus slopes). However, because these habitats are common in the area, the majority of the study area was surveyed. Two botanists visually surveyed most of the ridgetop habitats within the study area at a level sufficient to determine the presence of the target early-season species. Where road access was available and no suitable habitat existed, the survey was cursory and took place from a vehicle. Where suitable habitat was found, the survey was accomplished by performing meander pedestrian transects, zigzagging back and forth across the survey corridor.

The second rare plant survey was performed from June 3-7, 2002. This survey was designed to locate those target species that are identifiable during mid- to late-spring (this includes the majority of the target rare plant species). The June survey was conducted by three field botanists, who surveyed all ground within the study area using an 'intuitive controlled' survey pattern. The 'intuitive controlled' pattern is a variable intensity survey protocol designed to cover all ground within a study area at a level sufficient to locate all occurrences of the target species. The botanists, primarily working singly, walked each survey corridor, crossing back and forth from one edge of the corridor to the other in a zigzag pattern. The intensity of the pattern, and the speed at which the surveyors walked, was variable, and depended on the structural complexity of the habitat, the visibility of the target species, and the probability of species occurrence in a given area. In some high probability, low visibility habitats, a tight grid pattern was walked. Care was taken to thoroughly search all unique features and any high probability habitats encountered.

The third survey took place from July 17 through July 22, 2002 and was designed to locate certain rare plant species not identifiable in the spring. These were all species associated with riparian habitats, and the summer survey focused on the springs, seeps, and creeks of the project area. This survey used a 'targeted' survey pattern to search only the riparian habitats, which had been identified previously during the spring fieldwork. Two botanists traveled, either on foot or by vehicle, to each riparian habitat, intensively searched the area on foot, and then continued on to the next identified riparian habitat.

During all surveys, the investigators kept a list of all vascular plants encountered, and made informal collections of unknown species for later identification in the laboratory. *Vascular Plants of the Pacific Northwest* (Hitchcock *et al*., 1964) and *Flora of the Pacific Northwest* (Hitchcock and Cronquist, 1973) were used as the primary authorities for vascular plant species identification. Updated taxonomy was referenced in the NRCS PLANTS database, (which also serves as the source for the common plant names used in this document) (USDA, 2002*b*). Notes were also recorded regarding plant associations, land use patterns, unusual habitats, etc.

When target plant populations were found, data were collected regarding population size, location, associated habitat, and a number of other parameters. A standard rare plant site form was used to collect the information. Photographs of the population (both close-ups and general habitat shots) were taken using a Nikon® 950 digital camera. The location of the population was mapped on 7.5" US Geological Survey topographic quadrangle sheets. Garmin® 12-Series Geographic Positioning System (GPS) receivers were used to record the perimeter of the population for later entry into the project Geographic Information System (GIS). In the Project area, these GPS units typically self-reported an estimated positional error of seven meters or less.

The entire extent of each population was mapped, where feasible. However, where the populations were extensive and extended well beyond the edge of the study corridors, mapping the entire extent was not undertaken. In these cases, only the part of the population that occurred within the study corridor was mapped.

3.4.1.6 Rare Plant Resource Investigation Results

3.4.1.6.1 Prefield Review

The USFWS Section 7 response letter listed one federally threatened plant species with potential for occurrence in the Project area: *Spiranthes diluvialis* (Ute ladies'-tresses). No other plant species of concern to the USFWS were listed in the letter.

The WNHP reported one element occurrence record for a tracked plant species in the Project vicinity (WNHP, 2002*b*). This species occurrence, Suksdorf's monkey-flower (*Mimulus suksdorfii*), was reported from Township 19N Range 16E Section 1, which is just north of the Project area. The locational information for this population is not precise, and the last reported observation was in 1980. It should be noted that, although the section containing the population is immediately adjacent to the Project area, the habitat in that section is primarily forested, as opposed to the Project area, which is non-forested.

The final list of rare plant species thought to have potential for occurrence within the Kittitas Valley Wind Power project area is presented in Table 3.4.1-2 above. It includes all of the species discussed in this section above, as well as a number of others which were suggested by additional contacts and references consulted during the prefield review. Although rare plant species other than those listed in Table 3.4.1-2 were not thought to have potential for occurrence within the project area, all rare plant species known or suspected to occur in

Washington were considered during the field survey. The species listed in Table 3.4.1-2, however, received the most focus during the investigation.

3.1.4.6.2 Field Investigation

The field surveys did not locate any USFWS Endangered, Threatened, Proposed, or Candidate plant species. Marginal potential habitat was found for one federally listed species, Ute ladies'-tresses (*Spiranthes diluvialis*), in several of the project area riparian zones. However, the Project area is west of the species' known range, and the habitat at these sites was degraded due to past disturbance. Both these factors greatly reduced the potential for occurrence of Ute ladies'-tresses.

Marginal potential habitat was also found for one federal Candidate species; basalt daisy (*Erigeron piperianus*). Although basalt daisy is typically restricted to the extensive cliffs along the Yakima River and Selah Creek, all cliffs within the project area were searched intensively for the presence of the species with negative results.

Marginal potential habitat was also found within the study area for a number of federal 'Species of Concern'. These include Columbia milkvetch (*Astragalus columbianus*),

Figure 3.4.1-1 Photo of White Margined Knotweed

Hoover's desert-parsley (*Lomatium tuberosum*), least phacelia (*Phacelia minutissima*), Seely's silene (*Silene seelyi*), and Hoover's tauschia. In all cases, where potential habitat was found for these species, the area was searched carefully, with negative results.

Likewise, the field surveys did not locate any plants listed as Endangered, Threatened, or Sensitive by the State of Washington. Potential habitat, however, was found for a number of these species throughout the Project area. These habitats were searched thoroughly for the presence of the target species, but none was found.

Figure 3.4.1-2 Photo of White Margined Knotweed Habitat

Four populations of one plant species on the Washington State 'Review' list were found within, or immediately adjacent to, the Project area. The species, white-margined knotweed (*Polygonum polygaloides* ssp. *kelloggii*), was found in the Project area in vernally moist draws and swales (Figures 3.4.1-1 & 3.4.1-2). An estimated 2,500 white-margined knotweed plants were found in these four populations, and totaled over 2.5 ha in gross population area. Much of the suitable habitat present (vernally moist areas) was found to contain the species. Most of the knotweed plants were in full flower, or beginning to fruit at the time of the second survey.

It should also be noted that during the surveys of the original project area, which included a large portion of proposed project area west of Swauk Creek that was subsequently dropped from consideration, eleven populations of white-margined knotweed were found (including the four described above). Several of the populations were extensive and contained tens of thousands of plants within the survey corridor. These populations extended out of the survey corridor for an unknown distance, so estimates of total individuals and population size are likely conservative. An estimated 67,600 white-margined knotweed plants were found within the study corridors (with many more extending outside the corridors). Gross population areas ranged from 0.01 ha to 2 ha within the study corridors, and totaled over 14 ha for all eleven populations.

Figure 3.4.1-3 Photo of Habitat at the bottom on 'G-String'

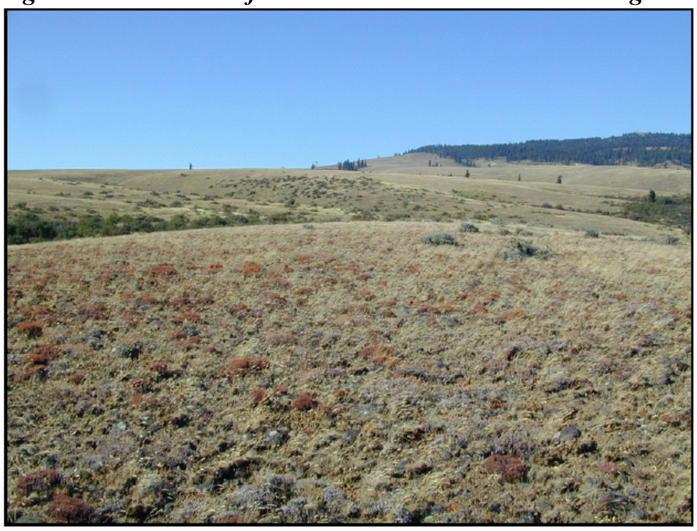
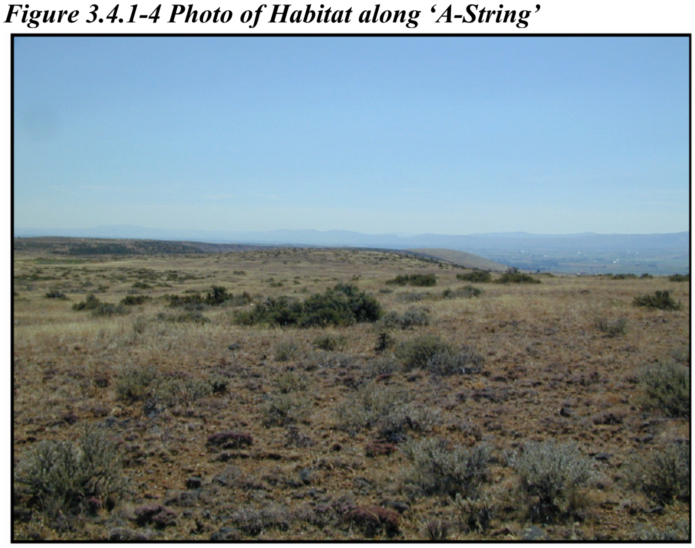


Figure 3.4.1-4 Photo of Habitat along 'A-String'



Locations of the white-margin knotweed populations and a complete list of all plant species encountered during the surveys is included in Exhibit 8, 'Rare Plant Report' Typical habitat encountered in the project area is shown in Figures 3.4.1-3 and 3.4.1-4

3.4.1.6.3 Survey Timing and Coverage

The combination of three surveys targeting species identifiable in the early spring, late spring, and summer was thought to be sufficient to identify all of the target species within the areas surveyed. As is common during the permitting process for most large construction projects, however, late-season changes to proposed facilities layouts occurred for the Project. This resulted in certain areas of the current proposed impact corridors that have not yet been surveyed for rare plants. It is unlikely, though, that significant rare plant populations exist within these unsurveyed corridors. In all cases, the habitat in the unsurveyed corridors is similar to that encountered in the surveyed areas. Given that no target plant species were found in the adjacent surveyed corridors (other than white-margined knotweed), the potential for other rare plant populations in these areas is thought to be limited.

In addition, several riparian areas within the survey corridors contained marginal habitat for Ute ladies'-tresses, a late-season rare orchid which blooms from late July through September. When these areas were surveyed in the latter half of July, no orchids of any species were found. Late August surveys of these small areas were not conducted for the following reasons:

- The Project area is well west of the species' known range;

- The riparian areas contained only marginal potential habitat for the species; and
- No orchids of any kind were found during the July survey.

It was felt that these three factors indicated that no Ute ladies'-tresses individuals exist within the Project area.

3.4.1.6.4 Target Plant Species within the Project Area

Only one target plant species is known to exist within the Project area; white margined knotweed. It is a small, annual plant in the buckwheat (Polygonaceae) family, which typically grows in meadows and vernal pools, up to dry subalpine slopes (Hitchcock and Cronquist 1964). It ranges from British Columbia southward on the east side of the Cascade Crest to Northern California, extending east to Montana, Wyoming, Colorado, and Arizona. The taxon was originally considered a separate species (*Polygonum kelloggii*), but the current consensus treats it as a subspecies of *P. polygaloides*.

White-margined knotweed is currently a Washington State 'Review 1' species, indicating that, within the state, the species is a, "[p]lant taxon of potential concern, [but is] in need of additional field work before a status can be assigned" (WNHP 2002*c*). The Review designation carries no legal requirement for protection; however, WNHP personnel are interested in tracking occurrences of Review species to aid in the assignment of status. White-margined knotweed is not currently regarded as Endangered, Threatened, or 'Species of Concern' by the USFWS.

The four populations found within the Project area are all located in vernally wet swales, seeps, and draws. These habitats are well represented within the Project area, and much of the suitable habitat searched was found to contain the species. In addition, a large amount of suitable habitat exists nearby, adjacent to the survey corridors. Although areas outside of the corridors were typically not surveyed, it is reasonable to assume that much of this suitable habitat also contains white-margined knotweed.

3.4.1.6.5 Potential Project Impacts to Target Plant Species

Due to the absence of known populations within the Project area as surveyed to date, no Project-related impacts are anticipated to any federally Endangered, Threatened, Proposed, or Candidate plant species. Likewise, no Project-related impacts are predicted for any Washington State Endangered, Threatened, or Sensitive plant species.

Limited impacts are anticipated, however, to one species on the Washington State Review list, white-margined knotweed. Ground disturbance related to construction and operation of the proposed Project could cause direct adverse impacts to knotweed individuals if they are located within the impact footprint. However, due to the large size of many of the populations, and the high likelihood that many more populations occur in the area adjacent to the impact corridors, the Project is not expected to significantly impact the species' viability in the Project area. Of the estimated 2,500 knotweed individuals in the study corridor, less than 10% are expected to be directly impacted by the Project. This level of direct impact is not anticipated to jeopardize the continued existence of the local population, or lead to the need for state or federal listing.

Furthermore, in the Project vicinity, eleven populations of white-margined knotweed are known, totaling more than 67,500 individuals. Within this larger area the Project is expected to impact less than 0.5% of these individuals.

In addition to direct impacts from ground disturbing activities, the Project also has the potential to impact white-margined knotweed indirectly if the Project leads to the degradation of habitat in the area through the introduction and spread of noxious weeds. Although little is known about how white-margined knotweed responds to competition from non-native species, it is safest to assume that significant increases in noxious weeds in the area would be detrimental to the species. At the present time, the habitat where white-margined knotweed is found is relatively intact. Native species predominate at the sites, although some noxious weeds are present. If the Project lead to the degradation of these vernally wet communities by increasing noxious weed densities, it is likely that some level of adverse impact to the knotweed populations would occur.

3.4.1.7 Proposed Mitigation Measures

Proposed mitigation measures for potential impacts to both plants and wildlife are discussed in Section 1.4.5.

3.4.2 Wetlands

No wetland areas have been identified on or near the Project site in areas designated for project facilities or construction impacts. As no wetlands exist on or near the Project site, no construction or operation impacts are expected, and no wetlands mitigation measures have been proposed.

3.4.3 Wildlife

This section summarizes results of the extensive wildlife studies that have been done to characterize the existing wildlife present at the Project site and estimate potential impacts to wildlife from construction and operation of the Project. The complete results of the wildlife studies and all accompanying maps and figures are presented in Exhibit 11, 'Wildlife Baseline Study'.

The Applicant has contracted with CH2MHILL, Western Ecosystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. to develop and implement a survey protocol for a baseline study of wildlife and habitat in the Project area. The protocol for the ecological baseline study is similar to protocols used at the Vansycle, Klondike, Stateline, Maiden, Condon and Nine Canyon wind projects in Washington and Oregon, the Buffalo Ridge wind project in Minnesota, and the Foote Creek Rim wind project in Wyoming.

This section summarizes the results of the ecological baseline studies conducted from February 2002 through early November 2002. The wildlife portion of the ecological baseline study consists of 1) point count and in-transit surveys for wildlife species with an emphasis on birds and big game, 2) two aerial surveys within approximately two miles of the project boundary for visible raptor nests in the spring of 2002, and 3) nine driving transect surveys along Highway 10, Highway 97, Bettas Road, and Hayward Road to estimate the number of wintering bald eagles in the project vicinity. Information on sensitive wildlife species within the vicinity of the project was requested from the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Washington Natural Heritage Program (WNHP). The recent synthesis of baseline and operational monitoring studies at wind developments by Erickson *et al.* (2002), as well as other relevant information has been reviewed and utilized for predicting impacts from the Kittitas Valley Project.

3.4.3.1 Existing Habitat

The ecological and current habitat conditions of the Project area are described in detail in Section 3.4.1 'Vegetation' and thus are not repeated here.

3.4.3.2 Agency and Local Audubon Consultation

Consultation with local, regional and central office personnel of WDFW was initiated in early 2002 for the proposed Project. A study protocol was provided to WDFW and the Kittitas Audubon Society in February 2002. Representatives of the Applicant, project consultants, and WDFW met in Yakima on February 27, 2002 to discuss the Project and protocol. Representatives of the Applicant and project consultants also met with Kittitas Audubon Society on February 26, 2002 to introduce the proposed Project and again after the spring surveys were completed to discuss the results of those surveys. Information on sensitive plant and wildlife species within the vicinity of the Project was requested and received from the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Washington Natural Heritage Program (WNHP).

3.4.3.3 Baseline Study Methodology

3.4.3.3.1 Diurnal Fixed-point and In-Transit Avian Use Surveys

The goal of the avian use surveys was to estimate the temporal and spatial use of the study area by birds. The avian use surveys combined observations collected at eleven fixed-point circular plots in the study area with in-transit observations of birds made while driving to and from the study area. All wildlife species of concern and unusual species observed were recorded while the observers were in the study area traveling between observation points and while conducting other field activities. Two experienced wildlife and avian biologists, Jay Jeffrey of WEST Inc., and Laurie Ness of Northwest Wildlife Consultants Inc., conducted the avian surveys. Fixed-point surveys were conducted weekly from March 21 through November 1, 2002 at the Project. A total of 279 20-minute point count surveys were conducted in the Project area.

3.4.3.3.2 Fixed-point Surveys

Each plot consists of an 800-m radius circle centered on an observation point location (See Exhibit 11, 'Wildlife Baseline Study', Figure 2, 'Location of fixed-point avian use stations for the Project site'). Landmarks were located to aid in identifying the 800 m boundary of each observation point. Observations of birds beyond the 800 m radius were recorded, but may be analyzed separately from observations made within the plot, if warranted.

All detections of birds, mammals, reptiles, and amphibians in and near plots during the 20-minute plot surveys were recorded. Visual and binocular scanning of the entire plot view shed and beyond were continuously performed throughout the survey period. A unique observation number was assigned to each sighting. The following data were recorded for each plot survey: date, start and end time of observation period, plot number, species or best possible identification, number of individuals, sex and age class when known, distance from plot center when first observed, closest distance, altitude above ground (first, low and high), flight direction, behavior(s), habitat(s), whether observed during one or more of the three instantaneous counts, and in which of the two ten minute periods it was observed. Flight paths were mapped for raptors and species of concern and given corresponding observation numbers. The map indicates whether the bird was within or outside the survey radius based on reference points at known distances from the plot center. Flight paths were digitized using ARCVIEW 3.2. Climate information, such as temperature, wind speed, wind direction, precipitation and cloud cover were also recorded for each point count survey.

3.4.3.3.3 Incidental/In-transit Observations

All wildlife species of concern and uncommon species observed while field observers were traveling between plots were recorded on incidental/in-transit data sheets. Other incidental observations made during other surveys or visits to the sites were also recorded. These observations were recorded in a similar fashion to those recorded during the plot studies. The observation number, date, time, species, number, sex/age class, height above ground, and habitat were recorded. Observations of species of concern and uncommon species were recorded in additional detail, mapped on a USGS quadrangle map by observation number, and digitized using ARCVIEW 3.2.

3.4.3.3.4 Observation Schedule

Surveys were conducted weekly at intervals designed to include approximately all daylight hours. During a set of surveys, each selected plot was visited once. A pre-established schedule was developed prior to field work to ensure that each station was surveyed about the same number of times each period of the day, during each season, and to most efficiently utilize personnel time. The schedule was altered in response to adverse weather conditions or farming operations, which required delays and/or rescheduling of observations.

3.4.3.3.5 Statistical Analysis

Avian Use

Species lists were generated by season including all observations of birds detected regardless of their distance from the observer. The number of birds seen during each point count survey was standardized to a unit area and unit time surveyed. The standardized unit time was 20 minutes and the standardized unit area was 2.01 km^2 (800 m radius view shed for each station). For example, if four raptors were seen during the 20 minutes at a point with a viewing area of 2.01 km^2, these data may be standardized to 4/2.01 = 1.98 raptors/km^2 in a 20-minute survey. For the standardized avian use estimates, only observations of birds detected within 800 m of the observer were used. Estimates of avian use (expressed in terms of number of birds/plot/20-minute survey) were to used to compare differences in avian use between 1) avian groups and 2) seasons.

Avian Diversity and Richness

The total number of unique species was calculated by season. The mean number of species observed per survey (i.e., per station per 20-minute survey) was tabulated to illustrate and compare differences in mean number of species per survey between seasons.

Avian Flight Height/Behavior

The first flight height recorded was used to estimate percentages of birds flying below, within and above the rotor swept area (RSA). The zone of collision risk was estimated at 25-100 m above ground level (AGL) which is the combination of proposed tower heights with 50 m diameter rotors.

Avian Exposure Index

A relative index to collision exposure (*R*) was calculated for bird species observed during the fixed-point surveys using the following formula:

$$R = A*P_f*P_t$$

Where A = mean relative use for species *i* (observations within 800 m of observer) averaged across all surveys, P_f = proportion of all observations of species *i* where activity was recorded as flying (an index to the approximate percentage of time species *i* spends flying during the daylight period), and P_t = proportion of all flight height observations of species *i* within the rotor-swept area (RSA). This index does not account for differences in behavior other than flight characteristics (i.e., flight heights and percent of birds observed flying).

3.4.3.3.6 Avian Flight Patterns and Behavior

Maps of flight paths of raptors and other species of concern were generated and reported to illustrate patterns in flight paths and behaviors.

3.4.3.3.7 Raptor Nest Surveys

Raptor nest surveys were conducted within approximately two miles of the proposed turbine locations (Exhibit 11, 'Wildlife Baseline Study', Figure 18, 'Raptor nest locations within two miles of the site'). The search area encompassed approximately 70 square miles which is the study area plus the two-mile radius buffer, referred to as the raptor nest study area (RNA). The survey was conducted via a helicopter by searching suitable habitat for nests, such as stands of trees, shrubs, rocky areas, cliffs, and power lines. If a nest was observed the helicopter was moved to a position where nest occupancy and species could be determined. Efforts were made to minimize disturbance to breeding raptors, including keeping the helicopter a maximum distance from the nest to identify species. Those distances varied depending upon nest location and wind conditions. No nesting raptors were flushed from their nests during the aerial surveys.

Two surveys of the RNA were conducted. The purpose of the initial survey, conducted between May 5 and 8, 2002 was to document the location of all raptor nest structures and to determine nest occupancy. A total of approximately 908 linear miles was covered from the air during the initial visit.

A second survey was conducted on June 5, 2002 to determine productivity of nests occupied during the initial survey. Inactive nests found during the initial survey were also revisited to determine if late nesting species (e.g. Swainson's hawks) occupied nests that were empty during the initial visit. Approximately 54 linear air miles were covered during the second visit.

3.4.3.3.8 Wintering Bald Eagle Surveys

Driving transects to evaluate the numbers of wintering bald eagles and their movements in the Project area were initiated in mid-February, 2002. Surveys involved driving and counting bald eagles along four different routes (see below and Exhibit 11, 'Wildlife Baseline Study', Figure 19, 'Approximate perches and flight paths of bald eagles observed during weekly winter driving surveys at the site'). Surveyors drove a pre-determined survey route at weekly intervals. A total of 9 surveys were conducted between February 15 and April 11, 2002. The one-way distance for all survey routes combined is approximately 35 miles. Most routes were surveyed twice on any given survey day (e.g., starting in the east to west direction, and returning on the west-east direction).

Route 1: From the junction of Highway 97 and Highway 10 along 97 North to the intersection with Bettas Road. Also includes approximately 2.5 miles of Smithson road. Total distance (one-way) is approximately 11 miles.

Route 2: North on Highway 97 from Bettas Road to Northern Bettas Road Junction including all of Bettas Road and south on Hayward Road. Total distance (one-way) is approximately 10 miles.

Route 3: Junction of Hayward Road and Highway 10, west on Highway 10 to Junction with Hart Road. Total distance (one-way) is approximately 7.4 miles.

Route 4: Junction of Highway 97 and Highway 10 west on Highway 10 to Hayward Road. Total distance (one-way) is approximately 6.7 miles.

Depending on the traffic and safe pull-off availability, the surveyor looked for eagles within the view shed from the road. During periodic stops, the surveyor scanned areas of large cottonwoods and conifer trees with binoculars to look for perched eagles. A spotting scope was used if closer views were required to confirm identifications or if a potential roost tree grove was identified in the distance. Between stops, the observer drove at a slow speed of approximately 25 mph (40 Kph), where appropriate. Surveys were conducted in the morning and evening hours, alternating each week. If bald eagles or other species of interest (e.g., raptors, elk) were sighted, they were assigned an observation number and mapped on USGS 7.5' quadrangle maps. Habitat, activity, and time of day were also recorded for each observation. Flight paths of bald eagles were mapped for as long as the bird was visible. Perch sites and evening roost sites were recorded on the topo maps. The direction of the route followed (forward or reverse), total time spent and distance driven was recorded for each survey route.

3.4.3.4 Wildlife Study Results

3.4.3.4.1 Avian Species Distribution

A total of 97 avian species were identified during the point count, in-transit, and/or bald eagle surveys and incidentally while conducting other field tasks at the Project (See Table 3.4.3-1). A total of 3,600 individual bird detections within 1,210 separate groups were recorded from during the fixed-point surveys. Cumulatively, four passerines, American pipits, American robins, horned larks, and western meadowlarks, comprised approximately 47% of the observations. All other species comprised less than 5% of the observations individually.

The mean number of species observed per survey (20-minute point count) was 3.63 with an average of 12.05 bird observations per survey. Higher overall avian-use occurred in the spring (15.14/survey) and fall (12.20/survey) compared with the summer (9.16/survey). The apparent higher use in spring was primarily due to observations of relatively large flocks of birds (e.g., 520 American pipits, 141 Canada geese).

Passerines were the most abundant avian group observed during all seasons. The next most abundant avian group varied by season, with corvids higher in spring and fall, and raptors more prevalent in summer. The most common raptor species observed were red-tailed hawks and American kestrels. Canada geese were observed primarily during spring, and common ravens were observed throughout the study period.

3.4.3.4.2 Raptors

Compared to results of studies at other wind developments including Buffalo Ridge (MN), Foote Creek Rim (WY), Klondike (OR), Nine Canyon (WA), Zintel Canyon (WA), Stateline (OR/WA), and Vansycle (OR), the Kittitas Valley Project site had relatively high spring and summer raptor use and moderate fall use. The higher use is primarily due to the presence of American kestrels and red-tailed hawks, two very common raptor species. High red-tailed hawk use is partly due to two active nests located within 0.25 mile of two avian point count stations.

A total of six red-tailed hawk nests and nine inactive raptor nests were found during the aerial raptor nest surveys. Five of the six red-tailed hawk nests produced a total of 9 young for an average of 1.5 young per nest. One previously active red-tailed hawk nest was not found during the second visit. The nest may have been blown out of the tree during a high wind event. Of the 15 nests found during surveys, six were in mature cottonwoods, six were in coniferous trees, one was in a shrub, one was located on a power line pole, and one was on a cliff. Much of the study area was dominated by coniferous forest. Due to the presence of thick foliage and interlocking crowns of coniferous forests, detection of raptor nests in many areas was difficult from the helicopter. Based on the current project layout, two of the six nests are within 0.25 mile of a proposed turbine string. One nest is between 0.25 and 0.5 mile of a proposed turbine string, and the other three nests are greater than one mile from proposed turbine strings.

Table 3.4.3-1: List of avian species observed during fixed-point, in-transit and bald eagle surveys on the Kittitas Valley Project site.

Species/Group	Scientific Name	Species/Group	Scientific Name	Species/Group	Scientific Name
blue-winged teal	*Anas discors*	black-headed grosbeak	*Pheucticus melanocephalus*	Townsend's solitaire	*Myadestes townsendi*
Canada goose	*Branta canadensis*	Brewer's blackbird	*Euphagus cyanocephalus*	Townsend's warbler	*Dendroica townsendi*
greater white-fronted goose	*Anser Albifrons*	Brewer's sparrow	*Spizella breweri*	Vaux's swift	*Chaetura vauxi*
Mallard	*Anas platyrhynchos*	brown-headed cowbird	*Molothrus ater*	vesper sparrow	*Pooecetes gramineus*
great blue heron	*Ardea herodias*	Bullock's oriole	*Icterus bullockii*	violet-green swallow	*Tachycineta thalassina*
herring gull	*Larus argentatus*	Cassin's finch	*Carpodacus purpureus*	warbling vireo	*Vireo gilvus*
common snipe	*Gallinago Gallinago*	cedar waxwing	*Bombycilla cedrorum*	western kingbird	*Tyrannus verticalis*
greater yellowlegs	*Tringa melanoleuca*	chipping sparrow	*Spizella passerina*	western meadowlark	*Sturnella neglecta*
Killdeer	*Charadrius vociferus*	cliff swallow	*Petrochelidon pyrrhonota*	western tanager	*Piranga ludoviciana*
long-billed curlew	*Numenius americanus*	dark-eyed junco	*Junco hyemalis*	western wood-pewee	*Contopus virens*
spotted sandpiper	*Actitis macularia*	eastern kingbird	*Tyrannus tyrannus*	white-crowned nuthatch	*Sitta carolinenis*
Wilson's phalarope	*Phalaropus tricolor*	European starling	*Sturnus vulgaris*	white-crowned sparrow	*Zonotrichia leucophrys*
American kestrel	*Falco sparverius*	golden-crowned kinglet	*Regulus satrapa*	yellow-headed blackbird	*Xanthocephalus xanthocephalus*
bald eagle	*Haliaeetus leucocephalus*	golden-crowned sparrow	*Zonotrichia atricapilla*	yellow-rumped warbler	*Dendroica coronata*
Cooper's hawk	*Accipiter cooperii*	gray-crowned rosy finch	*Leucosticte arctoa*	common nighthawk	*Chordeiles minor*
Golden eagle	*Aquila chrysaetos*	horned lark	*Eremophila alpestris*	downy woodpecker	*Picoides pubescens*
great-horned owl	*Bubo virginianus*	house finch	*Carpodacus mexicanus*	Lewis's woodpecker	*Melanerpes lewis*
Gyrfalcon	*Falco rusticolus*	lazuli bunting	*Passerina amoena*	northern flicker	*Colaptes auratus*
Merlin	*Falco columbarius*	Lincoln's sparrow	*Melospiza lincolnii*	Rufous hummingbird	*Selasphorus rufus*
northern goshawk	*Accipiter gentilis*	loggerhead shrike	*Lanius ludovicianus*	blue grouse	*Dendragapus obscurus*
northern harrier	*Circus cyaneus*	Macgillivray's warbler	*Oporornis tolmiei*	California quail	*Callipepla californica*
Osprey	*Pandion haliaetus*	mountain bluebird	*Sialia currucoides*	gray partridge	*Perdix perdix*
Prairie falcon	*Falco mexicanus*	mountain chickadee	*Poecile gambeli*	ruffed grouse	*Bonasa umbellus*
red-tailed hawk	*Buteo jamaicensis*	northern shrike	*Lanius excubitor*	mourning dove	*Zenaida macroura*
rough-legged hawk	*Buteo lagopus*	orange-crowned warbler	*Vermivora celata*		
sharp-shinned hawk	*Accipter striatus*	pine grosbeak	*Pinicola enucleator*		
Turkey vulture	*Cathartes aura*	purple finch	*Carpodacus purpureus*		
black-billed magpie	*Pica pica*	red crossbill	*Loxia curvirostra*	unidentified duck	
common raven	*Corvus corax*	red-breasted nuthatch	*Sitta canadensis*	unidentified accipiter	
Steller's jay	*Cyanocitta stelleri*	red-winged blackbird	*Agelaius phoeniceus*	unidentified buteo	
American goldfinch	*Carduelis tristis*	ruby-crowned kinglet	*Regulus calendula*	unidentified eagle	
American green-winged teal	*Anas crecca*	sage thrasher	*Oreoscoptes montanus*	unidentified falcon	
American pipit	*Anthus rubescens*	savannah sparrow	*Passerculus sandwichensis*	unidentified finch	
American redstart	*Setophaga ruticilla*	Say's phoebe	*Sayornis saya*	unidentified flycatcher	
American robin	*Turdus migratorius*	song sparrow	*Melospiza melodia*	unidentified passerine	
barn swallow	*Hirundo rustica*	spotted towhee	*Pipilo maculatus*	unidentified swallow	
black-capped chickadee	*Poecile atricapillus*			unidentified bluebird	

3.4.3.4.3 Flight Height Characteristics

Flight height characteristics were estimated for avian species and groups. Percentages of observations below, within, and above the rotor swept area (RSA) of 25 to 100 m above ground level were reported. Overall, 27.9% of the birds observed were recorded within the defined RSA, 64.9% were below the RSA and 7.1% were flying above the RSA. Certain species were commonly observed flying within the RSA, for example, 98.2% of 112 flying cedar waxwings, 85.7% of 14 common nighthawks, 79.2% of 322 American robins, 58.8% of 34 barn swallows, and 57.1% of 14 American goldfinches. However, other commonly observed species were not often observed within the RSA, such as 8.1% of 258 horned larks, and 4.3% of 23 western meadowlarks. Gray-crowned rosy finches, long-billed curlew, Townsend's solitaire, an unidentified swallow and an unidentified accipiter were always observed within the RSA based upon one bird observation for each species (except for gray-crowned rosy finches which was one group of five individuals).

3.4.3.4.4 Relative Exposure Index

A relative exposure index (avian-use multiplied by proportion of observations where bird flew within the RSA) was calculated for each species (See Table 3.4.3-2). This index is only based on flight height observations and relative abundance and does not account for other possible collision risk factors such as foraging or courtship behavior. Small bird species with the highest exposure indexes were American robin, cedar waxwing, and American pipit. Large bird species with the highest exposure index were common raven, red-tailed hawk and American kestrel. Mortality studies at other wind projects have indicated that although ravens are often observed at wind projects within the zone of risk, they appear to be less susceptible to collision with wind turbines than other similar size birds (e.g., raptors, waterfowl). Red-tailed hawks and American kestrels have been the most common species of the raptor fatalities at older wind projects in California, and a few fatalities of these two species have been observed at new wind projects (one red-tailed hawk at Buffalo Ridge, MN, and three American kestrels at Foote Creek Rim, WY). One common nighthawk fatality was observed at Foote Creek Rim (WY), but apparently no other common nighthawk fatalities have been observed at other U.S. wind projects.

Table 3.4.3-2 **Mean exposure indices calculated by species observed during fixed-point surveys at the Project site.**				
Species/Group	**Overall mean use**	**% flying**	**% flying within RSA**	**Exposure Index**
American robin	1.377	81.9	79.2	0.893
Cedar waxwing	0.402	97.4	98.2	0.385
American pipit	2.077	100.0	9.6	0.199
Common raven	0.421	74.6	48.4	0.152
Red-tailed hawk	0.319	76.0	52.1	0.126
American kestrel	0.242	78.9	42.9	0.082
Horned lark	1.595	57.5	8.1	0.075
Barn swallow	0.140	85.0	58.8	0.070
Mountain bluebird	0.301	67.5	25.0	0.051
Common nighthawk	0.052	93.3	85.7	0.042
American goldfinch	0.056	87.5	57.1	0.028
Cliff swallow	0.119	91.2	22.6	0.024
Gray-crowned rosy finch	0.017	100.0	100.0	0.017
Northern harrier	0.061	94.4	29.4	0.017
Turkey vulture	0.087	92.3	20.8	0.017
Brewer's blackbird	0.342	67.7	6.2	0.014
Rough-legged hawk	0.068	62.5	30.0	0.013
Killdeer	0.052	26.7	75.0	0.010
Sharp-shinned hawk	0.035	100.0	30.0	0.010
Violet-green swallow	0.014	100.0	75.0	0.010
Golden eagle	0.026	71.4	40.0	0.007
Mourning dove	0.029	100.0	25.0	0.007
Northern flicker	0.077	18.2	50.0	0.007
Bald eagle	0.017	85.7	33.3	0.005
Cooper's hawk	0.017	57.1	50.0	0.005
Lewis's woodpecker	0.007	100.0	50.0	0.004
Black-billed magpie	0.201	54.4	3.2	0.004
Western meadowlark	0.873	9.3	4.3	0.004
European starling	0.378	75.0	1.2	0.003
Unidentified passerine	0.077	77.3	5.9	0.003
Steller’s jay	0.042	66.7	12.5	0.003
Prairie falcon	0.017	80.0	25.0	0.003
Townsend's solitaire	0.014	25.0	100.0	0.003
Northern goshawk	0.007	100.0	50.0	0.003
Long-billed curlew	0.003	100.0	100.0	0.003
Unidentified swallow	0.003	100.0	100.0	0.003
Unidentified buteo	0.003	100.0	66.7	0.002
Unidentified accipiter	0.003	50.0	100.0	0.002
Blue-winged teal	N/A	100.0	0.0	0.000
Unidentified duck	N/A	0.0	N/A	0.000
Unidentified eagle	N/A	100.0	50.0	0.000
Unidentified falcon	N/A	100.0	0.0	0.000

Table 3.4.3-2 Mean exposure indices calculated by species observed during fixed-point surveys at the Project site.				
	Overall	**%**	**% flying**	**Exposure**
Vesper sparrow	0.435	5.6	0.0	0.000
Yellow-rumped warbler	0.406	86.2	0.0	0.000
Spotted towhee	0.190	5.6	0.0	0.000
Savannah sparrow	0.189	53.7	0.0	0.000
Chipping sparrow	0.169	40.4	0.0	0.000
Dark-eyed junco	0.134	65.8	0.0	0.000
White-crowned sparrow	0.119	11.8	0.0	0.000
Brown-headed cowbird	0.063	5.6	0.0	0.000
Red-winged blackbird	0.052	100.0	0.0	0.000
Unidentified finch	0.052	100.0	0.0	0.000
Canada goose	0.049	70.4	0.0	0.000
California quail	0.045	0.0	N/A	0.000
Black-capped chickadee	0.045	46.2	0.0	0.000
Unidentified bluebird	0.045	100.0	0.0	0.000
House finch	0.042	50.0	0.0	0.000
Mallard	0.038	10.3	0.0	0.000
Mountain chickadee	0.038	54.5	0.0	0.000
Purple finch	0.024	100.0	0.0	0.000
Blue grouse	0.024	57.1	0.0	0.000
Lazuli bunting	0.021	0.0	N/A	0.000
Orange-crowned warbler	0.017	0.0	N/A	0.000
Red crossbill	0.017	0.0	N/A	0.000
Ruby-crowned kinglet	0.017	0.0	N/A	0.000
Warbling vireo	0.017	0.0	N/A	0.000
Eastern kingbird	0.017	20.0	0.0	0.000
Western kingbird	0.017	20.0	0.0	0.000
Brewer's sparrow	0.014	0.0	N/A	0.000
Golden-crowned kinglet	0.014	0.0	N/A	0.000
Western wood-pewee	0.014	0.0	N/A	0.000
Rufous hummingbird	0.014	100.0	0.0	0.000
Song sparrow	0.010	0.0	N/A	0.000
Say's phoebe	0.010	33.3	0.0	0.000
Bullock's oriole	0.007	0.0	N/A	0.000
Lincoln's sparrow	0.007	0.0	N/A	0.000
Northern shrike	0.007	0.0	N/A	0.000
Western tanager	0.007	0.0	N/A	0.000
Vaux's swift	0.007	100.0	0.0	0.000
Herring gull	0.007	100.0	0.0	0.000
Merlin	0.007	100.0	0.0	0.000
Cassin's finch	0.003	0.0	N/A	0.000
Macgillivray's warbler	0.003	0.0	N/A	0.000

Table 3.4.3-2
Mean exposure indices calculated by species observed during fixed-point surveys at the Project site.

	Overall	%	% flying	Exposure
Townsend's warbler	0.003	0.0	N/A	0.000
Wilson's phalarope	0.003	0.0	N/A	0.000
Common snipe	0.003	0.0	N/A	0.000
Downy woodpecker	0.003	0.0	N/A	0.000
Golden-crowned sparrow	0.003	0.0	N/A	0.000
Great-horned owl	0.003	0.0	N/A	0.000
Osprey	0.003	0.0	N/A	0.000
Pine grosbeak	0.003	0.0	N/A	0.000
Ruffed grouse	0.003	0.0	N/A	0.000
Sage thrasher	0.003	0.0	N/A	0.000
American redstart	0.003	100.0	0.0	0.000
Black-headed grosbeak	0.003	100.0	0.0	0.000
Greater yellowlegs	0.003	100.0	0.0	0.000
Red-breasted nuthatch	0.003	100.0	0.0	0.000
Unidentified flycatcher	0.003	100.0	0.0	0.000
Yellow-headed blackbird	0.003	100.0	0.0	0.000

3.4.3.4.5 Non-Avian Wildlife Observations

Mammals

Mule deer (*Odocoileus hemionus*) were commonly observed throughout the Project area (Table 11). Observations of 10-20 individuals were commonly observed in the spring, with 3-7 individuals observed throughout the summer. Observations in the fall were typically small groups of does. Elk (*Cervis elaphus*) were observed in some large groups (15-25) individuals near the northern points (A, E, F and G) during the spring surveys, with few observations made in the summer and fall periods. American pika (*Ochotona princeps*) has been heard regularly on the large talus slope near station A.

Reptiles and Amphibians

Reptiles observed during the field studies included rubber boa (*Charina bottae*), Great Basin gopher snake (*Pituophis catenifer deserticola*), Northern Pacific rattlesnake (*Crotalus viridis oreganus*), and short-horned lizard (*Phrynosoma douglassii*). One amphibian chorus was heard during the spring at a distance of over 300 meters, and is likely one of the true frog species (e.g., Cascade frog, *Rana cascadae*). Spotted frogs (*Rana pretiosa*) and red-legged frogs (*Rana aurora*) have auditory calls that typically don't carry over 30 meters, and the northern leopard frog (*Rana pipiens*) is not known to occur in Kittitas county.

3.4.3.5 Potential Wildlife Impacts

3.4.3.5.1 Displacement

Most studies of displacement effects have been conducted in Europe, and most of the impacts have involved wetland habitats and groups of birds not common on this Project, including waterfowl, shorebirds and waders (Larsen and Madsen, 2000; Pederson and Poulsen, 1991; Vauk, 1990; Winkelman, 1989; Winkelman, 1990; Winkelman, 1992). Most disturbance has involved feeding, resting, and migrating birds in these groups (Crockford, 1992). European studies of disturbance to breeding birds suggest negligible impacts and disturbance effects were documented during only one study (Pedersen and Poulsen, 1991). For most avian groups or species or at other European wind plants, no displacement effects on breeding birds were observed (Karlsson, 1983; Phillips, 1994; Winkelman, 1989; Winkelman, 1990).

Avian displacement associated with windpower development has not received as much attention in the U.S. At a large wind plant on Buffalo Ridge, Minnesota, abundance of shorebirds, waterfowl, upland game birds, woodpeckers, and several groups of passerines was found to be significantly lower at survey plots with turbines than at plots without turbines. There were fewer differences in avian use as a function of distance from turbine, however, suggesting that the area of reduced use was limited primarily to those areas within 100 m of the turbines (Johnson *et al.,*. 2000a). A sizeable portion of these displacement effects are likely due to the direct loss of habitat near the turbine for the turbine pad and associated roads. These results are similar to those of Osborn *et al.* (1998) who reported that birds at Buffalo Ridge avoided flying in areas with turbines. Also at Buffalo Ridge, Leddy *et al.* (1999) found that densities of male songbirds were significantly lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. Grasslands without turbines as well as portions of grasslands located at least 180 m from turbines had bird densities four times greater than grasslands located near turbines.

Reduced avian use near turbines was attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness due to the presence of access roads and large gravel pads surrounding turbines (Leddy, 1996; Johnson *et al.,*. 2000a).

Construction and operation of the Foote Creek Rim wind plant did not appear to cause reduced use of the wind plant and adjacent areas by most avian groups, including raptors, corvids, or passerines (Johnson *et al.,* 2000b). Some reduced use of the areas near turbines was apparent for a local population of mountain plovers. A pair of golden eagles successfully nested 0.5 miles from the wind plant after one phase was operational and another phase was under construction.

Avoidance of wind plants by raptors has not been reported at any U.S. wind plants, and anecdotal evidence indicates that raptor use of the Altamont Pass, California wind resource area (WRA) may have increased since installation of wind turbines (American Wind Energy Association, 1995). Although displacement of birds by wind plants is not desirable, especially where important habitats may be limited, if other suitable habitats are available, one potential benefit of avian avoidance of turbines is the reduced potential for collision mortality to occur (Crockford, 1992).

Based on the available information, it is probable that some displacement effects may occur to the grassland/shrub-steppe avian species occupying the study area. The extent of these effects and their significance is unknown and hard to predict but could range from none to several hundred feet, resulting in a low level of impacts.

Operation of the proposed Project would not affect raptor nests unless there were displacement effects that caused raptors to not return to the nests close to the project site. Impacts would be considered very low, given the low density observed in close proximity to the turbines, and the species involved (red-tailed hawk).

3.4.3.5.2 Risk of Turbine Collision

Raptors

Based on the level of raptor use within the Project, raptor mortality is expected to be slightly higher compared to other wind projects with similar turbine types. American kestrels and red-tailed hawks account for much of the raptor use at the site, and are expected to be the species with the highest mortality. The potential exists for other raptor species to collide with turbines, including northern harrier, rough-legged hawk, bald eagle, and turkey vulture. However, the mortality risk associated with these species is expected to be lower than the risk for American kestrel and red-tailed hawk. Turkey vultures appear less susceptible to collision that most other raptors (Orloff and Flannery, 1992). Very few northern harrier fatalities and no rough-legged hawk or bald eagle fatalities have been observed at wind projects to date. Golden eagle use of the site is low relative to other wind sites and the mortality risk for golden eagles is also expected to be very low.

As a group, raptor use ranged from 0.73 per 20 minute survey in the fall to 1.03 in the summer, with an overall average of approximately 0.9. For comparison, raptor use at three wind projects studied with the same methods[1] was lower. Raptor use at the Vansycle wind

[1] Fixed-point surveys were conducted following the same methods at all three wind projects but had variable survey

project was approximately 0.36 raptors per 20-minute survey; at the Buffalo Ridge wind project raptor use was approximately 0.49 raptors per 20-minute survey; and at the Foote Creek Rim wind project raptor use was approximately 0.73 raptors per 20-minute survey. Overall raptor use as well as habitat is most similar to the Foote Creek Rim, Wyoming wind project.

Raptor mortality at other newer generation wind projects has been very low. The estimate of raptor mortality at the Foote Creek Rim wind project in Wyoming is the highest observed and is 0.03 raptors per turbine per year based on a three-year study of 69 turbines (Young *et al.,* 2002). No raptor mortality was observed at the Vansycle wind project in Oregon during a one-year study; and 1 raptor was recorded over a four-year study at the Buffalo Ridge wind project (Erickson *et al.,* 2001).

Considering these mortality results as well as raptor use estimates at these wind projects, it is estimated that potential raptor mortality at the proposed Project would be approximately 25% greater than that of the Foote Creek Rim Wind project (or approximately 0.038 raptors per turbine per year). Using these raptor mortality rates, a range of approximately 0 to 4 raptor fatalities per year at the Project may be expected if 115 turbines are constructed. It should be noted that the fatality estimates may vary from the expected range based on many factors, including the number of occupied raptor nests near the wind project after construction, turbine size and other site specific and/or weather variables. It should also be noted that the majority of raptor fatalities are expected to be American kestrels and red-tailed hawks, two very common raptor species.

<u>Passerines</u>

Passerines have been the most abundant avian fatality at other wind projects studied (see Johnson *et al.,* 2000; Young *et al.,* 2002; Erickson *et al.,* 2000), often comprising more than 80% of the avian fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines make up the vast majority of the avian observations on-site, it is expected passerines will make up the largest proportion of fatalities. Species most common to the study area will likely be most at risk, including western meadowlark, vesper sparrow and horned lark. Horned larks have been the most commonly observed fatality at several wind projects, including Vansycle and Foote Creek Rim (Erickson *et al.,* 2001, Young *et al.,* 2002). A few large flocks of birds such as American pipits were observed, but given their infrequent use, mortality would be expected to be low. Nocturnal migrating species may also be affected, but it is not expected that they would be found in large numbers based on data collected at other wind plants [i.e., no large mortality events documented (Erickson *et al.,* 2001)]. Based on the mortality estimates from the other wind plants studied, between 50 and 300 passerine fatalities may occur per year at the Project if all 120 turbines are constructed.

Carcass search studies at the Foote Creek Rim Wind Plant, Wyoming, have found avian casualties associated with guyed met towers. Based on searches of five permanent met towers at Foote Creek Rim over a three-year period, it was estimated that these towers resulted in approximately 8.1 avian casualties per tower per year (Young *et al.,* 2002). The vast majority of these avian casualties were passerines. The nine permanent met towers

duration. The calculated use at these wind projects was standardized to 20-minute duration surveys under the assumption that raptor observations were uniform across time for each survey period.

proposed for the Project would be expected to result in collision deaths for passerines at the site, although the use of bird flight diverters on guy wires should reduce the risk of collision.

Waterfowl

Some waterfowl mortality has been documented at other wind plants (Erickson *et al.,* 2001). However, studies at Foote Creek Rim, Vansycle, and Buffalo Ridge have not documented mortality of Canada geese, one the most common waterfowl species observed flying over the Project study area. Because of the low use of the site by waterfowl, little mortality would be expected from the Project.

Other Avian Groups/Species

Other avian groups (e.g., upland game birds, doves, shorebirds) occur in relatively low numbers within the study area and mortality would be expected to be low. Other species only observed during migration may be at risk; however, mortality would be expected to be low given the low use estimates by these species and groups.

Big Game

The Project area is within a transition zone between the dry grassland/shrub steppe basin towards the Columbia River and the wetter coniferous forest of the east slope of the Cascade Mountains. Portions of the proposed wind plant are within habitats designated by WDFW as winter range for mule deer and elk, although the human development that has already occurred in the project area has likely reduced the quality of the winter range. In addition, portions of the wind plant are near elk calving areas and elk migration routes. Wintering elk forage on native grass species such as Sandberg's bluegrass, which greens up with fall and winter rains, while mule deer likely utilize more shrub species in the project area. Wind-blown slopes and ridges remain snow-free most of the year. West and south-facing slopes green up earlier and provide accessible nutritious forage during the harsh winter months. Elk travel through the area between seasons and calving occurs at Lookout Mountain during the spring.

Although this area has been designated as elk and deer winter range, significant amounts of human activity have already occurred within the Project area. Highway 97, which accommodates an average of 2,200 vehicles a day, runs through the Project area, with turbine strings on both sides of the road. Bettas and Hayward roads each serve approximately 20 vehicles per day. Several of the turbine strings and associated roads will follow existing roads which are currently used to access private property in the Project area.

The WDFW has expressed some concern over the potential effects of wind project development on wintering big game. Winter is a crucial period of time for the survival of many big game species. Deer, for example, cannot maintain body condition during the winter because of reduced forage availability combined with the increased costs of thermogenesis (Reeve and Lindzey, 1991). In other words, as deer expend more energy than they take in, body condition gradually declines throughout the winter (Short, 1981). Unnecessary energy expenditures may increase the rate at which body condition declines, and the energy balance determining whether a deer will survive the winter is thought to be relatively narrow, especially for fawns (Wood, 1998). Overwinter fawn survival may decrease in response to human activity or other disturbances (Stephenson *et al.,* 1996). Roads and energy development may also fragment otherwise continuous patches of suitable habitat, effectively decreasing the amount of winter range available for big game. Fragmentation of habitat may also limit the ability of big game populations to move throughout the winter range as conditions change, causing big game to utilize less suitable habitat (Brown, 1992).

Two published studies of big game winter use may be relevant to the development of wind turbines and wintering deer and elk (Rost and Bailey, 1979; Van Dyke and Klein, 1996). Van Dyke and Klein (1996) documented elk movements through the use of radio telemetry before, during and after the installation of a single oil well within an area used year round by elk. Drilling activities during their study ceased by November 15, however, maintenance activities continued throughout the year.

Elk showed no shifts in home range between the pre and post drilling periods, however, elk shifted core use areas out of view from the drill pad during the drilling and post drilling periods. Elk also increased the intensity of use in core areas after drilling and slightly reduced the total amount of range used. It was not clear if the avoidance of the well site during the post-drilling period was related to maintenance activities or to the use of a new road by hunters and recreationalists. The authors concluded that if drilling activities occupy a relatively small amount of elk home ranges, that elk are able to compensate by shifting areas of use within home ranges.

While several authors have documented elk avoiding roads within forested environments during the summer, the effects of roads and associated human activity on wintering elk and mule deer have not been well documented. Rost and Bailey (1979) found that wintering mule deer and elk avoided areas within 200 m of roads in eastern portions of their Colorado study area, where presumably greater amounts of winter habitat were present. Road avoidance was greater where roads were more traveled. Only mule deer showed a clear avoidance of roads in the western portion of their study area, where winter range was assumed to be more limiting. Mule deer also showed greater avoidance of roads in shrub habitats versus more forested areas. The authors concluded that impacts of roads depended on the availability of suitable winter range away from roads, as well as the amount of traffic associated with roads.

There is little information regarding wind project effects on big game. At the Foote Creek Rim wind project in Wyoming, pronghorn observed during raptor use surveys were recorded year round (Johnson *et al.,* 2000). The mean number of pronghorn observed at the six survey points was 1.07 prior to construction of the wind plant and 1.59 and 1.14/survey the two years immediately following construction, indicating no reduction in use of the immediate area. Mule deer and elk also occurred at Foote Creek Rim, but their numbers were so low that meaningful data on wind plant avoidance could not be collected.

The elk and mule deer on site primarily occupy the grassland/shrub-steppe habitats, springs, and riparian corridors. During the construction period, it is expected that elk and mule deer will be displaced from the site due to the influx of humans and heavy construction equipment and associated disturbance. Construction related disturbance and displacement is expected to be limited to the construction period time frame. Most construction will take place during the summer months, minimizing construction disturbance to wintering big game. Following completion of the wind plant, the disturbance levels from construction equipment and humans will diminish and the primary disturbances will be associated with operations and maintenance personnel, occasionally vehicular traffic, and the presence of the turbines and other facilities.

Due to the lack of knowledge regarding the potential impacts of energy development on big game, it is difficult to predict with certainty the effects of the proposed wind project on mule deer and elk. Van Dyke and Klein (1996) showed wintering elk shifted use of core areas out of view of human related activities associated with an oil well and access road. Most turbines and roads in the project area will be located on ridges and will be visible over a fairly large area. Where wind turbines will be constructed in elk wintering areas, elk may concentrate use away from the wind development during construction. While human related activity at wind turbines during regular maintenance will be less than during the construction period, it is not known if human activity associated with regular maintenance activity will exceed tolerance thresholds for wintering elk. If tolerance thresholds during regular maintenance activities are exceeded, elk are likely to permanently utilize areas away from the wind development. Given the amount of residential development and the existing roads and disturbance within the Project area (approximately half are existing roads that will be improved), and including Highway 97 which runs through the middle of the Project area, disturbance levels after operation begins will not be greatly increased.

The proposed wind facility occurs approximately 3 miles southeast of mapped elk calving areas. Assuming calving areas are mapped accurately, the proposed project is not likely to impact the mapped calving area.

Other Mammals

Other mammals that likely exist within the Project site include, badger, coyote, pocket gopher, bobcat, American pika, and other small mammals such as rabbits, voles and mice. Construction of the wind project may affect these mammals on site through loss of habitat and direct mortality of individuals occurring in construction zones. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. Road and facility construction will result in loss of foraging and breeding habitat for small mammals. Ground-dwelling mammals will lose the use of the permanently impacted areas; however, they are expected to repopulate the temporarily impacted areas. Some small mammal fatalities can be expected from vehicle activity. Impacts are expected to be very low and not significant.

Reptiles and Amphibians

Construction of the Project may affect reptiles and amphibians on site through loss of habitat and direct mortality of individuals occurring in construction zones. The level of mortality associated with construction would be based on the abundance of the species on site. Some mortality may be expected as common reptiles such as short-horned lizards and yellow-bellied racers often retreat to underground burrows for cover or during periods of winter dormancy. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. While above ground, yellow-bellied racers and other snakes are generally mobile enough to escape construction equipment, however, short-horned lizards do not move fast over long distances and rely heavily on camouflage for predator avoidance. Some individual lizard fatalities can be expected from vehicle activity. Impacts are expected to be very low and not significant.

Bats

The potential for bats to occur is based on key habitat elements such as food sources, water, and roost sites. Potential roost structures such as trees are abundant along the riparian areas within the project area. Ponds in the Project area such as those located along the Dry Creek drainage may be used as foraging and watering areas. Little is known about bat species distribution, but several species of bats could occur in the Project area based on the Washington GAP project and inventories conducted on the Hanford Site, Arid Lands Ecology Reserve (ALE) located in Benton County to the southeast.

Bat research at other wind plants indicates that migratory bat species are at some risk of collision with wind turbines, mostly during the fall migration season. It is likely that some bat fatalities would occur at the proposed project site. Most bat fatalities found at wind plants have been tree-dwelling bats, with hoary and silver-haired bats being the most prevalent fatalities. Both hoary bats and silver-haired bats may use the forested habitats near the project site and may migrate through the Project.

At the Buffalo Ridge Wind Plant, Minnesota, based on a 2-year study, bat mortality was estimated to be 2.05 bats per turbine per year (Johnson *et al.*, 2000b). At the Foote Creek Rim Wind Plant, based on 2 years of study, bat mortality was estimated at 1.51 bats per turbine per year (Young *et al.*, 2001). At the Vansycle Ridge Wind Plant in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson *et al.*, 2000).

Although potential future mortality of migratory bats is difficult to predict, an estimate can be calculated based on levels of mortality documented at other wind plants. Using the estimates from other wind plants, operation of the proposed Project could result in approximately 240 bat fatalities per year. Actual levels of mortality are unknown and could be higher or lower depending on regional migratory patterns of bats, patterns of local movements through the area, and the response of bats to turbines, individually and collectively.

The significance of this impact is hard to predict since there is very little information available regarding bat populations. Studies do suggest resident bats do not appear to be significantly impacted by wind turbines (Johnson *et al.,* 2002; Gruver, 2002), since almost all mortality is observed during the fall migration period. Furthermore, hoary bat, which is expected to be the most common fatality, is one of the most widely distributed bats in North America. Pre-construction studies to predict impacts to bats may be relatively ineffective, because current state-of-the-art technology for studying bats does not appear to be highly effective for documenting migrant bat use of a site (Johnson *et al.,* 2002).

3.4.4 <u>Fisheries</u>

Facilities for the project are located more than ¼ mile from the Yakima River, and the small tributaries such as Dry Creek apparently do not support fish habitat (PHS data). No impacts to fish are likely to occur as a result of the project.

3.4.5 <u>Unique Species</u>

3.4.5.1 Sensitive, Threatened, and Endangered Species

A list of state and federally protected species that potentially occur within the project area was generated to assess the potential for impacts to these species (See Table 3.4.5-1). Species were identified based on the WDFW Species of Concern list, which includes state listed endangered, threatened, sensitive and candidate species; and the USFWS, Central Washington Ecological Services office list of Endangered, Threatened, Proposed, Candidate and Species of Concern for Kittitas County.

Information about occurrence of these species in the Project area is based largely on the following resources:

- Habitat mapping and predicted distribution from Washington State Gap Analysis Program (GAP) project;
- WDFW Priority Habitats and Species (PHS) records for the project area and a buffer or approximately 5 miles;
- Breeding Bird Atlas of Washington State, Location Data and Predicted Distributions (Smith *et al.* 1997);
- Baseline field studies being conducted on site (this report); and
- Other published literature where available.

A detailed analysis of the potential impacts to bald eagles and other endangered, threatened, proposed and candidate species is provided in Exhibit 12, 'Biological Assessment of Endangered, Threatened, Proposed and Candidate Species'.

Table 3.4.5-1. A list of state and federally protected species potentially occurring within the KVP area.				
Species	**State Status**	**Federal Status**	**Occurrence**	**Documentation**
Birds				
Northern goshawk (*Accipiter gentilis*)	C	SC	Documented breeder north and west of project; numerous PHS records from mountains north and west of project [T19N, R16E, Secs 21, 24, 28; T20N, R17E, Secs 6, 11, 14, 15]; coniferous and aspen forests	PHS 1989-1996
Golden eagle (*Aquila chrysaetos*)	C	-	Documented on site (6 observations in spring/ summer); No nest found	Erickson *et al.* 2002
Bald eagle (*Haliaeetus leucocephalus*)	T	T	Documented winter resident	Erickson *et al.* 2002
Merlin *(Falco columbarius*)	C	-	Possible breeder; one old PHS record from project area [T19N, R17E, Sec 8]	PHS 1981
Peregrine falcon (*Falco peregrinus*)	S	SC	Unlikely; most records in western WA; possible transient or migrant	Smith *et al.* 1997
Ferruginous hawk (*Buteo regalis*)	T	SC	Unlikely; most records in eastern WA in steppe zones; possible rare transient or migrant	Smith *et al.* 1997
Harlequin duck (*Histrionicus histrionicus*)	-	SC	Unlikely, occurs in fast flowing mountain rivers and streams; recorded in Kittitas Co. west of project	Smith *et al.* 1997
Spotted owl (*Strix occidentalis*)	E	T	Documented site centers north and west of project; PHS - T20N, R17E; T20N, R16E; T20N, R18E	PHS no date
Flammulated owl (*Otus flammeolus*)	C	-	Possible in forests nearby; unlikely in steppe habitats; recorded in Kittitas Co.	recorded in Kittitas Co.
Burrowing owl (*Athene cunicularia*)	-	SC	Unlikely due to species distribution in WA; possible in extreme eastern Kittitas Co.	Smith *et al.* 1997
Black tern (*Chlidonias niger*)	-	SC	Unlikely due to species distribution in WA; no records from Kittitas Co.	Smith *et al.* 1997
Pileated woodpecker (*Dryocopus pileatus*)	C	-	Possible in forests nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997
Black-backed woodpecker (*Picoides arcticus*)	C	-	Possible in forests/burns nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997
White-headed woodpecker (*Picoides albolarvatus*)	C	-	Possible in forests nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997
Lewis' woodpecker (*Melanerpes lewis*)	C	-	Possible in forests nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997

Table 3.4.5-1. A list of state and federally protected species potentially occurring within the KVP area.				
Species	**State Status**	**Federal Status**	**Occurrence**	**Documentation**
Vaux's swift (*Chaetura vauxi*)	C	-	Possible breeder; varied habitats below alpine habitats and excluding extensive steppe; recorded in Kittitas Co.	Smith *et al.* 1997
Olive-sided flycatcher (*Contopus borealis*)	-	SC	Possible breeder in forested habitats; recorded in Kittitas Co.	Smith *et al.* 1997
Willow flycatcher (*Empidonax traillii*)	-	SC	Possible breeder; moist forested areas, riparian habitats; recorded in Kittitas Co.	Smith *et al.* 1997
Sage thrasher (*Oreoscoptes montanus*)	C	-	Possible breeder; sagebrush shrublands; records from southern and eastern Kittitas Co.	Smith *et al.* 1997
Loggerhead shrike (*Lanius ludovicianus*)	C	SC	Possible breeder; shrub steppe, shrublands, agriculture, mixed habitats; recorded in Kittitas Co.	Smith *et al.* 1997
Sage sparrow (*Amphispiza belli*)	C	-	Possible breeder; sagebrush shrublands; records from southern and eastern Kittitas Co.	Smith *et al.* 1997
Mammals				
Gray wolf (*Canis lupus*)	E	E	Unlikely; unknown status in Washington but suitable habitat in North Kittitas Co., nearest PHS records from 1992 and 1993 from L.T. Murray State Wildlife Recreation Area southwest of I-90 [T19N, R16E, Sec 16, 34]	WDFW web page; WA GAP Analysis Project; PHS 1992-1993
Grizzly bear (*Ursus arctos*)	E	T	Unlikely; unknown status in Washington but suitable habitat in North Kittitas Co., one PHS record north of project [T20N, R17E, Sec 15]	WA GAP Analysis Project; PHS 1993
Wolverine (*Gulo gulo*)	C	SC	Unlikely; generally associated with northern coniferous forest; suitable habitat in western Kittitas Co.; PHS record from northeast of project [T20N, R18E, Sec 29]	WA GAP Analysis Project; PHS 1991
Fisher (*Martes pennanti*)	E	SC	Unlikely resident; associated with mature coniferous forests; suitable habitat in western Kittitas Co.	WA GAP Analysis Project
Western gray squirrel (*Sciurus griseus*)	T	SC	Unlikely resident; suitable habitat in northeast Kittitas Co.; PHS records from south of I-90 in L.T. Murray State Wildlife Recreation Area [T19N, R16E, Sec 35]	WA GAP Analysis Project; PHS 1997, 2000
White-tailed jackrabbit (*Lepus townsendii*)	C	-	Possible resident; grassland/ shrub habitats; recorded in northeast Kittitas Co.	WA GAP Analysis Project
Black-tailed jackrabbit	C	-	Possible resident; grassland/shrub	WA GAP Analysis

Table 3.4.5-1. A list of state and federally protected species potentially occurring within the KVP area.				
Species	**State Status**	**Federal Status**	**Occurrence**	**Documentation**
(*Lepus californicus*)			habitats; records from southeast Kittitas Co.	Project
Townsend's big-eared bat (*Coryhorhinus townsendii*)	C	SC	Unlikely resident; varied habitats but tends to prefer forested and riparian areas, hibernates in caves; no records from Kittitas Co.	WA GAP Analysis Project
Long-legged myotis (*Myotis evotis*)	-	SC	Unlikely due to habitat; coniferous and mixed forests, riparian areas; roosts caves, crevices, buildings, mines; potential habitat in western and northern Kittitas Co.	WA GAP Analysis Project
Long-eared myotis (*Myotis volans*)	-	SC	Unlikely due to habitat; primarily forested habitats and edges, juniper woodland, mixed conifers, riparian areas; roosts snags, crevices, bridges, buildings, mines; potential habitat in western and northern Kittitas Co.	WA GAP Analysis Project
Fringed myotis (*Myotis thysanodes*)	-	SC	Possible; varied habitats, forested or riparian habitats, shrublands; roosts buildings, trees; hibernates in mines and caves; potential habitat throughout eastern two-thirds of Kittitas Co.	WA GAP Analysis Project
Small-footed myotis (*Myotis ciliolabrum*)	-	SC	Possible; varied arid grasslands/ shrublands, mixed forests; roosts in crevices, cliffs; hibernates in caves, mines; records from eastern Kittias Co.	WA GAP Analysis Project
Yuma myotis (*Myotis yumanensis*)	-	SC	Possible resident; closely associated with water in varied habitats; no records from Kittitas Co.	WA GAP Analysis Project
Merriam's shrew (*Sorex merriami*)	C	-	Possible resident; sagebrush shrub and mesic grass/shrub habitats; records from southeast Kittitas Co.	WA GAP Analysis Project
Reptiles and Amphibians				
Striped whipsnake (*Masticophis taeniatus*)	C	-	Possible resident; occurs in grasslands, sagebrush, dry rocky canyons; records from eastern Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Sharptail Snake (*Contia tenuis)*	C	-	Likely resident; found in stable talus slopes, damp/moist habitats; forest edges; records from Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Larch Mountain Salamander (*Plethodon larselli*)	S	SC	Unlikely resident; found in lava talus slopes; recorded in western Kittitas Co.	WA GAP Analysis Project

Table 3.4.5-1. A list of state and federally protected species potentially occurring within the KVP area.

Species	State Status	Federal Status	Occurrence	Documentation
Western toad (*Bufo boreas*)	C	SC	Possible resident; occurs in spring pools, ponds, lake shallows, slow moving streams and uplands nearby; documented in Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Columbia spotted frog (*Rana luteiventris*)	C	SC	Likely resident; occurs in wetlands, marshy edges of ponds/lakes; documented throughout Kittitas Co.; two PHS records north of project T20N, R17E, Sec 22	WA GAP Analysis Project; Nussbaum *et al.* 1983; PHS 1992-1993
Cascades frog (*Rana cascadae*)	-	SC	Unlikely due to habitat; occurs in wet mountain meadows with ponds and potholes; records in western and northern Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983;
Red-legged frog (*Rana aurora*)	-	SC	Unlikely due to species range; moist forests, streams, and ponds; recorded in western Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Tailed frog (*Ascaphus truei*)	-	SC	Unlikely due to habitat; fast flowing permanent streams in forested areas; records in western and northern Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983;
Fish				
Chinook salmon (*Oncorhynchus tshawytscha*)	C	T	Yakima River and major tributaries; PHS record from Swauk Creek T20N, R17E and Yakima River T20N R16E	PHS 1997
Steelhead (*Oncorhynchus mykiss*)	C	T	Yakima River and major tributaries; PHS record from Swauk Creek T20N, R17E and Yakima River T20N R16E	PHS 1997
Bull trout (*Salvelinus confluentus*)	C	T	Yakima River and major tributaries; PHS records from Teanaway River and Yakima River T20N R16E	PHS 1997
Westslope cutthroat (*Oncorhynchus clarki lewisi*)	-	SC	Yakima River and major tributaries	no records located
Interior Redband trout (*Oncorhynchus mykiss gairdneri*)	-	SC	Yakima River and major tributaries	no records located
Mountain sucker (*Catostomus platyrhynchus*)	C	-	Yakima River and major tributaries; PHS record from Teanaway River north west of project [T20N, R16E, Sec 25]	PHS 1994
Pacific lamprey (*Lampetra tridentate*)	-	SC	Yakima River and major tributaries	no records located

E=Endangered, T=Threatened, C=Candidate, S = Sensitive, SC=Species of Concern

3.4.5.2 Potential Impacts to Threatened and Endangered Species

The Project area occurs within the potential range of 21 bird, 14 mammal, eight reptile and amphibian and six fish species which are of interest based on designations made under the State of Washington or Federal Endangered Species Act, or which are species of concern because of declining numbers (See Table 3.4.5-1). Several of these species are unlikely to occur within the Project area due to limited habitat or occurrence on the periphery of the known species distributions. These species are not likely to occur within the project area and the Project should have no effect on them. A total of 10 state and Federal sensitive, threatened, candidate and monitor species were observed during 2002 wildlife surveys at the Project site, these are listed in Table 3.4.5-2.

Table 3.4.5-2

A summary of State and Federal sensitive species and State Monitor species observed during 2002 wildlife surveys at the Project site.

Bald eagle	***State and Federally Threatened*** – Average of 5.6 bald eagles per winter driving survey, with a maximum survey day count of 12 (3/11/02). Winter use relatively high compared to other wind projects, but mostly along Yakima river. No bald eagle fatalities documented at any U.S. wind project.
Golden eagle	***State Candidate*** –Six observations during fixed-point surveys, six during in-transit surveys. Much lower use at KVP (0.02-0.05 per 20-minute survey) compared to Foote Creek Rim (WY) (0.2 – 0.3 per 20-minute survey) and Altamont Pass (CA) (0.2-0.3 per 20-minute survey). One golden eagle was killed during two years of monitoring at the Foote Creek Rim Phase I and II facility.
Merlin	***State Candidate*** – Two observations during spring and summer surveys. Occasional merlin observations have been recorded at several wind projects. No fatalities have been reported at U.S. wind projects.
Lewis's woodpecker	***State Candidate*** **–** One observation. Observed as a fatality at Vansycle in 1999.
Loggerhead shrike	***State Candidate and Federal Species of Concern*** – Not observed during spring and summer avian use surveys. One observation during winter bald eagle surveys as well as two unidentified shrike observations. One fatality observed each at Altamont Pass and Tehachapi Pass (CA).
Long-billed curlew	***State Monitor***[b] **–** One observation. Also observed occasionally at Stateline. No fatalities documented at any U.S. wind projects.
Turkey vulture	***State Monitor*** – Twenty-five observations during fixed-point surveys, 31 during in-transit surveys. A few fatalities observed at U.S. wind projects, but apparently not very susceptible to collision due to foraging/scavenging behavior.
Prairie falcon	***State Monitor*** – Five observations during the spring. Observed occasionally at most wind projects. One fatality documented at Foote Creek Rim (WY), two at Altamont Pass (CA), one at Montezuma Hills and one at Tehachapi Pass (CA).
Gyrfalcon	***State Monitor*** **–** One observation during winter bald eagle surveys. No fatalities documented at U.S. wind projects.
Osprey	***State Monitor*** **–** One observation during fixed-point surveys, one in-transit. No fatalities documented at U.S. wind projects.

3.4.5.2.1 Critical Habitat

Critical habitat for threatened or endangered species is defined by the Endangered Species Act as specific area(s) within the geographical range of a species where physical or biological features are found that are essential to the conservation of the species and which may require special management consideration or protection. Critical habitat is specific geographic area designated by the USFWS for a particular species.

Under the ESA, it is unlawful to adversely modify designated critical habitat. According to the USFWS letter, there is no critical habitat as defined by the ESA for threatened or endangered species that may be affected by the Project. Therefore, construction, maintenance, and operation of the proposed Project will not adversely modify critical habitat for endangered or threatened species.

3.4.5.2.2 No Effect

For most of the species identified, the Project should have no effect. Resource investigations indicated that gray wolf, bull trout, northern spotted owl, and Ute ladies'-tresses orchid are not likely to occur or only accidentally occur in the Project area and that essential habitat for some of these species is lacking within the Project area.

3.4.5.2.3 Birds

Bald eagle and northern spotted owl are the only bird species listed under the Endangered Species Act that may potentially occur within the Project area.

Bald eagle is documented wintering, but not breeding, within the Project area. To date, there have been no bald eagle fatalities documented at other wind plants in the U.S. (see Erickson et al., 2001). Few bald eagles were observed within the Project area during surveys, rather most bald eagles were observed along the Yakima River and in areas where cattle are pastured. While use of the Project site by bald eagles does occur, it is relatively low compared to adjacent areas along the Yakima River and appears to be related to the presence of livestock or wildlife carcasses (carrion), which they utilize for forage.

During Project construction the possibility of mortality effects to bald eagles is considered negligible and very unlikely to occur. Bald eagles in the area during the construction period are unlikely to occur within the construction zones due to disturbances and therefore unlikely to be at risk of construction related mortality. In addition, the majority of construction is likely to take place during late spring, summer and fall months when bald eagles very rarely or do not occur in the area.

During Project operations, based on the available information about bald eagle use of the site, potential bald eagle mortality due to operation of the wind plant will confined to the winter and early spring seasons. Bald eagles will not be at risk from the wind plant in the summer or fall. Bald eagles are not expected to frequently occur within the wind plant and operation of the wind plant should have minimal disturbance on bald eagles. Additionally, proposed mitigation measures are intended to further reduce the possibility of disturbance or displacement.

Although the risk is low, the potential exists for bald eagle fatalities during operation of the Project. The status of bald eagle in the Project area and range wide is not expected to change due to the Project. Bald eagle populations appear to be generally increasing and the USFWS has proposed the species for delisting (USFWS, 1999). The bald eagle populations in Washington and throughout North America will continue to increase during and after the Project is constructed. Exhibit 12, 'Biological Assessment of Endangered, Threatened, Proposed and Candidate Species', contains a detailed analysis of potential impacts to bald eagles.

Northern spotted owl site centers and associated territory buffers are mapped by the WDFW approximately ½ mile to the north of the Project area. Spotted owls occur almost exclusively within forested environments. The Project area is located within the transition zone between forest and grassland. No nesting habitat is present within the Project area. Although possible, it is unlikely that spotted owls will hunt within or disperse through the Project area. The Project is not expected to impact the northern spotted owl.

Northern goshawks are documented as breeding within the National Forest a few miles from the Project. Although the Project area does not contain suitable nesting habitat for northern goshawks, the species may occasionally occur within the Project area while hunting or migrating. This is expected to be a very rare occurrence, as no goshawks were observed during surveys within the Project area. The proposed Project is not expected to affect northern goshawks.

One historic record of a breeding merlin is present within the Project area, and two merlins were observed during avian use surveys. No merlin fatalities have been documented at other wind plants and considering the low use of the Project area by merlins, the Proposed project is not expected to impact merlins in the area.

3.4.5.2.4 Mammals

The Project occurs within the potential range of several species of federally and state protected mammals, which are unlikely to occur within the Project area due to habitat constraints and/or uncertain population status in Washington. These species include gray wolf, grizzly bear, wolverine, fisher, western gray squirrel, Townsend's big-eared bat, long-legged myotis, and long-eared myotis. These species are not expected to occur within the Project area and no impacts to these species are likely to occur.

Both the white-tailed and black-tailed jackrabbits have been documented within Kittitas County, and suitable habitat for these species is present in the Project area. Assuming these species are present in the Project area, the potential exists for individuals to be killed by vehicles on roads, and some suitable habitat for these species will be lost to turbine pads and road construction. Limits on vehicle speeds within the Project will minimize the potential for road kills, and the permanent loss of suitable habitat is relatively small. Overall, impacts to these species should be minimal.

Suitable habitat for three bat species, which are listed as federal species of concern, is present within the Project area: fringed myotis, small-footed myotis and Yuma myotis. However, only general descriptions of habitat requirements and potential distribution are available for the three species. Very little is known concerning the ecology of the three species, making it even more difficult to accurately predict potential impacts to these species. To date, we are unaware of any documented fatalities of these species at wind projects within the U.S.

Merriam's shrew has been documented within Kittitas County, and suitable habitat for the species occurs within the Project area. Assuming the species is present within the Project area, the construction of turbine pads and roads, and vehicle traffic has the potential to crush individuals within burrows or moving about above ground. Overall, total impacts to habitat are small and no significant impacts to the species are expected to occur as a result of this Project.

3.4.5.2.5 Reptiles and Amphibians

Two species of amphibians have been documented in the study area by the WDFW, including tailed frog and Columbia spotted frog. Field surveys conducted for the Project did not specifically target reptiles or amphibians. Reptiles observed during the field studies included rubber boa, Great Basin gopher snake, Northern Pacific rattlesnake, and short-horned lizard. One amphibian chorus was heard during the spring at a distance of over 300 meters, and is likely one of the true frog species (e.g., Cascade frog). Spotted frogs and red-legged frogs have auditory calls that typically don't carry over 30 meters, and the northern leopard frog is not known to occur in Kittitas county. Up to 25 additional species of reptiles and amphibians occur in Kittitas county and could possibly be present in the Project area, including the striped whipsnake, sharptail snake, and western toad. There is very little suitable habitat for amphibians or aquatic reptiles (e.g., turtles) in the study area. Two Pygmy short-horned lizards were present at points I & C in August.

Construction of the Project may affect reptiles on site through loss of habitat and direct mortality of individuals occurring in construction zones. The level of mortality associated with construction would be based on the abundance of the species on site. Some mortality may be expected as common reptiles such as short-horned lizards and yellow-bellied racers often retreat to burrows underground for cover or during periods of winter dormancy. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. While above ground, yellow-bellied racers and other snakes are generally mobile enough to escape construction equipment, however, short-horned lizards do not move fast over long distances and rely heavily on camouflage for predator avoidance. Some individual lizard fatalities can be expected from vehicle activity.

Once operational, the wind Project is not expected to substantially impact reptiles. Operations and maintenance activities may occasionally result in a road killed snake or lizard, however, this is expected to be a rare occurrence due to the limited nature of traffic expected within the Project area.

3.4.5.2.6 Threatened and Endangered Plant Species

The proposed Project, as mitigated, is not expected to have direct impacts on any federal or state listed species. The limited direct impacts to white-margined knotweed (a Washington 'Review' species) are not expected to significantly impact the local population. In addition, the mitigated project is not expected to produce significant indirect impacts (resulting from noxious weed increases or fire frequency changes) to local populations of any plant species of concern.

3.4.6 Wildlife Migration

3.4.6.1 Current Migration in Project Location

The proposed Project site does not currently support large congregations of mule deer or elk but is within area considered winter range for these species (WDFW, PHS database 2002). The Project falls within portions of the Lauderdale, Ellensburg, and Highway 10 Mule Deer Wintering Areas and the Lookout Mountain Elk Winter Area. During the winter months there is an influx of mule deer and elk moving from the surrounding mountains to the west and north to these winter areas. Based on the information in the WDFW PHS database, it is estimated that between 200 and 400 mule deer and 50 elk winter in these areas. No distinct migration routes have been identified within the Project area. The Quilomene Elk Migration Corridor is located north and east of the Project area (WDFW, PHS database). It is likely that wintering mule deer and elk simply move in from surrounding areas through undeveloped tracts of land.

Reptiles and amphibians are present in the Project area and may be concentrated in areas of suitable habitat (e.g., wetlands). No migration corridors for reptiles or amphibians are known to be present in the Project area. Many amphibians migrate short distances during spring or fall breeding periods to and from suitable wetlands and during fall dispersal of juveniles.

The Project area is located within the Pacific Flyway, one of four principal north-south bird migration routes in North America. Bounded roughly by the Pacific Ocean and the Rocky Mountains, the Pacific Flyway extends from the arctic regions of Alaska and Canada to Central and South America. Within the flyway, certain groups of birds may travel along narrower migration corridors, with more well defined paths.

The Project's location along the east flank of the Cascades places it within possible migration corridors of several bird species and the Yakima River riparian corridor south of the project may also be used by migrating songbirds. The river provides a distinct geographic visual cue to migrating birds and provides resting habitat for waterfowl. Riparian habitat along the river provides resting and foraging habitat for songbirds and raptors.

Passerine use (# observations/20 minute survey) for the Project Site was highest in the spring and fall compared to summer, suggesting some migrant use during the migration seasons (Table 3.4.6-1). Overall raptor use was relatively similar in the spring and summer periods, and slightly lower in the fall. Accipiter use (primarily sharp-shinned hawks) was highest in the spring, likely due to migrant hawks returning or passing through from wintering grounds.

Table 3.4.6-1

Species/Group	**Mean Use (#/20 minute survey)**			**Group Composition (%)**			**% Frequency**		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Waterfowl	0.25	0.03	0.00	1.7	0.3	0.0	4.5	2.1	0.0
Waterbirds	0.02	0.00	0.00	0.2	0.0	0.0	1.1	0.0	0.0
Shorebirds	0.09	0.07	0.04	0.6	0.8	0.3	6.8	2.0	2.0
Accipiters	0.11	0.01	0.07	0.8	0.1	0.6	10.2	1.0	6.1
Buteos	0.39	0.38	0.40	2.6	4.1	3.3	28.7	31.7	28.0
Northern Harriers	0.01	0.00	0.17	0.1	0.0	1.4	1.1	0.0	16.5
Eagles	0.11	0.02	0.01	0.7	0.2	0.1	8.4	1.0	1.0
Large Falcons	0.06	0.00	0.00	0.4	0.0	0.0	5.7	0.0	0.0
Small Falcons	0.24	0.45	0.06	1.6	4.9	0.5	19.3	40.5	4.0
Other – Raptor	0.09	0.17	0.02	0.6	1.9	0.2	8.0	16.2	2.0
Raptors Subtotal	1.01	1.03	0.73	6.7	11.2	6.0	62.8	59.1	47.6
Corvids	1.04	0.21	0.78	6.9	2.2	6.4	38.5	16.4	39.8
Passerines	12.48	7.55	10.40	82.5	82.3	85.3	80.0	97.0	73.6
Other Birds	0.11	0.21	0.13	0.8	2.3	1.1	10.2	11.2	12.1
Gamebirds	0.11	0.03	0.08	0.8	0.3	0.7	5.7	1.0	3.0
Doves/Pigeons	0.01	0.04	0.03	0.1	0.4	0.3	1.1	3.0	3.4

Subtotal	15.14	9.16	12.20		

Waterfowl were occasionally observed during the wildlife baseline study within the Project Site including Canada geese (142 observations, 5 groups), mallards (29 observations, 6 groups), greater white-fronted geese (10 observations, 1 group), blue-winged teal (3 observations, 1 group), and one unidentified waterfowl group (7 observations, 1 group). Waterfowl use is expected to be higher south of the Project near the Yakima River. Some waterfowl use can be expected in ponds along the Dry Creek drainage and along Swauk Creek to the west of the Project (WDFW 2002).

Some species of bats may also migrate through the Project area. At least two species of bats, hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasonycteris noctivagans*), are known to migrate through Washington and other species such as little brown bat (*Myotis lucifugus*) and big brown bat (*Eptesicus fuscus*) may make localized short distance migrations to suitable hibernacula sites (e.g, caves, mines). Bats typically migrate at night, and are most frequently observed migrating during August and mid-September.

3.4.6.2 Predicted Migration Impacts

No impacts are expected from the Project to big game or reptile and amphibian movement or migration. The Quilomene Elk migration corridor is outside the Project area and no Project features or construction will occur within the area identified as this migration corridor. Additionally, no wetlands will be affected which could impede amphibian movements.

Migrant birds and bats may be at risk of collision with turbines in the Project. Passerines have been the most abundant avian fatality at some other wind projects studied (see Johnson *et al.*, 2000; Young *et al.,* 2001; Erickson *et al.,* 2000), often comprising more than 80% of the avian fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines make up the vast majority of the avian observations on-site, passerines would likely make up the largest proportion of fatalities. Common species such as horned larks and western meadowlarks (confirmed casualties at other wind plants) would be most at risk. Nocturnal migrating species may also be affected, but would not be expected to be found in large numbers based on data collected at other projects (i.e., no large mortality events documented, see Erickson *et al.* 2001). Estimates of the percentage of bird fatalities that are migrants have ranged from approximately 30% at the Wisconsin wind plant to 60% at Buffalo Ridge, Minnesota (Erickson *et al.*, 2001). Estimates of total bird mortality at other wind plants have ranged from approximately 0.6 birds per turbine per year at the Vansycle wind plant in Oregon to 2.8 birds per turbine per year at the Buffalo Ridge wind plant in Minnesota (Erickson *et al.,* 2001). Provided 120 turbines are constructed at the proposed project, approximately 50-300 birds may be killed at the wind plant annually. The number of these that would be expected to be migrants would vary from approximately 30-180 birds.

Migrant bats, and in particular hoary bats and silver-haired bats, have been documented fatalities at other wind plants. Bat mortality at wind plants is highly seasonal, occurring primarily during the fall migration season (August – mid September). At the Buffalo Ridge Wind Plant, based on a 2-year study, bat mortality was estimated to be 2.05 bats per turbine per year (Johnson *et al.,* 2000b). At the Foote Creek Rim Wind Plant, based on 2 years of study, bat mortality was estimated at 1.51 bats per turbine per year (Young *et al.,* 2001). At the Vansycle Ridge Wind Plant in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson *et al.,* 2000). Provided 121 turbines are constructed, approximately 80-250 bats may be killed at the wind plant annually. Based on the species composition of bats at the other wind plants studied, nearly all of these would be expected to be migrants.

3.4.7 Potential Effects of Decommissioning and/or Cessation of Project

A more detailed discussion of decommissioning and site restoration plans is provided in Section 7.3, 'Initial Site Restoration Plan'.

3.4.7.1 Vegetation

Impacts from decommissioning the project would be similar but lower than those for construction, assuming that all access roads remained in place. Decommissioning vehicles would travel on established roadways, which would not impact vegetation. Vegetation around Project facilities to be removed would likely be impacted to the same extent as described for construction.

All facilities would be removed to a depth of 3 feet below grade and the soil surface would be restored as close as possible to its original condition, or to match the current land use. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area would be reclaimed, and would likely include regrading, adding topsoil, and revegetating disturbed areas.

3.4.7.2 Wildlife

Impacts from decommissioning the proposed Project would be lower than those for construction, assuming that all access roads remain in place. Vehicles would travel on established roadways which would not impact habitat for special status species. Dismantling the project would eliminate avian mortality caused by the presence of wind turbines. Wildlife habitat would have the potential to return to pre-project conditions over time, therefore impacts from decommissioning would be low. Mitigation for impacts to wildlife would follow procedures in use at the time of decommissioning.

3.4.8 Proposed Mitigation Measures for Potential Impacts to Plants and Animals

The potential direct impacts to plants and animals from the Project can be grouped into two main categories, loss of habitat from construction and operation of the Project, and potential mortality to individual birds or other animals from construction and operation of the Project. The loss of habitat associated with the Project can be further broken down into "temporary" and "permanent" habitat impacts. "Temporary" impacts are those arising from ground disturbance necessary for the construction of Project infrastructure but that will be not be permanently occupied once construction is complete. Examples include trenches for underground electrical collector cables, construction staging areas, etc. These areas will be disturbed during the construction period but will be replanted and restored after construction is finished. The vast majority (approximately 75%) of the total area impacted by construction of the Project will only be temporarily disturbed (i.e. for less than one year.) The remainder, (approximately 25%) will continue to be occupied by the Project, such as string roads, turbine foundation pads, Project substation and the O&M facility. These are considered "permanent" impacts for the purpose of this analysis.

Potential indirect impacts to plants and animals are more diffuse and could be caused by habitat fragmentation, wildlife disturbance or avoidance of the Project site, and introduction of noxious weeds and/or wildfire.

A comprehensive mitigation package for plants and animals is proposed for this Project. It consists of several categories of actions, including:

- Thorough study and analysis to avoid impacts;
- Project design features to minimize impacts;
- Construction techniques and (Best Management Practices) BMPs to minimize impacts;
- Post-construction restoration of temporarily disturbed areas;
- Operational BMPs to minimize impacts;
- Monitoring and adaptive management to minimize impacts during operations; and
- Acquisition and enhancement of on-site habitat Acquisition and enhancement of a large, contiguous on-site area of good quality habitat that faces immediate threat of development.

3.4.7.1 Thorough study and analysis to avoid impacts

The Applicant has commissioned extensive studies by qualified biologists of plants and animals at the Project site to avoid impacts to sensitive populations. These studies, results of which are included as Exhibits 8 - 12 include:

- Rare plant surveys;
- Habitat mapping;
- Avian use point count surveys;
- Aerial raptor nest surveys;
- Wintering bald eagle surveys;
- Non-avian wildlife surveys; and
- Biological assessment for threatened and endangered species.

The results and recommendations of these studies have been incorporated into the proposed design, construction, operation and mitigation for the Project. In the event that the final Project layout includes areas that contain habitat suitable for rare plants which have not previously been surveyed for rare plants, an additional rare plant survey will be conducted at the appropriate time in 2003.

3.4.7.2 Project design features to avoid and/or minimize impacts

The proposed design of the Project incorporates numerous features to avoid and/or minimize impacts to plants and wildlife. These features are based on site surveys, experience at other wind power projects, and recommendations from consultants performing studies at the site. Features of the Project that are designed to avoid or minimize impacts to plants and animals include the following:

- Avoidance of construction in sensitive areas such as riparian zones, wetlands, forests, etc.;
- Minimization of new road construction by improving and using existing roads and trails instead of construction new roads;

- Choice of underground (vs. overhead) electrical lines wherever feasible to minimize perching locations and electrocution hazards to birds;
- Choice of turbines with low RPM and use of tubular towers to minimize risk of bird collision with turbine blades and towers;
- Use of bird flight diverters on guyed permanent meteorological towers or use of unguyed permanent meteorological towers to minimize potential for avian collisions with guy wires;
- Equipping all overhead power lines with raptor perch guards to minimize risks to raptors; and
- Spacing of all overhead power line conductors to minimize potential for raptor electrocution.

3.4.7.3 Construction techniques and BMPs to minimize impacts

Construction of the Project has the potential to impact both habitat and wildlife in a variety of ways. The Applicant proposes the use of construction techniques and Best Management Practices (BMPs) to minimize these potential impacts. These include the following:

- Use of BMPs to minimize construction-related surface water runoff and soil erosion (these are described in detail in Section 2.10 Surface Water Runoff;
- Use of certified "weed free" straw bales during construction to avoid introduction of noxious or invasive weeds;
- Flagging of any sensitive habitat areas (e.g. raptor nests, wetlands, etc.) near proposed areas of construction activity and designation of such areas as "off limits" to all construction personnel;
- Development and implementation of a fire control plan, in coordination with local fire districts, to minimize risk of accidental fire during construction and respond effectively to any fire that does occur;
- Establishment and enforcement of reasonable driving speed limits during construction to minimize potential for road kills;
- Proper storage and management of all wastes generated during construction;
- Require construction personnel to avoid driving over or otherwise disturbing areas outside the designated construction areas;
- Monitoring of raptor nests on site for activity prior to construction and modify construction timing and activities to avoid impacts to nesting raptors; and
- Designation of an environmental monitor during construction to monitor construction activities and ensure compliance with mitigation measures.

3.4.7.4 Post-Construction Restoration of Temporarily Disturbed Areas

All temporarily disturbed areas will be reseeded with an appropriate mix of native plant species as soon as possible after construction is completed to accelerate the revegetation of these areas and to the prevent spread of noxious weeds. The Applicant will consult with Washington Department of Fish and Wildlife regarding the appropriate seed mixes for the Project area.

3.4.7.5 Operational BMPs to Minimize Impacts

During Project operations, appropriate operational BMPs will be implemented to minimize impacts to plants and animals. These include the following:

- Implementation of a fire control plan, in coordination with local fire districts, to avoid accidental wildfires and respond effectively to any fire that might occur;

- Establishment and enforcement of reasonable driving speed limits during construction to minimize potential for road kills;
- Operational BMPs to minimize storm water runoff and soil erosion;
- Implementation of an effective noxious weed control program, in coordination with the Kittitas County Noxious Weed Control Board, to control the spread and prevent the introduction of noxious weeds;
- Identification and removal of all carcasses of livestock, big game, etc. from within the Project that may attract foraging bald eagles or other raptors.

3.4.7.6 Monitoring and Adaptive Management to Minimize Impacts During Operations

The Applicant plans to convene a Technical Advisory Committee (TAC) to evaluate the mitigation and monitoring program and determine the need for further studies or mitigation measures. The TAC will be composed of representatives from Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Kittitas County, local interest groups (e.g., Kittitas Audubon Society), Project landowners, and the Applicant. The role of the TAC will be to coordinate appropriate mitigation measures, monitor impacts to wildlife and habitat, and address issues that arise regarding wildlife impacts during construction and operation of the wind plant. The post-construction monitoring plan should be developed in coordination with the TAC.

The Applicant proposes to develop a post construction monitoring plan for the Project to quantify impacts to avian species and to assess the adequacy of mitigation measures implemented and the possible need for additional measures. The monitoring plan will include the following components: 1) fatality monitoring involving standardized carcass searches, scavenger removal trials, searcher efficiency trials, and reporting of incidental fatalities by maintenance personnel and others; and 2) a minimum of one breeding season raptor nest survey of the study area and a 1 mile buffer to locate and monitoring active raptor nests potentially affected by the construction and operation of the wind plant.

The protocol for the fatality monitoring study will be similar to protocols used at the Vansycle Wind Plant in northeastern Oregon (Erickson *et al.,* 2000) and the Stateline Wind Plant in Washington and Oregon (FPL *et al.,* 2001).

3.4.7.7 Acquisition and Enhancement of On-site Habitat

In addition to all of the mitigation measures described above, the Applicant proposes to purchase and protect, for the life of the Project, a large area of habitat on-site. This privately owned parcel, which is located in Sections 22 and 27, Township 19 North, Range 17 East, and is adjacent to land owned by the Washington DNR, is currently under immediate threat of development. The parcel had been on the market for at least one year prior to the Applicant negotiating a purchase option with the current owner. The current owner has had active negotiations with and has received offers from developers to purchase this land and convert it to rural residential development.

The Applicant proposes to purchase this parcel and implement measures to enhance its value as habitat. The Applicant proposes to protect and restore a minimum of 1.5 acres of replacement habitat for every acre of habitat permanently disturbed the Project and a minimum of 0.5 acres of replacement habitat for every acre of habitat temporarily disturbed by Project construction. These proposed replacement ratios are consistent with, or higher than, replacement ratios that have been implemented at other wind power projects in Washington State.

3.4.7.8 Description of Proposed Mitigation Parcel

This proposed mitigation parcel consists of portions of two broad-topped north south trending ridges, with an unnamed creek and associated canyon running between them. A detailed description of this parcel written by a qualified plant ecologist is provided in Exhibit 10, 'Mitigation Parcel Description'. Within the parcel, five different cover types have been mapped. The largest of these is the Shrub-Steppe type, with a total area extent of 351 acres (or 64% of the parcel). These are areas dominated by tall shrubs, primarily bitterbrush (*Purshia tridentata*), containing an understory of native bunchgrasses (or in disturbed areas cheatgrass [*Bromus tectorum*]). The category was further broken down based on the relative spatial density of the shrub layer (Dense, Moderate, and Sparse sub-categories). Within the parcel, 278 acres (50% of the parcel) were categorized as Moderately Dense Shrub-Steppe, and 74 acres (13% of the parcel) were classed as Sparse Shrub-Steppe.

The majority of the remaining ground (189 acres or 34% of the parcel) was classed as Grassland habitat. This cover type includes a variety of plant associations, all dominated by grass species. In most cases these are bunchgrasses, such as Sandberg's bluegrass (*Poa secunda*) or bluebunch wheatgrass (*Pseudoroegnaria spicata*), but disturbed areas are sometimes dominated by cheatgrass or bulbous bluegrass (*Poa bulbosa*). The majority of the grassland habitat, is located on the westernmost ridgetop, and is likely the result of a recent fire that has removed most of the shrub component. The habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs.

Two cover types are exclusively associated with the unnamed creek that runs through the middle of the parcel. The largest of these is the Riparian Tree category which is present on approximately eight acres (1.5%) of the parcel. This cover type includes areas within riparian zones dominated by trees. Primarily this includes hydrophytic species such as cottonwoods (*Populus balsamifera* ssp. *trichocarpa*), but scattered conifers are also present in some areas. In addition, one 2.8 acre area (0.5% of the parcel) above the creek was typed as Deciduous Scrub Thicket. This cover type describes upland areas dominated by deciduous shrubs. Typical shrub species for this cover type include chokecherry (*Prunus virginiana*), bittercherry (*Prunus emarginata*), oceanspray (*Holodiscus discolor*), common snowberry (*Symphoricarpos albus*), and serviceberry (*Amelanchier alnifolia*).

3.4.7.9 Current Habitat Condition of Proposed Mitigation Parcel

A thorough discussion of current habitat conditions on this parcel written by a qualified plant ecologist is provided in Exhibit 10, 'Mitigation Parcel Description'. In the habitat descriptions that follow, ratings of habitat quality are based on general observed patterns of plant species diversity, native versus non-native species ratios, and overall vegetative structure. The following categories were used: 'Excellent' (high species diversity with negligible amounts of non-native weedy species, along with well developed native vegetative structure); 'Good' (moderate to high species diversity dominated by native plants, with significant inclusions of non-native species in certain areas, and fair to well-developed native vegetative structure); 'Fair' (moderate diversity with non-native species dominance or co-dominance in some or all layers, and fair native structure); and 'Poor' (low species diversity, dominated by non-native, weedy invaders in some or all layers, and poor native vegetative structure).

The eastern ridgetop contains primarily shrub-steppe habitat in fair to good condition (Photo 3.4.7-1). Native shrubs (primarily bitterbrush) and forbs dominate most of this area, with a mixture of native and non-native grasses. Areas along the jeep trails and canal road contain a higher percentage of non-native species. There are also several small inclusions of lithosol (shallowsoiled) habitat on this ridge (Photo 3.4.7-2). These are in good condition, dominated by native bunchgrasses (primarily Sandberg's bluegrass), as well as native forbs and low shrubs.

The western ridgetop has recently burned. The habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs (Photo 3.4.7-3). Habitat quality is generally fair. Weedy species are more common in the deeper-soiled areas, and several populations of noxious weeds are present. Further up the ridgeline, there is an unburned portion that is similar in condition to the eastern ridgetop (*i.e.* fair to good condition dominated by native shrubs and forbs, and a mix of native and non-native grasses).

The creek bottom ranges in habitat quality along its length. The upper portions are in poor to fair condition, with little development of riparian vegetation (Photo 3.4.7-4). Non-native species are common in these upper portions, although native species still dominate in areas. The creek appears to be intermittent in this upper section. Lower down, the creek bottom is in fair to good condition. Riparian vegetation is better developed and the creek flows late into the summer (Photos 3.4.7-5 and 3.4.7-6). Riparian trees and shrubs are present along this lower reach, and in places are dense and well developed.

Figure 3.4.7-1Shrub-Steppe Habitat Along the Eastern Ridgetop

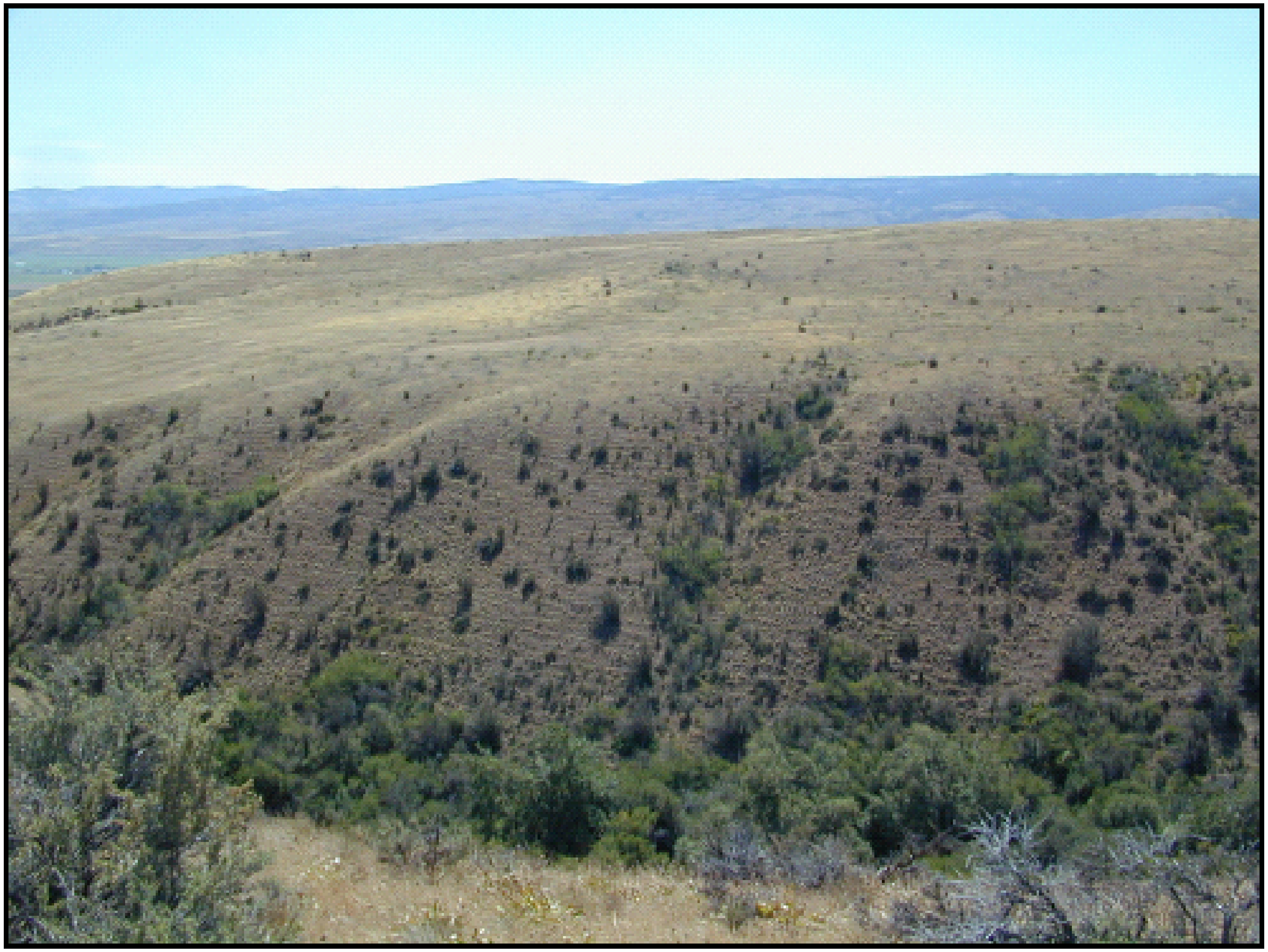
Figure 3.4.7-2 Lithosol Habitat Along the Eastern Ridgetop

Figure 3.4.7-3 Recently Burned Habitat Along the Western Ridgetop

Figure 3.4.7-4 Creek Bottom in Upper Portion of Parcel

Figure 3.4.7-5 Creek Bottom in Lower Portion of Parcel (Canal Road in Foreground)

Figure 3.4.7-6 Overview of Creek in Lower Portion of Parcel (Western Ridge in Background)



3.4.7.10 Proposed Habitat Enhancement Measures

Overall, the parcel is in fair to good condition. However, several opportunities for enhancement exist that would be expected to raise habitat quality further. Primary among these is management and control of cattle grazing within the entire parcel, and especially within the riparian zone. A grazing management plan could be developed that reduces or eliminates cattle pressure on the most sensitive portions, and allows for reestablishment of native vegetation in specific problem areas.

Although high concentrations of noxious weeds were not found within the parcel, scattered patches and individuals (primarily diffuse knapweed [*Centaurea diffusa*]) are present throughout. An overall noxious weed control effort for the parcel, developed in coordination with the Kittitas County Noxious Weed Control Board, would likely be effective at reducing or eliminating noxious weeds from the site, increasing the habitat quality and effectiveness.

3.5 ENERGY AND NATURAL RESOURCES

WAC 463-42-342 Natural environment – Energy and natural resources.

***Amount required/rate of use/efficiency** – The applicant shall describe the energy and natural resource consumption during both construction and operation of the proposed facilities as rate of use and efficiency that can be achieved during construction and operation.*

***(2) Source/availability** – The applicant shall describe the sources of supply, locations of use, types, amounts, and availability of energy or resources to be used or consumed during construction and operation of the facility.*

***(3) Nonrenewable resources** – The applicant shall describe all nonrenewable resources that will be used, made inaccessible or unusable by construction and operation of the facility.*

***(4) Conservation and renewable resources** – The applicant shall describe conservation measures and/or renewable resources which will or could be used during construction and operation of the facility.*

3.5.1 Introduction

The Project will consume limited amounts of energy and natural resources primarily during construction. Operation of the Project will consume very limited amounts of natural resources, as the wind turbine generators will use wind, an abundant, naturally occurring renewable resource, to generate electricity. By using wind, rather than non-renewable fossil fuels, to generate electricity, operation of the Project will help reduce overall consumption of non-renewable natural resources.

Numerous independent life cycle analyses of wind power projects have shown that wind farms have a very high "energy payback" (ratio of energy produced compared to energy expended in construction and operation), and that wind's energy payback is higher than that of thermal power plants. Several studies have found that it generally takes less than six months of operation for a wind farm to produce the total amount of energy used to construct the equipment and build the project. (Energy Center of Wisconsin, 1999; Grum-Schwensen, 1990; G. Hagedorn et al, 1991; Gydesen. D et al, 1990.)

The consumption of energy and material quantities of consumables involves the:

- The consumption of electricity and natural resources to produce the durable equipment and construction supplies used to build the Project;
- The consumption of electricity during construction and operation;
- The consumption of gasoline and diesel oil for motor vehicles during construction and operations; and
- The consumption of lubricating oil, greases, and hydraulic fluids for operating Project equipment controls and for providing lubrication of moving parts in wind turbine generators.

3.5.2 Energy and Other Natural Resource Consumption

3.5.2.1 Consumption of Energy and Natural Resources During Construction

The main categories and approximate amounts of energy and consumables used during construction are expected to be as follows:

- 25,000 gallons of fuel (diesel and gasoline) for mobile construction equipment.
- 11,000 tons of steel for turbine towers
- 2,000 tons of steel for tower foundation reinforcement
- 30,000 yards of gravel (aggregate) for roads and crane pads
- 30,000 yards of concrete for turbine foundations
- 5 million gallons of water for road compaction, dust control, wetting concrete, etc. assuming plain water is used for dust control, or 2 million gallons of water if lignin or other dust palliative is used (see Section 3.2.4, 'Dust' and Section 3.3.7 'Water Use')

3.5.2.2 Sources of Natural Resources Used During Construction

The source of fuel for construction equipment and vehicles will be existing, licensed fuel distributors or gas stations, as described in Section 2.9, 'Spill Prevention'. Water for construction will be obtained from a local source with a valid water right, as described in Section 3.3.7, 'Water Use'. Concrete will be purchased from existing suppliers located near the Project site. Aggregate will be obtained from existing, permitted local quarries. Several gravel pits and quarries are located near the Project site in Kittitas County. Electricity for construction use will be generated using portable generators.

3.5.2.3 Consumption of Energy and Natural Resources During Operations

Operation of the Project will consume very limited amounts of energy and non-renewable natural resources. Energy will be generated using the kinetic energy in wind, transformed by the wind turbine generators into useful electricity. Types and quantities of energy and natural resources consumed during operations will primarily consist of the following:

- Fuel for O&M vehicles,
  - Annual consumption is expected to be about 8,500 gallons
- Lubricating oils, greases and hydraulic fluids for the wind turbine generators
  - Minor quantities, as described in Section 2.9.2.2, 'Spill Prevention – Operations'
- Electricity for Project operations
  - Estimated to be less than 600 kWh/WTG/month, or about 0.1% of Project energy generation
- Water for domestic use at the O&M facility and periodic maintenance of turbine blades
  - Estimated to be less than 1,000 gallons/day (see Section 3.3.7 'Water Use')

Sources of Energy and Natural Resources Used During Operations

Fuel used for O&M vehicles will be purchased from local gas stations. Lubricating oils and hydraulic fluids used for wind turbine generator maintenance will be purchased from distributors of such materials. The final selection of these distributors will depend on the specific turbine model chosen for the Project. Electricity for Project operations will mostly be generated by the Project itself, during periods when the wind turbines are not generating power, it will be purchased from the regional utility.

3.5.2.4 Scenic Resources

Scenic resources are described and discussed in Section 5.1.4, ‘Aesthetics/Light and Glare’.

4.1 ENVIRONMENTAL HEALTH

WAC 463-42-352 Built Environment—Environmental Health.

(1) Noise *— The applicant shall describe the impact of noise from construction and operation and shall describe the measures to be taken in order to eliminate or lessen this impact.*

(2) Risk of fire or explosion *— The applicant shall describe any potential for fire or explosions during construction, operation, standby or nonuse, dismantling, or restoration of the facility and what measures will be taken to mitigate any risk of fire or explosion.*

(3) Releases or potential releases to the environment affecting public health, such as toxic or hazardous materials *— The applicant shall describe any potential for release of toxic or hazardous materials to the environment and shall identify plans for complying with the federal Resource Conservation and Recovery Act and the state Dangerous Waste Regulations (WAC 173-303). The applicant shall describe the treatment or disposition of all solid or semisolid construction and operation wastes including spent fuel, ash, sludge, and bottoms and shall show compliance with applicable state and local solid waste regulations.*

(4) Safety standards compliance *— The applicant shall identify all federal, state, and local health and safety standards that normally would be applicable to the construction and operation of a project of this nature and shall describe methods of compliance therewith.*

(5) Radiation levels *— For facilities that propose to release any radioactive materials, the applicant shall set forth information relating to radioactivity. Such information shall include background radiation levels of appropriate receptor media pertinent to the site. The applicant shall also describe the proposed radioactive waste treatment process, the anticipated release of radionuclides, their expected distribution and retention in the environment, the pathways that may become sources of radiation exposure, and projected resulting radiation doses to human populations. Other sources of radiation that may be associated with the project shall be described in all applications.*

4.1.1 Noise

This section presents an evaluation of potential noise resulting from the construction and operation of the Project. An essential part of this assessment is a comparison of expected noise levels from the Project with acceptable noise levels presented in applicable regulations.

4.1.1.1 Fundamentals of Acoustics

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. Table 4.1.1-1 summarizes the technical noise terms used in this subsection.

Table 4.1.1-1
Definitions of Acoustical Terms

Term	Definitions
Ambient noise level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the reference pressure to the sound pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure.
Decibel A-weighted sound level (dBA)	The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted unless stated otherwise.
Decibel C-weighted sound level (dBC)	The sound pressure level in decibels as measured on a sound level meter using the C-weighted filter network. The C-weighted filter does not de-emphasize the very low and very high frequency components of the sound. It is a flatter weighting in that each frequency has an almost equal weighting. It is therefore more sensitive to low frequencies than the A-weighting.
Equivalent noise level (L_{eq})	The energy average A-weighted noise level during the measurement period.
Percentile noise level (L_n)	The A-weighted noise level exceeded during n % of the measurement period, where n is a number between 0 and 100 (e.g., L_{90})
Community noise equivalent level (CNEL)	The average A-weighted noise level during a 24-hour day, obtained after the addition of 5 decibels to sound levels from 7 p.m. to 10 p.m. and after the addition of 10 decibels to sound levels between 10 p.m. and 7 a.m.
Day-night noise level (Ldn or DNL)	The average A-weighted noise level during a 24-hour day, obtained after the addition of 10 decibels from 10 p.m. to 7 a.m.

Sources: Beranek, 1988; California Department of Health Services, 1977.

In this subsection, some statistical noise levels are stated in terms of decibels on the decibel 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 noise ordinances and standards. 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 typically 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.

The effects of noise on people fall into three general categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction;
- Interference with such activities as speech, sleep, and learning;
- Physiological effects such as startling and hearing loss.

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants may experience noise effects in the third category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily a result of the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it with the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual (CEC, 2001).

With regard to increases in A-weighted noise level, knowledge of the following relationships is helpful in understanding this subsection (Kryter, 1970):

- Except in carefully controlled laboratory experiments, the human ear cannot perceive a change of 1 decibel (dB).
- Outside the laboratory, a 3-dB change is considered a just-perceivable difference.
- A change in level of at least 5 dB is required before any noticeable change in community response can be expected.
- A 10-dB change is subjectively heard as approximately a doubling in loudness and would likely cause an adverse community response.

The referenced dB increases are for noise of similar nature (e.g., increased traffic noise compared with existing traffic noise). Table 4.1.1-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

Table 4.1.1-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels (dBA)	Noise Environment	Subjective Impression
	140		
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.

4.1.1.2 Noise Standards

173-60 WAC provides the applicable noise standards for Washington State, including Kittitas County. Kittitas County has not promulgated independent state-approved noise standards pursuant to WAC 173-60-110. WAC 173-60 establishes maximum permissible environmental noise levels. These levels are based on the environmental designation for noise abatement (EDNA) which is defined as "an area or zone (environment) within which maximum permissible noise levels are established. " There are three EDNA designations (WAC 173-60-030), which roughly correspond to residential, commercial/recreational, and industrial/agricultural uses:

- Class A: Lands where people reside and sleep (such as residential)
- Class B: Lands requiring protection against noise interference with speech (such as commercial/recreational); and
- Class C: Lands where economic activities are of such a nature that higher noise levels are anticipated (such as industrial/agricultural).

As used in this section, "noise-sensitive areas" are equivalent to Class A EDNA areas. Table 4.1.1-3 summarizes the maximum permissible levels applicable to noise received at noise-sensitive areas (Class A EDNA) and at industrial/agricultural areas (Class C EDNA) from an industrial facility (Class C EDNA).

TABLE 4.1.1-3
State of Washington Noise Regulations (173-60-040 WAC)

	Maximum Permissible Noise Levels (dBA) from a Class C EDNA		
	Class A EDNA Receiver		**Class C EDNA Receiver [1]**
Statistical Descriptor	**Daytime (7 a.m. – 10 p.m.)**	**Nighttime (10 p.m. – 7 a.m.)**	**Anytime**
L_{eq}	60	50	70
L_{25}	65	55	75
$L_{16.7}$	70	60	80
$L_{2.5}$	75	65	85

Note: 1. Standard applies at the property line of the receiving property Source: WAC 173-60.

The following are exempted from the limits presented in Table 4.1.1-3 (per 173-60-050 WAC):

- Construction noise (including blasting) between the hours of 7 a.m. and 10 p.m.
- Motor vehicles when regulated by 173-62 WAC ("Motor Vehicle Noise Performance Standards" for vehicles operated on public highways)
- Motor vehicles operated off public highways, except when such noise affects residential receivers

Note that 173-60-50(6) WAC states, "Nothing in these exemptions is intended to preclude the Department from requiring installation of the best available noise abatement technology consistent with economic feasibility."

173-62 WAC, "Motor Vehicle Noise Performance Standards," regulates noise generated by vehicles traveling on public roads.

4.1.1.3 Affected Environment

As with most wind farms, this Project is located in a rural area with low population density and low ambient noise levels. The Applicant has entered into legal agreements with landowners controlling properties on which turbines will be erected and with several landowners who are near the Project. As part of those legal arrangements, a noise easement or option to purchase has been obtained for the parcels shown in Exhibit 21-1, 'House and WTG Locations'. In this document, these parcels are referred to as participating landowners. Noise impacts to non-participating land owners are therefore the primary focus of this document. As shown in Exhibit 21-1, 'House and WTG Locations', the vast majority of the area surrounding the Project consists of participating land owners.

4.1.1.4 Environmental Impacts of the Proposed Action

4.1.1.4.1 Construction

Noise generated by construction of the Project is expected to vary, depending on the construction phase (see Section 2.12.2, 'Construction Schedule, Activities and Milestones').

Table 4.1.1-4 lists the typical noise levels associated with common construction equipment at various distances.

All noise generating construction activities will be conducted between the hours of 7 a.m. and 10 p.m. and are therefore exempt from the limits presented in Table 4.1.1.-3 (per 173-60-050 WAC). Blasting is anticipated for the foundations and potentially some road areas. Blasting will be conducted only between the hours of 7 a.m. and 10 p.m. and is anticipated to occur over a period of eight weeks. Blasting activities are specifically exempted from the noise regulations (per WAC 173-60-050 (1)(c)).

TABLE 4.1.1-4
Noise Levels from Common Construction Equipment at Various Distances (dBA)

Construction Equipment	Typical Sound Pressure Level at 50 feet	Expected Sound Pressure Level at		
		1,000 feet	2,500 feet	5,000 feet
Bulldozer (250 to 700 horsepower)	88	62	54	43
Front-end loader (6 to 15 cubic yards)	88	62	54	43
Truck (200 to 400 horsepower)	86	60	52	41
Grader (13- to 16-foot blade)	85	59	51	40
Shovel (2 to 5 cubic yards)	84	58	50	39
Portable generators (50 to 200 kilowatts)	84	58	50	39
Mobile crane (11 to 20 tons)	83	57	49	38
Concrete pumps (30 to 150 cubic yards)	81	55	47	36
Tractor (3/4 to 2 cubic yards)	80	54	46	35

Source: Barnes et al., 1977.

4.1.1.4.2 Operation and Maintenance

Overall, wind turbines are typically quiet, especially when compared to their combustion-based alternatives. The noise generated by wind turbines is likely to be most noticeable at low wind speeds (8-10 mph) near the speed at which the wind turbines begin operating, when the background noise is at its lowest levels. Wind turbine noise tends to be masked by other background sources (i.e., the sound generated by the wind) at higher wind speeds.

The procedures for determining sound power levels from wind turbines are defined in International Electrotechnical Commission 61400 Wind Turbine Generator Systems Part 11: Acoustic Noise Measurement Techniques (Reference Number: IEC 61400-11:1998(E)). The measurement technique outlines procedures to determine corrections for background noise, apparent sound power level, and wind speed dependence.

Although the exact turbine model to be use for the Project has not been determined yet, representative values for the type of equipment being considered for this Project have been used. The turbines are expected to be warranted by the manufacturer not to exceed a maximum sound power level 104 dBA with a wind speed of 18 mph (8 meters per second) at 33-feet (10 meters) in accordance with the protocol established in IEC 61400. This is approximately equivalent to a sound pressure level of 72 dBA at 50 feet from the turbine. Measurements conducted by others at existing projects substantiate that the guaranteed sound power levels are realized under field conditions

4.1.1.5 Modeling Results and Regulatory Compliance

A three-dimensional noise model was developed using CADNA/A, a sophisticated program developed by DataKustik, GmbH, Munich, Germany. The algorithms in CADNA/A are based on the International Standard ISO –9613-2 “Attenuation of Sound During Propagation Outdoors”. Octave band sound power levels (determined in accordance with IEC 61400) for the wind turbines and topographic information from the USGS were input into the model.

The wind turbine noise emissions are required by 173-60 WAC not to exceed 70 dBA at all Class C EDNA (industrial/agricultural) property boundaries of non-participating land owners. The project will comply with this requirement at property boundaries of all non-participating landowners. In fact, the predicted property line noise levels are less than 60 dBA (see Table 4.1.1-5).

Non-participating residential daytime levels are required by 173-60 WAC not to exceed 60 dBA while nighttime levels are not to exceed 50 dBA. As shown in Exhibit 21-2, ‘Noise Impact Zones’, and summarized in Table 4.1.1-5, the project will comply with the more restrictive nighttime limit of 50 dBA at all existing residential structures owned by non-participating landowners. In fact, the project is anticipated to comply with the residential nighttime noise limit at all existing residences, participating or non-participating.

The Applicant is committed to designing and operating the Project in a manner that complies with all applicable noise standards.

TABLE 4.1.1-5
Summary of Model Results at Nearby Non-Participating Landowners

Map ID	Description	EDNA Classification	173-60 WAC Standard (dBA)	Predicted Noise Level from Wind Project (dBA)	Complies with Standard
117	Geisick Property Line	Class C	70	50	**YES**
117	Geisick Residence	Class A	50	46	**YES**
417	Nelson Property Line	Class C	70	56	**YES**
417	* Nelson Residence	Class A	50	48	**YES**
215	Schwab Property Line	Class C	70	52	**YES**
215	* Schwab Residence	Class A	50	42	**YES**
216	Oslund Property Line	Class C	70	46	**YES**
216	* Oslund Residence	Class A	50	43	**YES**
	US Timber Property Line	Class C	70	56	**YES**
	Burke Property Line	Class C	70	56	**YES**
	Thomas Property Line	Class C	70	56	**YES**

TABLE 4.1.1-5
Summary of Model Results at Nearby Non-Participating Landowners

Map ID	Description	EDNA Classification	173-60 WAC Standard (dBA)	Predicted Noise Level from Wind Project (dBA)	Complies with Standard
	Swauk Valley Ranch Property Line	Class C	70	51	**YES**
	Kuhn Property Line	Class C	70	56	**YES**
	Gagnon Property Line	Class C	70	56	**YES**

Sources: 173-60 WAC and CH2M HILL. Refer to Exhibit 21-2, 'Noise Impact Zones', for predicted project noise contours.
Note: * These are recreational structures not occupied on a permanent basis and lack water and/or power.

4.1.1.6 Decommissioning

Decommissioning activities would be similar in type but shorter in duration compared to those anticipated for the construction phase. Noise generating decommissioning activities would be conducted between 7 a.m. and 10 p.m.

4.1.2 Risk of Fire or Explosion

4.1.2.1 Introduction

Unlike thermal power plants, wind power projects pose a much smaller risk of explosion or fire potential, as there is no need to transport, store or combust fuel to generate power. As with any major construction undertaking, construction of the Project does present some fire risks. Fire risk mitigation starts with Project design, especially with electrical design which needs to comply with the National Electric Code (NEC) and the National Fire Protection Agency (NFPA). A strict fire prevention plan will be enforced both during construction and operations to mitigate fire risks.

4.1.2.2 Fire and Explosion Sources and Mitigation Measures

The risk of unintentional or accidental fire or explosion during both construction and operations is minimal. As the Project site is generally arid rangeland with a predominant groundcover of grasses and sagebrush the highest expected fire risks are grass fires during the hot, dry summer season. Fire risk potential is constantly tracked and reported during the summer fire season by the DNR and this will be actively posted at the construction job site during the high risk season. The Project site roads act as firebreaks and also allow for quick access of fire trucks and personnel in the event of a grass fire.

The Construction Manager will be responsible for staying abreast of fire conditions in the Project area by contacting Washington DNR and implementing any necessary fire precautions.

A Fire Protection and Prevention Plan will be developed and implemented, in coordination with the Kittitas County Fire Marshal and other appropriate agencies. Table 4.1.2-1 lists sources of potential fire and explosion along with measures to mitigate the risk of either occurring.

The Applicant has already held meetings with the Kittitas County Fire Marshal and other local fire officials to discuss preventive measures during construction and operation of the Project. As some portions of the Project area are currently outside of existing fire districts, it is anticipated that the Applicant will enter into contract(s) for fire protection with local service providers during Project construction. This is discussed further in Section 5.3.2.2, 'Fire Services'.

Lightning induced fires are rare in the Project area and both the wind turbine generators and the substation are equipped with specially engineered lightning protection systems, as described in Section 2.3.6.1.11, 'Lightning Protection Systems'. As is the case with almost any complex machines, there is some potential for fire inside the wind turbine generators. With the types of modern wind turbines proposed for the Project, however, turbine malfunctions leading to fires in the nacelle are extremely rare. The turbine control system detects overheating in turbine machinery and internal fires would be detected by these sensors causing the machine to shutdown immediately and send an alarm signal to the central SCADA system which would notify operators of the alarm by cell phone or pager.

Table 4.1.2-1
Fire and Explosion Risk Mitigation Plan

C / O *	Potential Fire or Explosion Source	Mitigation Measures
C & O	General Fire Protection	• All on-site service vehicles fitted with fire extinguishers • Fire station boxes with shovels, water tank sprayers, etc. installed at multiple locations on-site along roadways during summer fire season • Minimum of 1 water truck with sprayers must be present on each turbine string road with construction activities during fire season
C & O	Dry vegetation in contact with hot exhaust catalytic converters under vehicles	• No gas powered vehicles allowed outside of graveled areas • Mainly diesel vehicles (i.e. w/o catalytic converters) used on site • Use of high clearance vehicles on site if used off-road
C & O	Smoking	• Restricted to designated areas (outdoor gravel covered areas)
C & O	Explosives used during blasting for excavation work	• Only state licensed explosive specialist contractors are allowed to perform this work – explosives require special detonation equipment with safety lockouts • Clear vegetation from the general footprint area surrounding the excavation zone to be blasted • Standby water spray trucks and fire suppression equipment to be present during blasting activities
C & O	Electrical fires	• Use of generally high clearance vehicles on site • No gas powered vehicles allowed outside of graveled areas • All major construction equipment is diesel powered (i.e. w/o catalytic converters) used
C & O	Lightning	• Specially engineered lightning protection and grounding systems used at wind turbines and at substation • Footprint areas around turbines and substation are graveled with no vegetation

Table 4.1.2-1 Fire and Explosion Risk Mitigation Plan		
C	Portable Generators – hot exhaust	• Generators not allowed to operate on open grass areas • All portable generators to be fitted with spark arrestors on exhaust system
C	Torches or field welding on-site	• Immediate surrounding area will be wetted with water sprayer • Fire suppression equipment to be present at location of welder/torch activity
C & O	Electrical arcing	• Electrical designs and construction specifications meet or exceed requirements of NEC and NFPA
* Indicates risk during construction (C) and/or operations (O)		

The potential fire risks are similar in nature but lower for Project decommissioning and fire prevention measures during decommissioning would be similar to those for Project construction.

4.1.3 Releases or Potential Releases of Hazardous Material to the Environment

4.1.3.1 Construction

Diesel fuel is the only potentially hazardous material that will be used in any significant quantity during construction of the Project. Construction of the Project will require the use of diesel fuel for operating construction equipment and vehicles. Measures to prevent and contain any accidental spills resulting from this fuel storage and use are described in detail in Section 2.9.2.1 'Construction Spillage Prevention'. Construction of the project will not result in the generation of any hazardous wastes in quantities regulated by state or federal law. During construction, the primary wastes generated will be solid construction debris such as scrap metal, cable, wire, wood pallets, plastic packaging materials and cardboard. The total volume of construction wastes is expected to be less than ten tons. This waste will be accumulated on site in drop boxes until hauled away to a licensed transfer station or landfill by either the EPC contractor or a local solid waste collection service provider, probably Waste Management, which has the franchise for solid waste collection service in Kittitas County.

4.1.3.2 Operations

Operation of the Project will not result in the generation of regulated quantities of hazardous wastes. As no fuel is burned to power the wind turbine generators, there will be no spent fuel, ash, sludge or other process wastes generated. The primary type of waste generated by operations the Project will be municipal solid waste generated at the Operations and Maintenance facility, consisting of typical office wastes (paper, cardboard, food waste, etc.) which will be stored in a dumpster until it is collected by the local solid waste collection service provider (currently Waste Management has this franchise for Kittitas County.) Periodic changing of lubricating oils and hydraulic fluids used in the individual wind turbine generators (WTGs) will also result in the generation of small quantities of these materials. These waste fluids will be generated in small quantities because they need to be changed only infrequently and the changing of these fluids is not done all at once, but rather on an individual WTG by WTG basis. These waste fluids will be stored for short periods of time in appropriate containers at the O&M facility for collection by a licensed collection service for recycling or disposal. Procedures for collecting, storing and transporting these materials for recycling or disposal are described in detail in Section 2.9.2.2 'Operations Spill Prevention'.

4.1.4 Safety Standards Compliance

The Applicant and its subcontractors will comply with all applicable local, state and federal safety, health, and environmental laws, ordinances, regulations, and standards. Some of the main laws, ordinances, regulations and standards (LORS) that will be reflected in the design, construction, and operation of the Project are as follows: Occupational Safety And Health Act Of 1970 (29 U.S.C. 651, et seq.) and 29 CFR 1910, Occupational Safety and Health Standards; Uniform Fire Code; Americans with Disabilities Act; Uniform Fire Code Standards; Uniform Building Code; National Fire Protection Association, which provides design standards for the requirements of fire protection systems; National Institute For Occupational Safety And Health (NIOSH), which requires that safety equipment carry markings, numbers, or certificates of approval for stated standards; American Society Of Mechanical Engineers, which provides plant design standards; American National Standards Institute, which provides plant design standards; National Electric Safety Code; American Concrete Institute Standards; American Institute of Steel Construction Standards; American National Standards Institute; American Society for Testing and Materials; Institute of Electrical and Electronic and Installation Engineers; and the National Electric Code .

4.1.5 Radiation

Pursuant to WAC 463-42-115 the Applicant requests a waiver of the requirements of the information required by WAC 463-42-352(5) which calls for information relating to radioactivity. No radioactive materials will be used, consumed, or released during construction or operation of the Project.

5.1 LAND USE

WAC 463-42-362 Built environment – Land and shoreline use.

***(1) The relationship to existing land use plans and to estimated population** – As part of the application, the applicant shall furnish copies of adopted land use plans and zoning ordinances, including the latest land use regulation and a survey of present land uses within the following distances of the immediate site area:*

(a) In the case of thermal power plants, twenty-five miles radius;
(b) In the case of petroleum refineries ten miles radius;
(c) In the case of petroleum or LNG storage areas or underground natural gas storage, ten miles radius from center of storage area or well heads;
(d) In the case of pipe lines and electrical transmission routes, one mile either side of center line.

***(2) Housing** – The applicant shall describe potential impact on housing needs, costs, or availability due to influx of workers for construction and/or operation of the facility.*

***(3) Light and glare** – The applicant shall describe the impact of light and glare from construction and operation and shall describe the measures to be taken in order to eliminate or lessen this impact.*

***(4) Aesthetics** – The applicant shall describe the aesthetic impact of the proposed energy facility and associated facilities and any alteration of surrounding terrain. The presentation will show the location and design of the facilities relative to the physical features of the site in a way that will show how the installation will appear relative to its surroundings. The applicant shall describe the procedures to be utilized to restore or enhance the landscape disturbed during construction (to include temporary roads).*

***(5) Recreation** – The applicant shall list all recreational sites within the area affected by construction and operation of the facility and shall then describe how each will be impacted by construction and operation.*

***(6) Historic and cultural preservation** – The applicant shall list all historical and archaeological sites within the area affected by construction and operation of the facility and shall then describe how each will be impacted by construction and operation.*

***(7) Agricultural crops/animals** – The applicant shall identify all agricultural crops and animals which could be affected by construction and/or operation of the facility and any operations, discharges, or wastes which could impact the adjoining agricultural community.*

5.1.1 Existing Conditions

5.1.1.1 Land Use

Section 463-42-362 of the *Washington Administrative Code* (WAC) does not specify the land use survey distances for wind power projects; however, for electric transmission routes, one mile on either side of the center line is specified. That is also an appropriate distance for wind generation projects, given that they, like transmission lines, are above ground and extend over substantial area. Therefore, the study area for this land use analysis is the acreage located within one mile on either side of the wind turbine strings.

The Project would be located in central Kittitas County, northwest of the City of Ellensburg. The general study area is characterized by a hilly rural landscape of rangeland with some scattered residences. The overall population density in the area is low. There are approximately 60 dwellings within one mile of the proposed Project. Many of these are not permanent or full time residences but rather are seasonal cabins. There are approximately 7 residences within the immediate Project area; all but one of them have signed option agreements with the Applicant. Land use in the entire study area consists of open space and cattle grazing. Forest cover exists to the north of the Project but there are no commercial forestry operations taking place in the immediate vicinity of the Project. There are no Conservation Resource Program (CRP) lands, prime soils, or aircraft flight paths in the study area. Seasonal hunting is allowed on some parcels with landowner permission.

Additional land uses in the area include:

- A commercial gravel quarry on Highway 97 just south of the northern junction with Bettas Road operated by Ellensburg Cement Products;
- An inactive gravel quarry on Bettas Road north of the junction with Hayward Road owned by the Washington Department of Transportation;
- Five sets of BPA electric transmission lines running east to west across the Project area, divided into one group of four near the middle of the Project and one to the north;
- One set of Puget Sound Energy electric transmission lines running east to west across the Project area just north of the southern set of BPA lines;
- Three communication towers;
- Two state highways: Highway 97, running through the middle of the Project area, and Highway 10 south of the Project area;
- Two county roads: Bettas Road, a paved, two lane road near the western edge of the Project area and Hayward Road, an unpaved road toward the south of the Project area;
- Five parcels of land owned by the Washington Department of Natural Resources, located in T 19 N R 17 E, Sections 2, 10, 16 and 22, which are currently leased for grazing;
- A parcel of private land located on either side of the Swauk Creek drainage is currently under a conservation easement with the Nature Conservancy of Washington. Agricultural lands are located south of Highway 10 along the Yakima River. The Project would be located on privately owned land except for the parcels owned by the DNR.

5.1.1.2 Zoning

The property on which the wind turbines would be located contains two zoning designations: Agriculture-20 and Forest and Range. The areas east of Highway 97 are zoned Forest and Range while those west of Highway 97 are zoned Agriculture-20. Exhibit 18, ‘Project Area Zoning Designation, Aerial Photo’, indicates where these County zoning designations fall within the Project area. The County does not anticipate zoning changes in the Project area.

According to the County’s zoning code, the Agriculture-20 agricultural zone is dominated by farming, ranching, and rural lifestyles. The purpose of the zoning classification is to preserve fertile farmland from encroachment by nonagricultural land uses and to protect the rights and traditions of those engaged in agriculture.

The intent of the Forest and Range zone is to provide areas of Kittitas County where natural resource management is the highest priority and where the subdivision and development of lands for uses and activities incompatible with resource management are discouraged.

5.1.2 Environmental Impacts

5.1.2.1 Consistency with Land Use Policies

Land use in Kittitas County is guided by the Kittitas County Comprehensive Plan (Kittitas County, 2001), which implements the planning requirements and goals of the 1990 Washington State Growth Management Act. The Comprehensive Plan is implemented through the adoption of ordinances and codes designed to achieve the objectives and policies outlined in the Plan. It does not contain policies specifically related to wind power projects.

The Plan was reviewed for this land use analysis to assess the Project's consistency with county policies. Only the policies listed below were determined to be potentially relevant to the proposed wind Project. The policy number is provided, followed by the policy itself in quotation marks. The analysis of the Project's consistency is indented below the policy statement.

Chapter 2 Land Use

"GPO 2.114B. *Economically productive farming should be promoted and protected. Commercial agricultural lands includes those lands that have the high probability of an adequate and dependable water supply, are economically productive, and meet the definition of "Prime Farmland" as defined under 7CFR Chapter VI Part 657.5…."*

The proposed Project would be developed on non-irrigated land, most of which is used for cattle grazing. This land does not meet the definition of Prime Farmland. Removal of minor amounts of rangeland would not affect the productivity of cattle grazing operations. Therefore, the Project would be consistent with this land use policy.

"GPO 2.118. *Encourage development projects whose outcome will be the significant conservation of farmlands."*

The permanent footprint of the Project will remove approximately 90 acres from open space and cattle grazing uses. This reduction poses a negligible impact to cattle operations. The steady source of income to property owners would increase and diversify overall farm income, creating a beneficial impact and helping to ensure continued agricultural viability. Therefore, development of the Project would not conflict with the above policy.

"GPO 2.140. *Land use activities within or adjacent to commercial forest land should be sited and designed to minimize conflicts with forest management and other activities on commercial forest lands."*

Although forest cover exists to the north of the Project area, there is no commercial forest land or activities immediately adjacent to the Project and there would be no effects on any forest management or other activities on commercial forest lands.

Chapter 5 Capital Facilities Plan

"GPO 5.110A. *Capital facilities and utilities may be sited, constructed, and operated by outside public service providers (or sited, constructed, and/or operated jointly with a Master Planned Resort (MRP) or Fully Contained Community to the extent elsewhere permitted), on property located outside of an urban growth area or an urban growth node if such facilities* *and utilities are located within the boundaries of such resort or community which is approved pursuant to County Comprehensive Plan policies and development regulations."*

The Project is located outside any urban growth area or urban growth node, but the policy does not apply to the Project because the policy relates to utility facilities associated with MRPs or Fully Contained Communities, rather than to utility facilities for general public service.

"GPO 5.110B. *Electric and natural gas transmission and distribution facilities may be sited within and through areas of Kittitas County both inside and outside of municipal boundaries, UGAs, UGNs, Master Planned Resorts, and Fully Contained Communities, including to and through rural areas of Kittitas County."*

To the extent that the underground collector lines associated with the Project are considered electric transmission and/or distribution facilities, this Policy allows their placement in rural areas of the County.

"GPO 5.120. *To recognize the Swiftwater Corridor Vision Plan as a planning tool that provides recommendations for specific strategies to improve, enhance, and sustain the corridor's unique intrinsic qualities and the many enjoyable experiences it offers. Selected projects within the vision plan shall not place additional management policies or regulations on private property or adjacent landowners beyond those that already exist under federal, state, regional, and local plans and regulations."*

The Swiftwater Corridor Vision Plan applies to the area along Highway 10 that runs along the southern edge of the Project area. However, as noted in the policy language for GPO 5.120, the Vision Plan does not have regulatory power but instead provides strategies for corridor enhancement. The policy specifically notes that the Vision Plan does not place additional management policies or regulations on private property or adjacent landowners.

Chapter 6 Utilities

"GPO 6.7. *Decisions made by Kittitas County regarding utility facilities will be made in a manner consistent with and complementary to regional demands and resources."*

The proposed Project would draw upon a county resource (wind) to provide energy to meet the regional power demands. Therefore, development of the Project would be consistent with, and complementary to, regional utility demands and local resources.

"GPO 6.9. *Process permits and approvals for all utility facilities in a fair and timely manner, and in accordance with development regulations that ensure predictability and project concurrency."*

The proposed Project would be developed in accordance with all local, regional, and state wind power development regulations and would therefore be consistent with this policy.

"GPO 6.10. *Community input should be solicited prior to county approval of utility facilities which may significantly impact the surrounding community."*

Both the county and the Project developer have solicited community input on the proposed wind farm.

"GPO 6.18. *Decisions made regarding utility facilities should be consistent with and complementary to regional demand and resources and should reinforce an interconnected regional distribution network."*

This policy is similar to GPO 6.7. The proposed Project would significantly reinforce an interconnected regional power transmission and distribution network by connecting to Puget Sound Energy's (PSE) and/or Bonneville Power Administration's (BPA) electric power grid. Therefore, the Project is consistent with this policy.

"GPO 6.21. *Avoid, where possible, routing major electric transmission lines above 55 kV through urban areas."*

The Project does not propose any major electric transmission lines but will connect to existing BPA and/or PSE high voltage transmission lines. The collector cables that connect each wind turbine and strings of turbines will be located underground. In addition, the Project will not be developed in an urban area; therefore, it is consistent with this policy.

"GPO 6.32. Electric and natural gas transmission and distribution facilities may be sited within and through areas of Kittitas County both inside and outside of municipal boundaries, UGAs, UGNs, Master Planned Resorts, and Fully Contained Communities, including to and through rural areas of Kittitas County."

This policy is identical to Policy GPO 5.11B and has been addressed previously.

Chapter 8 Rural Lands

"GPO 8.7. *Private owners should not be expected to provide public benefits without just compensation. If the citizens desire open space, or habitat, or scenic vistas that would require a sacrifice by the landowner or homeowner, all citizens should be prepared to shoulder their share in the sacrifice."*

The proposed wind Project would be constructed on privately owned and DNR land through lease agreements with willing landowners. This comprehensive plan policy suggests that landowners should not be expected to forgo the opportunity to develop wind generation on their properties simply because of potential visual effects, unless the public at large compensates them for their lost opportunity.

"GPO 8.24. *Resource activities performed in accordance with county, state and federal laws should not be subject to legal actions as public nuisances."*

The proposed Project, to the extent it is a "resource activity" because it uses the area's wind resource, would be constructed and operated in accordance with all county, state, and federal laws, and thus is consistent with this policy.

"*GPO 8.42.* *The development of resource based industries and processing should be encouraged."*

Wind energy production is a type of resource-based industry in that it uses a natural renewable resource, the wind. The proposed Project could thus be considered to be consistent with this policy encouraging such industries.

*"**GPO 8.62.** Habitat and scenic areas are public benefits that must be provided and financed by the public at large, not at the expense of individual landowners and homeowners.*

This policy is similar to GPO 8.7, and implies that landowners should not be expected to forgo the opportunity to develop wind generation on their properties simply because of potential visual effects, unless they are compensated for their lost opportunity by the public at large.

5.1.2.2 Consistency with Zoning

On August 7, 2001, the Kittitas County Board of County Commissioners (BOCC) unanimously adopted Ordinance 2001-12, an amendment to Chapter 17.61 of the Kittitas County Code allowing Major Alternative Energy Facilities as a conditional use in both the Agriculture-20 and Forest and Range zoning designations. The Kittitas County Board of Adjustment had the authority to authorize a conditional use permit for such a project based upon the following criteria:

- The proposed use is essential or desirable to the public convenience and not detrimental or injurious to the public health, peace, or safety or to the character of the surrounding neighborhood;
- The proposed use will not be unreasonably detrimental to the economic welfare of the County and will not create excessive public cost for facilities and services.

In addition, approval of a conditional use permit by the Board of Adjustment required compliance with review criteria for Special Utilities and Associated Facilities (17.61.030). These criteria require a utility project to:

- Reduce the risk of accidents caused by hazardous materials;
- Use public right-of-ways or established utility corridors when reasonable;
- Consider industry standards, available technology, and proposed design technology for special utilities and associated facilities in promulgating conditions of approval.

This zoning ordinance was in effect throughout the planning phase of the Project. The Applicant coordinated with Kittitas County Planning Department staff and the BOCC to ensure that the proposed Project would comply with the existing zoning criteria in place at the time.

On December 3, 2002, the Kittitas County BOCC changed the zoning ordinance pertaining to wind farm development to shift responsibility for reviewing and permitting wind farms from the Board of Adjustment to the BOCC (Kittitas County Code Chapter 17.61 A , included as Exhibit 15). Wind farms are a permitted use in a Wind Farm Resource Overlay Zoning District. A wind farm may be authorized by the BOCC only through approval of a Wind Farm Resource Development Permit in conjunction with approval of a development agreement.

The development agreement is conditioned upon development standards such as densities, number, size, setbacks, location of turbines and mitigation measures and other appropriate development conditions to protect the surrounding area. The BOCC would concurrently: 1) adopt a site-specific amendment to the Comprehensive Plan land use designation map to Wind Farm Resource Overlay District; 2) adopt a site specific rezone of the county zoning map to Wind Farm Resource Overlay Zoning District; 3) issue a Wind Farm Development Permit; and (4) negotiate and approve a development agreement. These approvals can be made only if the BOCC determines that 1) the proposal is essential or desirable to the public convenience; 2) the proposal is not detrimental or injurious to the public health, peace, or safety or to the character of the surrounding neighborhood; and 3) the proposed use at the proposed location(s) will not be unreasonably detrimental to the economic welfare of the County and it will not create excessive public cost for facilities and service.

Because the requirements set out in the Kittitas County Code Chapter 17.61A for approval are of the same nature as those used by EFSEC in its administrative and SEPA process, the Project will be built and operated consistent with Kittitas County Code Zoning Code and the Wind Farm Resource Development Overlay Zone criteria.

The Project would be considered desirable to public convenience because it would use a renewable resource to provide clean, safe, quiet, non-polluting energy to help the region meet its energy needs. It would be located on private and DNR property and no public access to the wind turbines would be allowed. It would not be detrimental or injurious to the public health, peace, or safety.

Changes to the surrounding neighborhood would consist of visual changes resulting from the addition of wind turbines to the local landscape. However, the inherent rural character of the surrounding area would not significantly change. Potential visual impacts of the Project are discussed in Section 5.1.4, 'Aesthetics/Light and Glare'.

Development of the Project would generate additional local tax revenues and provide substantial economic benefits to Kittitas County during both construction and operation. Local products and services would be purchased during the construction phase, and hundreds of construction jobs would be created. In addition, lease payments would be made to landowners throughout the life of the Project. The portions of the Project located on DNR property would generate lease revenues that would be applied to local public schools through the state's Common School Fund. The Project would not increase the need for public services such as schools, roads, police and fire service or water and sewer service because no facilities would be developed that require these services (see Section 5.3, 'Public Services and Utilities', below)

The Project would not require the use of hazardous materials; therefore, there are no safety risks associated with hazardous materials. The wind turbine strings and roads would use public right-of-ways and established utility corridors where possible. In some cases, existing farm and private roads would be widened to accommodate construction vehicles. The Project would be constructed and operated in accordance with the latest industry standards and available technology.

Land use impacts associated with construction and operation of the Project would be negligible because the Project would not impair or impact current land uses, change land use patterns, or be incompatible with existing uses or zoning ordinances. Wind farms are generally considered compatible with agricultural and grazing uses. The Agriculture-20 and Forest and Range zoning of the site allows Major Alternative Energy Facilities and Special Utilities as a conditional use. The Project meets the County criteria for a CUP. The Project will not cause impacts or changes to the existing land use in the study area or surrounding area.

5.1.3 <u>Housing</u>

The description of the potential impact on housing needs, costs, or availability due to influx of workers for construction and/or operation of the facility is contained in Section 8.1, 'Socioeconomic Impact'.

5.1.4 Aesthetics and Light and Glare

5.1.4.1 Introduction

5.1.4.1.1 Purpose and Scope

Visual or aesthetic resources are generally defined as the natural and built features of the landscape that can be seen. The combination of landform, water, and vegetation patterns represent the natural landscape features that define an area's visual character while built features such as buildings, roads and other structures reflect human or cultural modifications to the landscape. These natural and built landscape features or visual resources contribute to the public's experience and appreciation of the environment. Visual resource or aesthetic impacts are generally defined in terms of a project's physical characteristics and potential visibility and the extent to which the project's presence would change the perceived visual character and quality of the environment in which it would be located.

In response to EFSEC's requirements for assessment of a proposed project's aesthetic and light and glare impacts, this chapter documents the visual conditions that now exist in the area in which the Kittitas Valley Wind Power Project (Project) is located and evaluates the implications that the Project would have for the public's experience of the area's aesthetic qualities, and day and night light conditions. A number of specialized terms are used in presenting this analysis; definitions of these terms are provided in a Technical Terms section at the end of the chapter.

5.1.4.1.2 Overview of Wind Energy Aesthetic Issues

Wind energy has a long history in that it has been used for centuries for grinding grain and pumping water. As a consequence in many places, including ranches in the American west, windmills have been a long-established and well-accepted part of the landscape. In the United States, large-scale use of wind power to generate electricity first took place in California in the 1980's with establishment of wind farms such as those in the Altamont, Tehachapi, and San Gorgonio Passes involving large numbers of small turbines that were closely spaced.[1] Many of these early turbines were supported on lattice steel towers that were similar in appearance to the towers frequently used for transmission lines. These wind farms were located on highly visible sites, in many cases, within close range view of major freeway corridors, and generated considerable discussion about their appearance. Reaction to the wind farms was split. In the view of some, the turbines were visually dominant technological structures that adversely affected the natural or rural character of the landscapes in which they were located. In the view of others, though, the wind turbines were visually interesting technological objects, and the strings of turbines along the ridgelines were seen as delineating and emphasizing the topography's variations. In addition, the movement of the turbines in the wind was seen as introducing an unusual kinesthetic dimension to the visual experience. To some extent, the turbines became a point of visual interest, and were featured in films and advertisements, and were depicted on post cards sold in the regions around the facilities. Although many appreciated the early California wind farms as positive visual features, they

[1] At the Altamont Pass, turbines typically had towers 60 to 80 feet in height and blades 50 to 60 feet in diameter.

created a number of specific aesthetic problems. These problems included creation of dense, disorderly, cluttered-appearing arrays of turbines on hillsides; use of rickety appearing lattice steel towers with awkward designs; use of a variety of highly divergent turbine designs of varying heights in a single installation, creating a sense of visual disunity; the presence of non-operating turbines; visual impacts related to insensitive road cuts; and visible erosion of hillsides related to improper drainage of access roads.[2] This experience in California provided valuable lessons that have been drawn on in planning and designing subsequent wind energy installations in a way that avoids the aesthetic issues associated with these early projects.

Perception research validates that even though these early California wind farms created specific aesthetic problems, the public perceptions of them, although mixed, were generally favorable. For example, research on public perceptions of the Altamont Wind Energy Area by Thayer and Freeman (1987) found that those surveyed perceived the wind farms in the Altamont Pass area to be highly visible, constructed environments, but that more respondents tended to like wind energy developments than dislike them. However, when asked to rate photos of the wind installations on a scale from beautiful to ugly, respondents rated the views as neutral to slightly ugly. Thayer and Freeman discovered that reactions to the Altamont Wind Energy installations were complex, and factors other than beauty played a major role in determining them. The symbolic or connotative aspects of the wind energy facilities were found to be particularly important in influencing reactions. Those who indicated strongly positive attitudes toward the wind energy facilities were likely to find them to be appropriate, efficient, safe, natural (in the production of energy) progressive, and a sign of the future. Those who indicated strongly negative attitudes tended to cite the visual conspicuousness, clutter, and unattractiveness of the facilities. This finding led Thayer and Freeman to conclude that the two groups focused on different aspects of the facilities "…with the 'like' group responding strongly to the symbolic, referential attributes not automatically associated with the visual stimuli. This group was willing to forgive the visual intrusion of the turbines on the existing landscape for the presumably higher goals of the Project where dislikers were not." (Thayer and Freeman 1987, p. 394)

One of Thayer and Freeman's key findings related to the importance of symbolic aspects in influencing evaluations of wind energy developments is that viewers have negative responses when they see turbines that are not operating. They discovered that viewers expect the turbines to turn when the wind is blowing, and when these expectations are not met, they have negative reactions. Based on their research, Thayer and Freeman reached a number of conclusions related to design measures that could improve the public's perceptions of wind farm attractiveness. Design measures supported by their research include:

- Use of neutral colors for turbines[3];
- Evenly spaced arrays;
- Consistency in turbine type and size within arrays;
- Use of fewer, larger turbines versus use of more smaller ones;
- Minimization of conspicuously malfunctioning turbines (Thayer and Freeman 1987, pp. 395-396)[4].

---

[2] For fuller documentation of this experience see Gipe 1995b, 1997.

[3] This recommendation is consistent with experience in the electric utility industry, which has found through studies and experience that neutral gray colors perform the best in visually integrating electric transmission lines into the landscape. See for example, Goulty (1990) pp 110-120.

[4] Thayer and Freeman note that in addition to being supported by their own research, these design recommendations are also supported by research by Nassauer and Benner (1984) on landscape preferences that included scenes of oil and gas developments, who found that perceived tidiness was a strong predictor of landscape preference.

The proposed Kittitas Valley Wind Power Project builds on and applies the lessons learned from the California experience. Development of the Project's proposed layout and operational plans were informed by the design principles identified by Thayer and Freeman, and other observers of recent wind energy experience in California and in Europe as well, where the level of concern with landscape values is particularly high.[5] In addition, the Project will make use of the latest generation of turbines, which are larger, more widely spaced and rotate at lower RPM (revolutions per minute) than those used in earlier projects. The equipment being used reflects design refinements made by industrial designers intended to make the turbine towers, nacelles, and rotors, sleek and attractive elements in the landscape.

51.4.1.3 Methodology

This analysis of the visual effects of changes that might occur with implementation of the proposed wind energy facility is based on field observations and review of the following information: research about wind energy facility visual effects, public perceptions of wind energy facilities, and design measures for integrating wind energy facilities into their landscape settings; local planning documents; Project maps, drawings, and technical data; computer-generated maps of the areas from which the Project facilities are potentially visible; aerial and ground level photographs of the Project area; and computer-generated visual simulations. Site reconnaissance was conducted from February 2002 through December 2002 to observe the Project area, to take representative photographs of existing visual conditions and to identify key public views appropriate for simulation.

The visual study employs assessment methods based, in part, on the U.S. Department of the Transportation Federal Highway Administration (FHWA) (US DOT 1988) and other accepted visual analysis techniques as summarized by Smarden et al. (1988). The study is also designed to respond to the provisions of the Washington Code (WAC 463-42-362 Built Environment – Land and Shoreline Use) that specify the analysis of aesthetic and light and glare issues as part of the EFSEC process. Included are systematic documentation of the visual setting, an evaluation of visual changes associated with the Project and measures designed to mitigate the Project's visual effects, including lessening of any light and glare impacts and restoration or enhancement of any portions of the landscape that may have been disturbed during construction.

5.1.4.2 Existing Conditions

5.1.4.2.1 Regional and Local Landscape Setting

The lands on which the Kittitas Valley Wind Power Project is sited extend across a roughly 3.4 by 5.5 mile area of ridge lands located along the northern edge of the Kittitas Valley, approximately 11 miles to the north and west of the City of Ellensburg. These ridge lands slope southward toward the valley from Table Mountain, a 6,359 foot high peak that is part of the Wenatchee Range to the north. The ridges on which the Project is located range in elevation from 2,160 to 3,445 feet above mean sea level, and lie in the area defined by Swauk

[5] Paul Gipe, a long-time observer of the wind industry in California and an advocate for wind energy development that respects community landscape values has developed further lists of aesthetics guidelines for wind plants based on the lessons learned in California and elsewhere that are consistent with and expand upon those identified by Thayer and Freeman (Gipe 1995a, 1995b, 2002). For reflections on experience in integrating wind energy facilities into the landscape in the US and Europe, see Pasqualetti, Gipe, and Righter 2002.

Creek on the west and Green Canyon on the east. The tops of the ridges have a gentle southward slope, and the ridge area is dissected by a number of deep, narrow, steep-sided canyons.

The Project area has an open, windswept appearance. Most of the ridgetops on which the Project facilities would be located consist of dry, rocky grasslands used for grazing. To a large degree, trees and shrubs are limited to the areas along the streams in the canyons. The exception is in the higher elevation areas at the Project's northern fringes, where there are clusters of ponderosa pines and other conifers that form the southern edge of the forests that lie upslope to the north.

The Project area is roughly bisected by Highway 97, a north-south route of regional importance. The most visually prominent built features in the Project area in addition to Highway 97 are the sets of large electric transmission lines in the Bonneville Power Administration (BPA) and Puget Sound Energy (PSE) transmission corridors that cross the Project area in an east-west direction. Although many portions of the Project area are uninhabited, there are clusters of rural residences on large parcels in several areas, most notably along the Highway 97 corridor just south of the Project site, in portions of the ridge area east of Highway 97, and along Bettas Road. Under the Kittitas County Comprehensive Plan (Kittitas County, 2001) and Zoning Ordinance, the lands in the Project area have been designated as Agriculture-20 and Forest and Range land use areas. The Comprehensive Plan does not acknowledge any special scenic or visual resource values in the Project area, and does not include policies that are specifically oriented to protection of Project area scenic qualities.

Although the County's Comprehensive Plan is silent on the question of scenic values in the Project area and vicinity, the corridor along Highway 10, which runs along the southern edge of the Project area, has gained some recognition as having scenic values[6]. In the 1990's, Kittitas County received a grant from the Quad County Regional Transportation Organization that enabled it to prepare a plan for a scenic route that would include this segment of Highway 10, along with segments of Highways 970 and 903, which follow the segments of the Yakima and the Cle Elum Rivers between Ellensburg and Salmon La Sac. To prepare this plan, the County established a Corridor Planning Management Team (CPMT) that included citizens, agency representatives, and technical experts, including county staff and representatives from the Washington State Department of Transportation and the Forest Service. Under the CPMT's direction, a planning report for this corridor, titled The Swift Water Corridor Vision (Kittitas County, 1997) was prepared. This report documents the corridor's scenic values and identifies opportunities for undertaking road improvement measures and development of roadway amenities and interpretive installations. As the vision statement takes pains to point out, "This Vision is ***not*** intended to be a plan that creates additional management policies, regulations, or restriction on private property, beyond those that already exist under federal, state, regional, and local plans and regulations. ***This Vision is not a mandate; it is a recommendation.***" Although the Swiftwater Vision was completed and published in 1997, it has not been formally adopted by the County.

5.1.4.2.2 Project Site Visibility

[6] For example, the American Automobile Association map of Washington indicates that the segment of Highway 10 between Cle Elum and Ellensburg is an "AAA Designated Scenic Byway" and local tourist literature promotes Route 10 as a scenic alternative to I-90.

Exhibits 22-1 and 22-2, Potential Project Visual Impact in the Region and Potential Local Project Visual Impact, provide a generalized indication of the areas from which the proposed wind turbines will be potentially visible. These visibility analyses were prepared using the "Zones of Visual Influence" (ZVI) feature of the WindPro software system, a sophisticated program developed to assist in the planning, design, and environmental assessment of wind energy projects (EMD 2002). To identify the areas from which the turbines are potentially visible, the ZVI module makes use of a digital height model generated from digital height contour lines. The module calculates lines of sight between each point on the land surface and the tops of each of the proposed turbines, and notes whether there is an unobstructed view toward the turbine. When the analysis is complete, the module produces maps showing the areas from which the turbines will be potentially visible, and can create the maps in a way that indicates the numbers of turbines that are potentially visible from each point in the surrounding landscape.

The visibility data presented in Exhibits 22-1 and 22-2 represent the potential visibility of the turbine towers, which will extend up to 262 feet above the surface of the ground, and the rotor blades, which will extend up to 410 feet above the ground surface. Both figures were prepared using the 20 foot contour lines from the USGS topographic maps available for the region. Both figures represent "worst case" assessments of potential Project visibility because they do not take into account the effect that other structures close to viewer might have on obstructing views toward the turbines. The visibility analyses presented on these figures do not reflect any screening effects that might be provided by trees, and thus overstate the potential visibility of the turbines to some degree. The overstatement of the potential visibility is particularly pronounced in and around Section 35 in the area to the north of the turbines located on the ridge lands east of Highway 97 where in reality, the presence of thick tree cover will provides substantial screening of views from the cluster of lots located on the slope above the Project area.

Exhibit 22-1 provides an understanding of the Project's potential visibility in the Project area's larger landscape context, including areas that are as far as 12 miles away from the Project site. This exhibit indicates the areas from which any turbines at all would be potentially visible.

Exhibit 22-2 is a more detailed map that focuses in on the Project area's foreground and middle ground viewing areas (the areas up to 5 miles). These viewing areas derive from the landscape visual analysis systems developed by the US Forest Service and other agencies, which divide the landscape up into distance zones that are related to the degree to which landscape details are detectable to the viewer. The foreground distance zone is defined as the area within ¼ to ½ mile from the viewer, where the maximum discernment of detail is possible. The middle ground is defined as the area from ¼ to 3 to 5 miles from the viewer, where there is visual simplification of vegetative surfaces into textures, overall shapes and patterns, and there is linkage between foreground and background parts of the landscape. The background is defined as the landscape zone 3 to 5 miles and further from the viewer in which little color or texture is apparent, colors blur into values of blue or gray, and individual visual impacts become least apparent (USDA Forest Service 1973, pp. 56-57). The graphic display on this map provides an indication of the relative numbers of turbines that can be seen from each location in the surrounding landscape. Both Exhibits 22-1 and 22-2 are annotated with numbers and arrows that indicate the locations from which the character photos, presented as Exhibit 22-3, Figures 3a through 3i, and the simulation views, presented as Exhibit 22-3, Figures 4 through 19, were taken.

Review of Exhibit 22-1 suggests that one or more turbines will be visible to one degree or another from most of the valley and foothill areas to the north and west of Ellensburg. The one notable exception is in the corridor along Highway 10 to the northwest of Ellensburg, where there are pockets where views toward the turbines will be blocked by the ridge defining the river canyon road corridor's northeastern edge. Based on field work conducted in the area, it is fair to say that the seen area analysis presented on Exhibit 22-1 substantially overstates the Project's potential visibility in that there are many areas, particularly in the City of Ellensburg and in the corridors along I-90 and the Yakima River where structures and trees in the foreground of the view create substantial or complete blockage of views toward the distant foothill region where the Project will be located.

Review of Exhibit 22-2 indicates that the greatest numbers of turbines will be visible from the wide, flat valley area north of Ellensburg and east of Highway 97, from the tops of the ridges in the foothill areas, and from Thorp Prairie. From most areas of the narrow, steep sided valleys that lie within and close to the Project area, relatively small numbers of turbines will be visible from any given location.

5.1.4.2.3 Viewing Areas

To structure the analysis of the Project's effects on visual resources, the Project area was divided up into a number of viewing areas – areas which offer similar kinds of views toward the Project site and/or within which there would likely be similar concerns about landscape issues. The existing visual conditions of views from these areas toward the Project site are described below. Within most of these viewing areas, Simulation Viewpoints (SVs) were selected as locations for taking photos that could be used for the development of simulated views of the Project that could form the basis for visualizing the Project's potential visual effects. The simulation viewpoints were established to capture views that are typical of the conditions that exist in each of the viewing areas. The emphasis was placed on views from publicly accessible locations that would be likely to be seen by the largest numbers of people.

5.1.4.2.4 Assessment of Scenic Quality

To assess the scenic quality of the landscapes potentially affected by the proposed alternatives, the analyses of the views toward the Project site from each of the viewing areas includes an overall rating of the level of scenic quality prevailing in the views. These ratings were developed based on field observations made in November 2002, review of photos of the affected area, review of methods for assessment of visual quality, and review of research on public perceptions of the environment and scenic beauty ratings of landscape scenes. The final assessment of scenic quality was made based on professional judgment that took a broad spectrum of factors into consideration, including:

- Natural features, including topography, water courses, rock outcrops, and natural vegetation;
- The positive and negative effects of man-made alterations and built structures on visual quality; and
- Visual composition, including an assessment of the vividness, intactness, and unity of patterns in the landscape.[7]

[7] For definitions of these terms, please refer to the Technical Terms section at the end of this chapter.

The final ratings assigned to each view fit within the rating scale summarized in Table 5.1.4-1. Development of this scale builds on a scale developed for use with an artificial intelligence system for evaluation of landscape visual quality (Buhyoff et al., 1994), and incorporates landscape assessment concepts applied by the U.S. Forest Service and the U.S. Department of Transportation.

Table 5.1.4-1. Landscape Scenic Quality Scale

Rating	Explanation
Outstanding Visual Quality	A rating reserved for landscapes with exceptionally high visual quality. These landscapes are significant nationally or regionally. They usually contain exceptional natural or cultural features that contribute to this rating. They are what we think of as "picture post card" landscapes. People are attracted to these landscapes to view them.
High Visual Quality	Landscapes that have high quality scenic value. This may be due to cultural or natural features contained in the landscape or to the arrangement of spaces contained in the landscape that causes the landscape to be visually interesting or a particularly comfortable place for people. These landscapes have high levels of vividness, unity, and intactness.
Moderately High Visual Quality	Landscapes that have above average scenic value but are not of high scenic value. The scenic value of these landscapes may be due to man-made or natural features contained within the landscape, to the arrangement of spaces, in the landscape or to the two-dimensional attributes of the landscape. Levels of vividness, unity, and intactness are moderate to high.
Moderate Visual Quality	Landscapes, that are common or typical landscapes that have, average scenic value. They usually lack significant man-made or natural features. Their scenic value is primarily a result of the arrangement of spaces contained in the landscape and the two-dimensional visual attributes of the landscape. Levels of vividness, unity, and intactness are average.
Moderately Low Visual Quality	Landscapes that have below average scenic value but not low scenic value. They may contain visually discordant man-made alterations, but these features do not dominate the landscape. They often lack spaces that people will perceive as inviting and provide little interest in terms of two-dimensional visual attributes of the landscape.
Low Visual Quality	Landscapes that have below average scenic value. They may contain visually discordant man-made alterations, and often provide little interest in terms of two-dimensional visual attributes of the landscape. Levels of vividness, unity, and intactness are below average.

Note: Rating scale based on Buhyoff et al., 1994; U.S. DOT Federal Highway Administration, 1988, and United States Department of Agriculture Forest Service. 1995.

5.1.4.2.6 Assessment of Visual Sensitivity

The analysis of viewers, viewing conditions, and viewer sensitivity in each viewing area was structured to consider residential viewers, roadway viewers, and, to the extent to which they are present, recreational viewers. To summarize the insights developed through the analysis of viewer sensitivity, overall levels of visual sensitivity along the various sections of the alternative routes were identified as being High, Moderate, or Low. In general, High levels of sensitivity were assigned in situations where turbines would be potentially visible within 0.5 mile or less from residential properties, heavily traveled roadways, or heavily used recreational facilities. Moderate levels of sensitivity were assigned to areas where turbines would be potentially visible within 0.5 to 5 miles within the primary view cone of residences and roadways. In distinguishing between moderate and low levels of sensitivity in the 0.5 to 5 mile zone, account was also taken of contextual factors, including the viewing conditions in the immediate foreground of the view. In areas lying 5 miles or more from the closest turbine, where a wind farm would be distant and relatively minor element in the overall landscape, a low level of sensitivity was assigned.

5.1.4.3 Existing Visual Conditions in the Landscape Viewing Areas

5.1.4.3.1 Highway 97 Corridor

Landscape Description and Scenic Quality:

The Project area is roughly bisected by Highway 97, an old US highway that begins in California, and extends along the eastern edge of the Cascades through Oregon and Washington. Locally, Highway 97 plays an important role as a route between Ellensburg and Wenatchee. As indicated in Table 5.2.1-1 in the 'Traffic and Transportation' section, in 2001 the Average Daily Traffic on the segment of Highway 97 between Ellensburg and Highway 970 was 2,800 vehicles.

As it heads north from Ellensburg, Highway 97 travels along the wash along Dry Creek as it passes through the generally flat and open upper reaches of the Kittitas Valley. Along the stretch of highway approaching the Project area from the south, northbound travelers are able to see the grass and shrub-steppe covered lower slopes of the ridge spurs that define the Valley's northern edge, as well as the forest covered upper ridge areas (Exhibit 22-3, Photo 1 on Figure 3a). As travelers approach within a mile or closer to the Project area, the lower slopes of the ridge spurs become more prominent in the view, and block the views toward the forested upper slopes. In this area, the landscape consists of open shrub-steppe lands with a scattering of rural residences that are generally highly visible because of the openness of the surrounding landscape. The most visually prominent built features in this area are the lattice steel transmission towers on the Bonneville Power Administration (BPA) transmission corridor that crosses Highway 97 and the adjoining ridge lands along the southern edge of the Project area (Exhibit 22-3, Photo 2 on Figure 3a and Simulation View 1 on Figure 4a). The BPA transmission corridor accommodates 4 sets of high voltage transmission towers of varying design (Exhibit 22-3, Photo 4 on Figure 3b) that extend up to 182 feet in height. Along the segment of Highway 97 that extends from a point several miles south of the Project area to the place where the Project area begins at the BPA transmission corridor, the level of existing visual quality can be generally be classified as moderately low.

As Highway 97 enters the Project area, the corridor along Dry Creek that it follows becomes a well-defined valley through the ridge lands (Exhibit 22-3, Photo 3 on Figure 3b). The highway passes though this valley (Exhibit 22-3, Photo 5 on Figure 3b and Photo 6 on Figure 3c) and up a long, steep slope to a crest at approximately 1,700 feet in elevation where it passes over the side of one of the ridges. The most prominent landmark at the crest area is a privately owned gravel pit and gravel storage area located along the west side of the road. In this area, views for northbound travelers toward the ridge lands to the east where many of the Project turbines will be located are constrained to some degree by the steep-sided road cuts along the east side of the road. Views toward the ridgeline to the west where String F is proposed are more open. The area along the west side of the highway at Bettas Road, where the proposed operations and maintenance (O&M) facility and Project substation would be located, is also in open view from the highway (Exhibit 22-3, Photo 6 on Figure 3C). Although the landscape in this area consists primarily of open shrub-steppe lands, there are clusters of ponderosa pines and other trees at scattered locations along the edge of Dry Creek (Exhibit 22-3, Photo 5 on Figure 3b and Photo 6 on Figure 3c). This area is crossed by a single PSE 230-kV line that is carried on wood pole H-frame towers (Exhibit 22-3 Photo 6 on Figure 3c). The level of existing visual quality in the area along Highway 97 extending from the BPA transmission corridor to the road's crest on the side of the ridge ranges from moderately low to moderate.

From the gravel pit area at the crest, Highway 97 travels northward down a long slope, and in the area close to Highway 970, enters Hidden Valley a small valley formed by Swauk Creek, and continues to the intersection with Highway 970. The area along this segment of the highway is a transition zone between the open, grass and shrub-steppe covered ridges to the south and the more heavily forested mountain and valley areas to the north. In this area, like the area to the south, views for northbound travelers toward the ridge lands to the east where many of the turbines will be located are constrained to a large degree by the steep road cuts along the road's eastern edge. In this area, the road cuts include scattered clusters of trees at various stages of maturity (Exhibit 22-3, Photo 7 on Figure 3c). The BPA Rocky Reach – Maple Valley 230-kV transmission line, which is carried on tall lattice steel transmission towers, crosses this segment of the highway. One of this line's towers is visible in the mid-distance in the hillside area seen in Simulation View on Exhibit 22-3, Figure 5a. In the area between the gravel pit at the crest and the transmission line crossing, the level of visual quality is moderate. A half mile north of the transmission line crossing, where the highway enters Hidden Valley and a more rugged, forested, and visually intact landscape comes into view, the level of visual quality is moderately high to high (Exhibit 22-3, Photo 8 on Figure 3C).

Traveling south toward the Project area from the intersection with Highway 970, Highway 97 first passes through the meadows and forests of Hidden Valley, and as the road starts to travel up the ridge, the view opens up to reveal the ridge along the east side of the highway where String G is proposed (Exhibit 22-3, Photo 9 on Figure 3d). Further up the road, in the vicinity of the intersection with the northern end of Bettas Road, this ridge becomes the primary element in the cone of vision of roadway viewers (Exhibit 22-3, Simulation View 3 on Figure 6a). South of the intersection with Bettas Road, as the roadway travels along the base of the steep slopes of the ridge, the view to the east and to the ridge top becomes more constrained, but the view toward the southwest and the ridge top on which String F will be located opens up (Exhibit 22-3, Photo 10 on Figure 3d). Along this segment of the highway, the most salient developed features in the southbound view are the road and road cuts, the BPA Rocky Reach-Maple Valley transmission line (Exhibit 22-3, Photo 9 on Figure 3d), and the gravel piles at the gravel facility at the top of the ridge (Exhibit 22-3, Photo 10 on Figure 3d). Along this segment of Highway 97, the visual quality of southbound views ranges from moderately high in Hidden Valley to moderate in the area further to the south.

After Highway 97 crosses over the crest by the gravel facility, views for southbound travelers open up to reveal a panorama to the southwest and then to the south across the ridge lands and the Kittitas Valley toward Manastash Ridge and other high ridges 20 miles or more in the distance. In this area, views toward the ridge lands to the east where many of the turbines will be located are constrained to some degree by the road cuts, but views toward the ridge top to the west where String F is planned are more open, although they are screened in places by clusters of trees along the highway's edge (Exhibit 22-3, Photo 11 on Figure 3d). Further south along Highway 97, the ridge lands on which turbines would be located move out of the southbound traveler's cone of vision, but the Project's substation and O&M facility sites become prominently visible in the canyon area at the base of the slope. In this area, the landscape consists primarily of open shrub-steppe land, and the transmission towers in the PSE and BPA transmission corridors become prominent elements of the landscape pattern. Along this segment of Highway 97, southbound views from the highway range from moderate to moderately high on the upper slopes to moderately low in the areas on the lower slopes where the many transmission lines are an important element of the view.

South of the BPA transmission lines at the southern end of the Project area, there is a scattering of rural residential development in the corridor alongside the highway. Some of this development lies along Sagebrush Road and Ellensburg Ranches Road, private roads that serve a large-lot subdivision developed on the ridge slopes to the west of the highway. In this area, there are over 30 lots, of which about half have been developed with residences. All of these residences are located 0.7 mile or more from the closest turbines proposed for the ridge lands across Highway 97 to the east. Several of the residences at the northern end of Sagebrush Road lie within 0.5 mile of the southernmost turbine proposed as a part of String E, which will be located on the ridge top to the northwest. Simulation View 4 on Figure 7a, Exhibit 22-3, is a view looking north along Sagebrush Road toward the ridge lands east of Highway 97 on which development of Strings G, H, I and J is proposed. Several additional rural residences on large lots lie along the east side of Highway 97 in the area along Nacho Lane. These residences all lie more than 0.5 mile from the closest turbine. Some of these residences are visible in Exhibit 22-3, Photo 1 on Figure 3a. In general, views toward the Project site from residences in the area along both sides of the Highway 97 corridor in this area have visual quality levels that range from moderately low to moderate.

<u>Viewers and Visual Sensitivity:</u>

The traffic volume on Highway 97 is 2,800 vehicles per day, a figure that, according to WDOT information, includes about 500 trucks. For the entire length of Highway 97 extending from the intersection with northern end of Nacho Road to a point slightly north of the intersection with the northern end of Bettas Road, the highway lies within 0.5 mile of the closest proposed wind turbine. In this area within 0.5 mile from the proposed turbine locations, the sensitivity of viewers is assumed to be high. Along the portions of the highway to the north and south of this road segment where travelers are in the zone between 0.5 and 2 miles from the closest turbine, the level of traveler sensitivity is considered to be moderate. For the most part, the sensitivity of the views from the rural residences located in the Highway 97 corridor in the area south of the BPA transmission corridor can be considered to be moderate because most of these residences are located 0.5 mile or more from the closest proposed turbine. The exception is that there are several residences located at the northern end of Sagebrush Road that lie less than 0.5 mile from proposed turbines E4 and E5, and because of their proximity to these proposed turbines, the level of visual sensitivity is being rated as high. However, an additional factor that needs to be considered is that some of these residences are located downslope from these turbine sites, and that none of these residences are oriented toward these turbine locations.

5.1.4.3.2 Ridge Lands East of Highway 97

<u>Landscape Description and Scenic Quality:</u>

This viewing area encompasses the terrain east of Highway 97 that consists of long, north-south trending ridges separated by narrow canyons. In this area, 71 of the Project's turbines will be located along the ridgelines in Strings G, H, I, and J. Most of this area is open in character and covered in grass and shrub-steppe vegetation, although there is some riparian vegetation along the creeks in the canyons, and the slopes at the northern end of the ridges are covered with forests of Ponderosa pine and other evergreen trees. The most visually prominent developed features in this area are the transmission structures in the BPA transmission corridor that runs across the southern ends of the ridges (visible in Photo 12 on Figure 3e, Exhibit 22-3) and the PSE and BPA transmission lines that run through the area at points further up the ridges. For the most part, the lands in this area are used for grazing, but the area also contains a number of scattered rural residences. Some of these residences are accessed by Cricklewood Lane, a private road that extends into the canyon area between the ridges on which Strings I and J will be located. Although Cricklewood Lane is a private road, it is un-gated in the area from Highway 97 to the BPA transmission line corridor. North of this area, access is restricted by a locked gate. Photo 12 on Figure 3e, Exhibit 22-3, is a view toward the Project site from the lower portion of this road. A total of approximately 35 residences and recreational properties are accessed by way of Elk Springs Road, a private road that extends along the top of the ridge on which String I will be developed. Elk Springs Road is gated at Highway 97, and is accessible only to property owners with a key. Several residences are located at widely dispersed locations along the ridge, but the largest single concentration is in Township 20 North, Range 17 East, Section 35, which is located on the forested slopes that lie to the north of proposed Strings G and H. Photo 14 on Figure 3f, Exhibit 22-3, is a view toward Section 35 from the upper end of Elk Springs Road; Section 35 encompasses the sloped and forested area visible on the right half of the photo, as well as a portion of the flat, open area at the base of the slope. This section has been divided into 32 lots ranging from 10 to 60 acres in size. Approximately 20 of these parcels have some kind of structure or a trailer on them. Conversations with residents of Elk Springs Road suggest that approximately 5 of the parcels in Section 35 have residences that are occupied on a full-time basis; 6 of the parcels are used on weekends, that 9 are used occasionally (more than a few times a year, but less frequently than most weekends); and that the rest are used infrequently (a few times a year). Simulation View 5 (Figure 8a, Exhibit 22-3) is a view from one of the residences in Section 35, looking south toward the area in which Strings F, G, H, I, and J are planned. The visual quality of the views in this area range from moderately low in the area at the base of the ridges (Photo 12, Exhibit 22-3), moderate, along the ridgetops (Photo 13, Exhibit 22-3), and in locations in Section 35 from which panoramic views toward the south are available, moderately high to high (Figure 8a, Exhibit 22-3).

Visual Sensitivity:

Because portions of Cricklewood Lane and most of Elk Springs Road are located in areas with open views that lie within 0.5 mile or less of proposed turbines, the views from these roads can be considered to be sensitive. Because these are private, dead-end roads whose primary function is to provide access to abutting properties, the numbers of road users affected can assumed to be relatively small. In light of the restricted access to these road segments and the small numbers of viewers, the level of sensitivity to Project visual effects is classified as low.

For the total of 11 residences located along Cricklewood Lane and the lower and middle sections of Elk Springs Road that lie within 0.5 mile of the proposed turbines and which would have unobstructed views of them, the sensitivity of views is high. Field studies, aerial reconnaissance, and review of maps and photos indicate that in Section 35, there is heavy tree cover that provides partial to full screening of many of the views toward the area where the turbines would be located. Given this tree screening, it appears that there are 5 existing residences from which the proposed turbines would be potentially visible. Three of these residences lie within 0.5 mile of the proposed turbines, and views from these residences would be considered to have a high level of sensitivity. Because the other two residences in Section 35 from which the turbines would be potentially visible lie more than 0.5 miles from the location of the closest proposed turbine, the visual sensitivity of views from those properties is considered to be moderate.

5.1.4.3.3 Bettas Road

Landscape Description and Scenic Quality:

This viewing area consists of the corridor along Bettas Road that extends westward from the area west of the site of the proposed O&M facility and substations, and then north to the point where the northern end of Bettas Road intersects with Highway 97. The southeastern portion of this corridor lies in a draw that drains into Dry Creek to the east. This area has a shrub-steppe landscape, and except for the road itself and a PSE 230 kV transmission line carried on wood pole, H-frame towers that pass through it, this portion of the Bettas Road corridor is undeveloped. After passing over the crest of the ridge, Bettas Road descends into Horse Canyon, a small valley with a rural character. At the southern end of the valley, there is a cluster of five rural residences on ranchette parcels. Further north along the road, there are two dwellings associated with larger ranch properties. Photo 15 on Figure 3f, Exhibit 22-3, is a panoramic view from Bettas Road at the intersection with Hayward Road, at the top of the ridge that separates the Dry Creek drainage to the east from Horse Canyon to the west and north. The southernmost of the cluster of rural residences along the west side of Bettas road is visible at the left side of the photos. Just to the right of this house, the slopes defining the western side of Horse Canyon are visible. The ridge area visible on the right side of the photo is the location where String F is proposed. The tilt to the trees visible in this portion of the view reflects the high wind levels that prevail in this area. Photo 16 on Figure 3g, Exhibit 22-3, is a view looking north along Bettas Road from within Horse Canyon. One of the ranch residences is visible in the mid-distance on the left side of the road. Simulation View 6 (Figure 9a, Exhibit 22-3) is a view toward the north from the northern portion of Bettas Road. The BPA Rocky Reach-Maple Valley transmission line is visible crossing the ridge in the mid-distance. String G is proposed for development on the ridgeline on which the transmission towers are now visible. In the middle ground of the view, Highway 97 can be seen traveling up the slope at the base of this ridge. Along the portion of the Bettas Road corridor south and east of the ridgeline separating the two drainages, the level of existing visual quality is moderately low. North and west of the ridgeline the level of visual quality is moderately high, reflecting more vivid topographic and vegetative conditions, and moderately high levels of unity and intactness.

Visual Sensitivity:

The level of sensitivity of views on Bettas Road is moderate. Although from most portions of the road, turbines will be visible within 0.5 miles, the numbers of travelers affected is very low. As indicated in Table 5.2.1-1 in the ‘Traffic and Transportation’ section, in 2001 the Average Daily Traffic (ADT) on Bettas Road was only 26 vehicles per day. It should also be noted that from the portions of the road at the base of steep slopes, the slopes will constrain views toward the closest turbines. All of the residences along the Bettas Road corridor are within 0.5 mile, or are close to 0.5 mile from the closest proposed turbine location. From most of the residences, the level of visual sensitivity is high, but from several which are oriented toward views down the valley to the southwest, rather than to views toward the ridgelines to the east and north, the level of sensitivity is moderate.

5.1.4.3.4 Highway 970/Hidden Valley

<u>Landscape Description and Scenic Quality:</u>

This viewing area encompasses the corridor along Highway 970 and Hidden Valley, areas that lie a mile or more to the west and north of the Project site. Highway 970 is a state highway that connects Cle Elum to Highway 97 and Wenatchee, and has an ADT of 5,100 vehicles per day. Hidden Valley is a valley formed by Swauk Creek that extends toward the southwest from the intersection of Highways 970 and 97. The Valley has a rural character and contains a mix of ranches and rural residences on ranchette parcels. Photo 17 on Figure 3g, Exhibit 22-3, is a panoramic view taken from a viewpoint on Hidden Valley Road near Highway 970 at a point a little less than 3 miles from the Project area. The ridgeline on which String G is proposed is visible as the un-forested ridge that can be seen in the distance in the middle of the right side of the view. The BPA Rocky Reach-Maple Valley transmission line can be seen crossing the meadow in the far foreground of this view. Simulation View 7 on Figure 10a, Exhibit 22-3, is a single frame view from a viewpoint just south of the location from which Photo 17 was taken. This view focuses specifically on the ridgeline on which the development of String G is proposed. One of the transmission structures that is a part of the Rocky Reach –Maple Valley transmission line is detectable on the ridgeline in the area slightly to the right of the view's center. In general, views toward the Project site from the Highway 970/Hidden Valley area have moderately high levels of visual quality, reflecting moderately high levels of vividness, unity, and intactness.

<u>Visual Sensitivity:</u>

Although Highway 970 carries relatively high levels of traffic, because the areas from which the Project might potentially be seen from the highway lie 1.5 mile or more from the closest proposed turbine and generally do not lie within the primary cone of vision of highway travelers, the level of sensitivity of views from this roadway to Project-related visual changes is low. In this viewing area, the closest residences to the Project site are those located along the eastern end of Hidden Valley Road, at a distance of approximately 1.5 miles to the northwest of the closest turbine. Other residences lie further to the west at distances of 2 miles or more from the Project site. Because the ridgeline on which the closest turbines will be located lies in the middle ground viewing zone, the sensitivity of views from these residences to Project effects is considered to be moderate.

5.1.4.3.5 Hayward Hill

<u>Landscape Description and Scenic Quality:</u>

Hayward Hill is the 2300 to 2400 foot elevation ridge that lies along the northeastern edge of the Yakima River in the area approximately 2 miles northwest of the community of Thorp. This ridge, which extends for about 2.5 miles, is proposed as the site of Strings A and B. This windswept ridge has a grassland and shrub steppe landscape, and as a consequence has a very open appearance. The ridge is crossed by Hayward Road, a narrow, unpaved county-maintained road that extends approximately 2.7 miles from the intersection of Highway 10 and Thorp Road on the south to Bettas Road on the north. Except for the road and the BPA and PSE transmission lines that cross the ridge at its north end near its intersection with Bettas Road, Hayward Hill is essentially undeveloped. A large parcel on the southwest side of the ridge is owned by the Cascade Field & Stream Club, and is proposed for use as a recreational firing range, although a permit for such use has not yet been approved. Photo 18 on Figure 3h, Exhibit 22-3 is a view from the northern end of Hayward Road looking north toward the BPA transmission line. Photo 19 is a view from the same general area looking south across the top of the ridge and across the upper Kittitas Valley toward the distant ridges to the south. In general, the existing level of visual quality of views on Hayward Hill is moderate, reflecting generally lower than average levels of vividness and mixed but not particularly high levels of unity and intactness.

Visual Sensitivity:

The sensitivity of views on Hayward Hill is low. As indicated in Table 5.2.1-1 in the 'Traffic and Transportation' section, average daily traffic on Hayward Road is estimated to be 26 vehicles per day. Although Hayward Road passes in close proximity to and well within 0.5 mile from the proposed turbines, given the low numbers of travelers, the views of users of this road are considered to have a low level of sensitivity. Because there are no residences on Hayward Hill that are located within 0.5 mile of proposed turbines, there are no residences in this area that are considered to have a high or moderate level of sensitivity to the visual changes that the Project might create.

5.1.4.3.6 Highway 10 Corridor

Landscape Description and Scenic Quality:

This viewing area extends along an approximately 6 mile long segment of Highway 10, a state highway that travels along the northern banks of the Yakima River and which provides both nearby and more distant views of portions of the Project areas. Highway 10 was formerly a major east-west route across the state, but since the opening of Interstate 90, now plays the role of an alternative route between Ellensburg and Cle Elum. The section of Highway 10 between Ellensburg and Cle Elum is also recognized as having scenic qualities, and to some degree is promoted as a scenic byway. As indicated in this section's Regional and Local Landscape Setting discussion, this section of Highway 10 is designated on the American Automobile Association's State of Washington map as a scenic route, and a planning report, the Swift Water Corridor Vision (Kittitas County, 1997), has been prepared that identifies measures to develop roadway improvements and roadside amenities that will enhance the road's scenic qualities. As indicated on Table 5.2.1-1, the Average Daily Traffic on Highway 10 is 1,200 vehicles per day. The area along the corridor is only lightly developed. Except for scattered ranch dwellings and clusters of rural residences the landscape along the southeastern and central portions of this highway segment consists of open grasslands and areas of riparian forest. A distinctive landscape element in this area is an old flume structure that skirts the base of the bluffs just to the east of the road. Photo 20 on Figure 3i, Exhibit 22-3, is a view from Highway 10 in this area looking northwest toward Hayward Hill, where String B is proposed. Simulation View 8 on Figure 11a, Exhibit 22-3, is a view looking west along the Highway at the intersection of Hayward Road and taking in the ridge tops where String A and a portion of String B would be located. Photo 21 on Figure 3i, Exhibit 22-3, is a view looking east toward Hayward Hill from Thorp Road at Highway 10. Along this segment of Highway 10, the visual quality of views toward the Project site is generally moderate to moderately high. Further to the northwest, where the highway alignment is located at a higher elevation along the side of the bluff defining the river canyon, there is no development, and the landscape is characterized by rock outcrops, clusters of trees and shrubs, and views of the canyon below and the rail corridors that follow it. Photos 22 and 23 on Figure 3i and Simulation view 9 on Figure 12a, Exhibit 22-3, represent views to the east from Highway 10 in this area, looking toward the ridgeline of Hayward Hill where String B is proposed. Along this segment of the highway corridor, the visual quality of views toward the Project site also ranges from moderate to moderately high.

Visual Sensitivity:

Because several short segments of Highway 10 lie within 0.5 mile of the closest proposed turbine, because the highway carries a moderately high level of traffic, because the road has been recognized as having scenic qualities, and because efforts have been started to enhance the highway's role as a scenic corridor, the sensitivity of views from the highway toward the Project is high.

Although ridgelines where turbines are proposed are potentially visible from the small number of residences scattered along this corridor, the level of visual sensitivity of views from these properties is moderate at most, because these residences are not generally located within the foreground viewing zone, and in most cases, the residences are not oriented toward views of the ridge tops.

The segment of the Yakima River that Highway 10 follows in this area receives a low to moderate level of recreational use, primarily for fishing. Recreational use of this segment of the river is limited by the fact that there are no public river access facilities in this area. Along the western portion of this corridor, a segment of the John Wayne Trail makes use of an abandoned railroad right-of-way along the south side of the River. This trail is described in more detail in the discussion below. Because of the relatively low numbers of recreational users in this area, because most areas of the River and Trail are located a mile or more from the closest proposed turbine and because in many places views toward the Project site are constrained by the steep sides of the bluffs and by stands of riparian vegetation, the sensitivity of views toward the Project site from the recreational use areas is low to moderate.

5.1.4.3.7 John Wayne Trail

Landscape Description and Scenic Quality:

This viewing area encompasses the segment of the John Wayne Trail that lies within 5 miles of the Project site. The John Wayne Trail is a hiking, biking, and equestrian trail that has been developed in the Iron Horse State Park, a state park created on the former right of way of the Milwaukee Road railroad, which was acquired by Washington State Parks in the 1980s. The John Wayne Trail extends 109 miles from a trailhead near North Bend to the west to the Columbia River on the east. In the Project area, the Trail has a wide gravel surface, and is paralleled by a PSE electric transmission line and distribution line carried on wood poles. The only formal trailhead in this area is on Thorp Depot Road south of the community of Thorp. From most areas of the trail, the ridges on which the Project would be developed are visible at a distance ranging from one to five miles. Simulation View 11 on Figure 14a, Exhibit 22-3, is a representative view from the trail toward the Project area. This photo was taken along the trail at a point just north of Taneum Road in the area north of Thorp. At this point, the closest turbine would be located approximately two miles from the Trail. From most areas along the Trail, the visual quality of views toward the Project site would be rated as moderately high. The ridgelines in the middle ground and the higher elevation slopes visible in some places in the background provide a moderately high level of vividness. The level of visual unity and intactness is decreased to some degree by the presence of the transmission and distribution lines in the immediate foreground of the view.

Visual Sensitivity:

Washington State Parks reports that in 2001, the portion of the John Wayne Trail extending from North Bend to Thorp had 163,532 visitors, that the segment from Thorp eastward to Vantage had 21,079 visitors, and that most visits took place during the summer season. It is likely that use levels in the portions of the trail closest to the Project area are relatively low in comparison with those in the westernmost part of the county, particularly in the area near Snoqualmie Pass where the Trail is closer to the population centers of the Puget Sound area, the scenery is more outstanding and where the Trail ties in with other recreational facilities. Because of the Trail's character as an engineered right-of-way that has a wide gravel surface and is paralleled with utility lines, its visual sensitivity is assumed to be lower than that of a more conventional park or wildland trail. In light of the Trail's visual character, the moderate level of trail use this segment receives, and the middle ground viewing distances toward the Project area, the level of sensitivity of views from the Trail to potential Project visual effects is low.

5.1.4.3.8 Thorp

Landscape Description and Scenic Quality:

Simulation View 12 on Figure 15a, Exhibit 22-3, is a view toward the Project site taken from Thorp Highway in the center of the small, unincorporated community of Thorp. The ridgelines on which the Project is proposed for development lie three miles and further to the north, and form the backdrop of the view. The existing level of visual quality of the view toward the Project site is moderate, reflecting moderate levels of vividness, unity, and intactness.

Visual Sensitivity:

No data is available on traffic volumes on Thorp Highway in Thorp where Simulation View 12 is located, but based on land uses and field observations; it is assumed that traffic volumes are moderate. Given the moderate levels of traffic in this area, the Project area's location in the far middle ground of the view, and the fact that the Project area does not lie within the primary cone of vision of views from the road, the sensitivity of traveler views in this area to potential Project visual effects is considered to be low.

There are a total of approximately 118 residences in Thorp and the immediately surrounding area. From many of these residential properties, views toward the ridgeline are screened to some degree by other structures and by trees and other vegetation in the near foreground of the views. However, from other properties in the community, the ridgelines on which the Project is proposed for development are visible. Because these ridgelines are a part of the far middle ground zone of the view, the sensitivity of the residential views in this area to changes that might result from the Project is moderate at most.

5.1.4.3.9 Sunlight Waters

Landscape Description and Scenic Quality:

Sunlight Waters is a small lot subdivision that lies in the middle of a region of large ranch parcels located between I-90 and the Yakima River. This development, which is partially built out, contains a golf course and a total of approximately 150 dwellings located on an upper and a lower terrace above the south bank of the River. From some areas of this development, there are views toward the ridges on which the Project is proposed, which lie about 2.8 miles and further to the east. Simulation View 13 on Figure 16a, Exhibit 22-3, is a view toward the Project site from Highline Loop, a high point in the upper terrace area which provides the fullest and least obstructed views toward the Project area. The existing visual quality of views from this area toward the site are moderately high to high, reflecting a high levels of vividness and unity. The level of intactness is reduced to some degree by the towers located in the BPA transmission corridor that are prominently visible along the top of the first line of ridges in the view.

Visual Sensitivity:

Although views toward the Project site from this area are open, and some residences are oriented toward this view, the sensitivity of residential views in this area to potential Project effects is moderate at most because of the distance of the viewers from the Project area.

5.1.4.3.10 Interstate-90

Landscape Description and Scenic Quality:

Interstate 90, the most important east/west cross-state route in Washington, angles through the upper Kittitas Valley on an alignment that lies approximately 2.5 miles southeast of the Project site. WDOT figures indicate that in 2001, the average daily traffic on I-90 in this area was 21,000 vehicles per day. From some areas along I-90 in the general Project vicinity, views toward the ridges on which the Project will be developed are screened by topography, trees, and other features in the foreground of the view. In many areas, however, these ridges are clearly visible in views across an open valley landscape. It is important to note, though, that the views toward the Project area from I-90 are at a right angle to the road and do not fall within the primary cone of vision of drivers. Simulation View 14 on Figure 17a, Exhibit 22-3, is a view toward the Project area from I-90 at Springwood Ranch, a point along the highway that is approximately 2.5 miles from the closest proposed turbine location. In this area, the visual quality of views toward the Project site is high, reflecting the high level of vividness attributable to the presence of the peaks of the Stuart Range in the far background of the view, and the view's relatively high levels of unity and intactness. The 100 mile segment of I-90 beginning at the Seattle waterfront and extending east to Thorp was designated as a National Scenic Byway by the Federal Highway Administration in 1998. This highway segment is also a part of the Mountains to Sound Greenway. The greenway, which consists of the corridor along I-90 from downtown Seattle to Thorp, is conceived of as a scenic, historic, and recreation corridor intended to function as a scenic gateway to the Seattle metropolitan area and a pathway to nature for the metropolitan area's population. The greenway concept has provided a framework within which the Mountains to Sound Greenway Trust, a private non-profit organization and state and federal agencies have been able to plan and implement measures to acquire, protect, and develop lands along the corridor that provide recreational opportunities and/or protect natural, historic, and scenic resources.

Visual Sensitivity:

The sensitivity of views from this area to potential visual changes associated with the Project is moderate, reflecting on the one hand, the very high numbers of roadway users and I-90's Scenic Byway status, and on the other, the fact that the views toward the Project site do not fall within the primary cone of vision of drivers, and appear in the far middle ground of the view.

5.1.4.3.11 Lower Green Canyon Road

Landscape Description and Scenic Quality:

Simulation View 15 on Figure 18a, Exhibit 22-3, is a view looking northwest toward the Project site from a viewpoint on Lower Green Canyon Road in the area between Highway 97 and Clarke Road. This view represents views in the portion of the Kittitas Valley northwest of Ellensburg, where the Project area is visible across the flat valley lands on the distant hillsides that frame the northwestern edge of the valley. In the upper valley, viewing distances to the Project site range from approximately 2 to over 8 miles. In the view from Simulation Viewpoint 15, the Project site lies approximately 5 miles in the distance. The upper valley is highly rural in character, and the landscape consists of large farms and ranches and a scattering of non-farm residences on smaller parcels. In general, views from this area toward the Project site have a moderately high to high level of visual quality.

Visual Sensitivity:

Taking into account the relatively large numbers of residential and roadway viewers in this area on the one hand, and the distant nature of the views on the other, the sensitivity of traveler and residential views from this area to the potential changes that might be brought about by the Project is no more than moderate.

5.1.4.3.12 Ellensburg

Landscape Description and Scenic Quality:

The outer edges of the city of Ellensburg lie approximately 11 miles to the southwest of the Project site. From most areas of the city, views toward the Project site are blocked by structures and trees in the foreground of the view, although there are a few locations in parking lots and other open areas in the community where the ridges on which the Project will be developed are visible in the far distance. Simulation View 16 on Figure 19a, Exhibit 22-3, is a view from Reed Park, a small park located on an elevated knoll in the neighborhood southeast of Central Washington University in Ellensburg. Because of its elevated location, this park provides Ellensburg's most complete and unobstructed view toward the Project site. This viewpoint is located approximately 13 miles from the site of the closest proposed turbine. The existing level of visual quality of this view is high, reflecting the very high level of vividness created by the presence of the Stuart Range in the far distance of the view, and moderate levels of visual unity and intactness.

Visual Sensitivity:

Although there are large numbers of potential viewers in Ellensburg, the level of sensitivity of views from Ellensburg is low because the areas from which views toward the Project can be seen are limited and because the Project area is in such a distant portion of the view.

5.1.4.4 Environmental Impacts of the Proposed Action

5.1.4.4.1 Analysis Procedure

The impact analysis is based primarily on the Federal Highway Administration (FHWA) methodology for determining visual resource change and assessing viewer response to that change (US DOT, 1988). The analysis is focused on evaluating impacts and recommending measures to minimize adverse visual effects. Central to this assessment is an evaluation of representative public views from which the Project would be most visible. To document the visual changes that would occur, visual simulations show the proposed Project from a set of 16 viewpoints selected to be representative of views toward the Project from a range of locations. The visual simulations are presented as “before” and “after” images from each of these simulation viewpoints. Presented as Figures 4 through 19 in Exhibit 22-3, the simulation images provide a clear image of the existing character and quality of the views from each of the simulation viewpoints and of the scale, and visual appearance of the changes that would be brought about by the proposed Project. The computer-generated simulations are the result of an objective analytical and computer modeling process and are accurate within the constraints of the available site and Project data.

The simulations were developed using photographs taken with a digital camera, using a wide-angle 28 mm focal length. The Photomontage module of the WindPro software program (a widely accepted and applied program used for planning and assessing wind generation projects) was used to carry out the computer modeling and rendering required to produce the images of the Project facilities that were superimposed on the photographs to create the simulations. Existing topographic and site data provided the basis for developing an initial digital model. The Applicant provided site plans and digital data for the proposed wind turbines. These were used to create three-dimensional (3-D) digital models of these facilities. These models were combined with the digital site model to produce a complete computer model of the wind farm. For each viewpoint, viewer location was digitized from topographic maps, using 5 feet as the assumed eye level. The WindPro program overlaid computer “wire frame” perspective plots on the photographs of the views from the Simulation Viewpoints to verify scale and viewpoint location. Digital visual simulation images were produced as a next step based on computer renderings of the 3-D model combined with high-resolution digital base photographs. The final “hardcopy” visual simulation images that appear in this document were produced from the digital image files using a color printer.

The visual impact assessment was based on evaluation of the changes to the existing visual resources that would result from construction and operation of the Project. These changes were assessed, in part, by evaluating the “after” views provided by the computer-generated visual simulations and comparing them to the existing visual environment. Consideration was given to the following factors in determining the extent and implications of the visual changes:

- The specific changes in the affected visual environment’s composition, character, and any specially valued qualities;
- The affected visual environment’s context;
- The extent to which the affected environment contains places or features that have been designated in plans and policies for protection or special consideration; and
- The relative numbers of viewers, their activities, and the extent to which these activities are related to the aesthetic qualities affected by the expected changes. Particular consideration was given to effects on views identified as having high or moderate levels of visual sensitivity.

Levels of impact were classified as high, moderate, and low. In general, High levels of aesthetic impacts were assigned in situations in which turbines would be highly visible in areas with sensitive viewers, and would alter levels of landscape vividness, unity, and intactness to the extent that there would be a substantial decrease in the existing level of visual quality. Moderate levels of aesthetic impact were assigned in situations in which turbines would be visible in areas with high levels of visual sensitivity in which the presence of the turbines would alter levels of landscape vividness, unity and intactness to the extent that there would be a moderate change in existing visual quality. Moderate levels of visual impact were also found in situations in which the presence of turbines in the view would lead to more substantial changes in visual quality, but where levels of visual sensitivity were moderate to low. Low levels of visual impact were found in situations where the Project would have relatively small effects on overall levels of landscape vividness, unity, and intactness and/or where existing levels of landscape aesthetic quality are low or where there are low levels of visual sensitivity.

5.1.4.4.2 Project Appearance

The physical elements of the Project are described in detail in Section 2.3 'Construction On-Site'. Exhibit 01, 'Project Site Layout', is a general site layout that indicates the locations of the proposed roads, overhead and underground transmission lines, substation, operations and maintenance facility, and other features that comprise the Project.

The Project will include up to 121 turbines. The turbines will be mounted on tubular steel towers that will be approximately 18 feet in diameter at the base and will rise to a hub height of about 213 feet. Each tower will support a nacelle that houses a drive train, gearbox, generator, and other generating equipment. The nacelles will be approximately 30 feet long, 11 feet wide and 12 feet high and will be completely sheathed in an aerodynamically shaped fiberglass or metal shell. The rotors will be attached to the front of the nacelles, which are mounted on the tops of the towers. The rotors will have three blades, and will have a diameter of 213 feet to 236 feet. Although not required for functionality, each rotor will have an aerodynamic appearing nose cone to improve its appearance. The dimensions provided here represent the range of sizes of the various turbine models being considered for this Project. The Applicant is considering several turbine models from different vendors. The final decision regarding turbine and tower dimensions is driven largely by Project economics such as turbine pricing and the performance of specific turbines under different wind conditions. Given the relatively low wind shear at the Project site, it is not anticipated that taller towers will be necessary. The primary difference among the turbine models being considered is the rotor diameter, which range from 62 meters to 80 meters. Most of the visual simulations presented here are based on a turbine with a hub height of 210 feet and a rotor diameter of 203 feet, which are representative of the dimensions of the turbines that are being considered for the Project. For two of the simulation views, simulations are provided of the turbines with dimensions at the high end of the dimension range (Exhibit 22-3, Figures Vis 4c and Vis 6c) to permit the appearance of the slightly larger turbines to be compared with that of the slightly smaller turbines that have been simulated.

The surfaces of the turbine towers, rotors, and nacelles will be neutral gray in color and will be given a finish that has a low level of reflectivity.

The power generated by the turbines will be delivered to the Project substation by means of a largely underground electric collection system. Small, pad-mounted transformers located at the base of each turbine tower will convert the electricity produced by the turbine to a transmission voltage of 34.5 kV and will connect to the underground collection lines. Each of the transformers will be housed in a metal-sided case that is approximately 8 feet wide, 8 feet long, and 8 feet high. The transformer housings will be painted in earth tone colors using paint with a low-reflectivity finish. An approximately 1.2 mile long segment of the collection system connecting the eastern and western portions of the Project may be above ground due to the large amount of power flowing through this portion of the collection system. This line would run from near the northern end of Hayward Road (String D) to near the junction of Bettas Road and Highway 97 (substation). This portion of the system would be carried on single wood poles with dual cross arms that are 40 to 50 feet tall. The overhead portion of the transmission system will utilize non-specular conductors and insulators that are non-reflective and non-refractive.

The network of roads that will provide access to each of the turbines will consist of both existing and new roads which will have a standard width of 20 feet and a compacted gravel surface. In areas with steeper slopes, cutting and filling will be required to keep grades below 15%.

The proposed operations and maintenance (O&M) facility is planned for an approximately 2-acre site located in the flat area along the north side of the southern end of Bettas Road in the area just west of its intersection with Highway 97. This area is visible in Exhibit 22-3, Photo 6 on Figure 3c. To construct this facility, the existing shrub-steppe vegetation on the site will be removed and the site will be graded and fenced. The primary structure in the O&M facility will be a main building that is approximately 50 feet wide, 100 feet long, and 35 feet high. This building will house offices, spare parts storage, and a shop area. This building will be steel framed and will have steel siding that will be painted with low reflectivity paints in earth-tone colors that blend well with the surrounding landscape. The outdoor areas devoted to parking and vehicle turning will be paved with asphalt in areas that are heavily used and with gravel in less frequently used areas. The color of the asphalt and gravel used on the site will be selected to minimize contrast with the colors of the surrounding landscape. Naturalistic groupings of indigenous trees and shrubs will be established in the area surrounding the O&M facility to provide partial screening and to integrate it into the landscape setting.

Two sites have been proposed as locations for Project substations. One of the sites would be located adjacent to the proposed O&M facility along the north side of the southern end of Bettas Road just west of its intersection with Highway 97, and would tie into the adjacent PSE 230-kV Rocky Reach to White River transmission line. The other site is located approximately 800 feet southwest of this site, on the sloped area south of Bettas Road and immediately north of the BPA transmission corridor. It is possible that either or both of these sites would be developed. In either case, the substation would occupy an area of 2 to 3 acres that would need to be cleared and graded. Because of the sloped terrain, considerable grading would be required to accommodate a substation on the site adjacent to the BPA corridor. The primary elements of a substation on either site would include a small control building, large transformers, structures housing switchgear, bus work, steel support structures, a transmission take-off tower, lightning suppression structures, outdoor lighting, and a perimeter chain link fence. The tallest structures would be the transmission take-off structures, which would be on the order of 60 feet high. The bus work and steel support structures would be in the range of 40 to 45 feet high. The transformers, switchgear structures, and control building would be no more than 12 to 15 feet in height. Although the substation control buildings would be painted an earth-tone color using low-reflectivity paints, the substation equipment would have a standard low reflectivity neutral gray finish.

5.1.4.4.3 Light and Glare

To respond to the Federal Aviation Administration's aircraft safety lighting requirements, the Project will be marked with lights that flash white during the day (at 20,000 candela) and red (at 2,000 candela) at night. These lights are designed to concentrate the beam in the horizontal plane, thus minimizing light diffusion down toward the ground and up toward the sky. The exact number of turbines that will require lighting will be specified by the FAA after it has reviewed final Project plans; however, typically, FAA has required that warning lights be mounted on the first and last turbines of each string, and every 1000 to 1400 feet on the turbines in between. Aside from the aircraft warning lights, the turbines will not be illuminated at night.

At the O&M facility, outdoor night lighting will be required for safety and security. This lighting will be restricted to the levels required to meet safety and security needs. Sensors and switches will be used to keep lights turned off when not required. All lights will be hooded and directed to minimize backscatter and illumination of areas outside the O&M site. The lighting, paving and landscaping mitigation measures proposed for the O&M facility would be applied to the substation(s) as well.

5.1.4.4.4 Construction

The on-site activities that will be required as a part of Project construction are described in Section 2.3 'Construction On-Site'. Project construction is expected to take place over a period of 12 months. During that time, a staging area will be set up at the site of the proposed O&M facility along Bettas Road just west of Highway 97 that will be used for storage of turbine components, equipment, and vehicles. Grading will be required to create access roads and 30 by 60-foot flat, gravel-covered areas at the base of each tower site that will accommodate the cranes required to erect the turbines.

5.1.4.5 Assessment of Visual Effects

5.1.4.5.1 Short Term Construction Impacts

During the construction period, large earth moving equipment, trucks, cranes, and other heavy equipment will be highly evident features in views toward the Project site from nearby areas. At some times, small, localized clouds of dust created by road-building and other grading activities may be visible at the site. Because of the construction-related grading activities, areas of exposed soil and fresh gravel that contrasts with the colors of the surrounding undisturbed landscape will be visible. In close-at-hand views, particularly those seen by travelers on the segment of Highway 97 that passes through the Project site, and those seen from the closest residences, the visual changes associated with the construction activities will be highly visible and will have a moderate to high level of visual impact. From more distant viewing locations, the visual effects will be relatively minor and will have little or no impact on the quality of views. It is important to note that because construction activities take place over a period of only 12 months, the construction impacts will be relatively short in duration. After construction, is complete, all construction-related debris will be removed from the site and any other non-road surface areas disturbed during construction will be replanted to recreate the appearance of their original vegetative cover.

5.1.4.5.2 Long-Term Impacts During the Project Operation Phase

The Project's aesthetic impacts during the operational period are summarized in Table 5.1.4-2, and presented in more detail in Table 5.1.4-3. As these tables indicate, the Project has the potential to create High levels of visual impact at several points along Highway 97, at the residential area along Sagebrush Road in the Highway 97 corridor, and in views from residences in the ridgelands east of Highway 97. Moderate levels of impact would occur at other points along Highway 97, in views from residences along Bettas Road, in views from Highway 10, and in views from the Sunlight Waters residential development. From all the other areas evaluated, the Project's impacts on aesthetics would be minimal.

Table 5.1.4-2
Summary of Impacts to Visual Resources During Project Operation

Viewing Area	Existing Visual Quality	Visual Sensitivity	Distance to Closest Turbines (in miles)	Number of turbines visible	Potential Level of Visual Impact
Highway 97 Corridor					
Simulation View 1	Moderately Low	Moderate	0.8	Approximately 40	Low to Moderate
Simulation View 2	Moderate	High	0.4	9	Moderate to High
Simulation View 3	Moderate	High	0.5	5	Moderate
Simulation View 4	Moderately Low to Moderate	Moderate to High	0.9	More than 70	Moderate to High
Ridgelands East of Highway 97 Simulation View 5	High	Moderate	0.7	Approximately 40	Moderate to High
Bettas Road Simulation View 6	Moderately High	Moderate to High	0.5	10	Moderate
Highway 970/Hidden Valley Simulation View 7	Moderately High	Moderate	3	11	Low
Hayward Hill (no simulation prepared)	Moderately Low to Moderate	Low			Low
Highway 10 Corridor					
Simulation View 8	Moderate	High	1.25	7	Moderate
Simulation View 9	Moderate	High	1.5	14	Moderate
Simulation View 10	Moderately High	High	2	11	Low
Iron Horse Trail Simulation View 11	Moderately High	Low	2	Over 30	Low
Thorp Simulation View 12	Moderate	Moderate	3	Over 20	Low

Table 5.1.4-2 Summary of Impacts to Visual Resources During Project Operation					
Sunlight Waters Simulation View 13	Moderately High to High	Moderate	2.8	Over 40	Moderate
I-90 Simulation View 14	High	Moderate	2.5	Over 20	Low
Upper Kittitas Valley Simulation View 15	Moderately High to High	Moderate	5	116	Low
Ellensburg Simulation View16	High	Low	13	116	Low

Table 5.1.4-3 Analysis of Impacts to Visual Resources During Project Operation				
Simulation Views	**Existing Level of Visual Quality**	**Level of Visual Sensitivity**	**Assessment of Visual Change**	**Potential Level of Visual Impact**
Highway 97 Corridor				
Simulation View 1 (Exhibit 22-3, Figures 4a and 4b) Highway 97 at Ellensburg Ranches Road looking north	Moderately Low	Moderate	Approximately 40 turbines will be visible on the ridge tops in the center of the view at distances of 0.8 to 3 or more miles. Although the turbines will in reality be considerably taller than the existing transmission towers, because they will be sited behind the transmission towers, they will, for the most part, appear to be similar to them in scale. About half the turbines will be visually absorbed by the landscape backdrop to some degree, but the other half will be silhouetted against the sky, increasing their visual salience. The presence of the turbines will reduce the scene's degree of intactness to some extent by introducing a large number of highly visible engineered vertical elements, but because the pattern that the turbines will form will be consistent with the pattern created by the existing transmission towers, they will not substantially change the scene's degree of visual unity.	Low to Moderate
Simulation View 2 (Exhibit 22-3, Figures 5a 5b, and 5c) Highway 97 north of gravel pit looking north	Moderate	High	From this viewpoint, 9 turbines will be visible on top of the ridge defining the east side of the ridge at distances ranging from 0.4 to 1.0 miles. Because the turbines will be seen against the sky at relatively close range, they will be highly visible in this view. These turbines will be new and visually dominant constructed features in a landscape setting that now has a relatively high degree of visual unity, and will reduce that unity to a degree that will substantially alter the scene's existing character. It can be argued that because the turbines have an attractive design and are sited along the ridgeline in an orderly and uncluttered way, that their presence will not necessarily create a change the in the setting's existing moderate level of visual quality. Exhibit 22-3, Figure 5c simulates the turbines as they would appear with use of brown paint. Under this alternative, the contrast of the turbines with their sky backdrop and their visual salience and effect on the	Moderate to High

Table 5.1.4-3 **Analysis of Impacts to Visual Resources During Project Operation**				
			view would be intensified. It is likely that the effects of the Project on views of northbound travelers along this area of the highway will be a little less than suggested by this simulation because the photograph on which the simulation is based was taken from the west side of the road, where the ridge top area is more visible. On the east side of the road where northbound travelers would be located, views toward the ridgetop and the turbines would be constrained to some degree by the proximity of the slope to the side of the road.	
Simulation View 3 (Exhibit 22-3, Figures 6a and 6b) Highway 97 at northern end of Bettas Road looking south	Moderate	High	10 turbines will be prominently visible in the driver's cone of vision in the ridgetop area along the east side of the road. These turbines will be located at distances ranging from approximately 0.5 to 1.0 miles from this viewpoint. Because the turbines will be seen against the sky at relatively close range, they will be highly visible in this view and will reduce the level of visual unity to a degree that will substantially alter the scene's existing character Because the turbines have an attractive design and will be arrayed along the ridgeline in an orderly and uncluttered way, that their presence will not necessarily create a substantial change the in the setting's existing moderate level of visual quality.	Moderate
Simulation View 4 (Exhibit 22-3, Figures 7a and 7b) Sagebrush Road looking north	Moderately Low to Moderate	Moderate to High	A total of more than 70 turbines will be visible to the east and north at distances ranging from 0.9 to over 4 miles from this viewpoint. Although most of the turbines will be seen against hills in the backdrop, which will reduce their visual salience to some degree, a number of the closer turbines and many of the turbines to the north will be seen silhouetted against the sky, which will increase their noticeablity. The high visibility of the many of the turbines and the large numbers of turbines involved will reduce the visual intactness and unity of this view.	Moderate to High
Ridgelands East of Highway 97				
Simulation View 5 (Exhibit 22-3, Figures 8a and 8b) View looking south from residence in	High	Moderate	A total of approximately 40 turbines will be visible from this viewpoint. Three strings of turbines will be visible in the middle ground, and an additional two strings will be visible in the far middle ground. Because of the elevated viewing position, these turbines will be seen against the backdrop of the ridgetop's ground surface. The contrast between the light	Moderate to High

Table 5.1.4-3 **Analysis of Impacts to Visual Resources During Project Operation**				
Section 35 at upper end of Elk Springs Road			color of the turbines and the darker color of the ground will create a moderate level of visual contrast, increasing the visibility of the turbines. Because of the elevated position of this viewpoint and its distance from the turbines, the turbines' apparent scale will be consistent with that of other features in the setting. The presence of the turbines will have little effect on the vividness of this view, but will reduce its overall sense of unity and intactness.	
Bettas Road				
Simulation View 6 (Exhibit 22-3, Figures 9a and 9b) View looking north along northern portion of Bettas Road	Moderately High	Moderate (views of travelers on road) High (views from residences	10 turbines that are a part of String G will be visible along the top of the ridgeline, as close as 0.5 mile from this viewpoint. Although the turbines will be seen against the sky, their neutral gray color will reduce their contrast with the sky backdrop. The apparent height of the turbines will be relatively consistent with the heights of the trees in the foreground of the view, reducing the degree of scalar contrast. The presence of the string of turbines that accentuates the ridgeline could be thought of enhancing the vividness of this view. Because only a single string of turbines that have a clean design and form an orderly composition will be visible, the visual unity of this view will not be substantially reduced. However, the presence of the turbines will reduce the level of intactness, contributing to the creation of a moderate level of visual impact.	Moderate
Highway 970/Hidden Valley				
Simulation View 7 (Exhibit 22-3, Figures 10a and 10b) View looking east from viewpoint on northern portion of Hidden Valley Road	Moderately High	Moderate	11 turbines that are a part of String G will be visible on the top of the ridgeline visible in the distance nearly three miles away from this viewpoint. Although the turbines will be seen against the sky, their neutral gray color will reduce their contrast with the sky backdrop. Although the turbines appear taller than the trees and transmission tower along the ridgetop, at this distance, their apparent slimness and their neutral color causes them to fade into the sky backdrop, downplaying any scalar contrasts. The presence of the turbines has little effect on the vividness and unity of this view, but creates a slight decrease in the overall level of intactness.	Low
Hayward Hill				

Table 5.1.4-3 Analysis of Impacts to Visual Resources During Project Operation				
Refer to photos 18 and 19 on Exhibit 22-3, Figure 3h	Moderately Low to Moderate	Low	Because of the low level of visual sensitivity of views in this viewing area, no visual simulations were prepared. In light of the low level of viewer sensitivity and the unexceptional visual resource values, it can be assumed that the level of the Project's impacts on this area's aesthetic values would be low.	Low
Highway 10 Corridor				
Simulation View 8 (Exhibit 22-3, Figures 11a and 11b) View looking west from a viewpoint along Highway 10 at Hayward Road	Moderate	High	A total of 7 turbines from Strings A, B, and D will be visible on the ridgeline located 1.25 miles and further from this viewpoint. The turbines will be seen against the sky, but their neutral gray color will reduce their contrast with the sky. Because of their low level of contrast and their apparent slimness, they will appear to fade into the sky backdrop to some degree, reducing the sense of a contrast in scale with the surrounding landscape. The presence of the turbines will have little effect on the vividness of this view, but would create a small degree of change in the view's overall levels of unity and intactness.	Moderate
Simulation View 9 (Exhibit 22-3, Figures 12a and 12b) View looking east from viewpoint along Highway 10 between Morrison Canyon and Swauk Creek	Moderate	High	14 turbines from Strings B and C will be visible on the ridgeline located 1.5 miles and further from this viewpoint. The turbines will be seen against the sky, but their neutral gray color will reduce their contrast this backdrop. Because of their low level of contrast and their apparent slimness, they will appear to fade into the sky to some degree, reducing the sense of a contrast in scale with the surrounding landscape. The presence of the long line of turbines may create a slight increase in the vividness of this view, may have a small adverse effect on the view's unity, and would have a more substantial effect on the view's level of intactness.	Moderate
Simulation View 10 (Exhibit 22-3, Figures 13a and 13b) View looking east from viewpoint along Highway 10 west of Swauk Creek	Moderately High	High	11 turbines from Strings A, B and C will be visible on the ridgeline located approximately 2 miles and further from this viewpoint. The turbines will be seen against the sky, but their neutral gray color will reduce their contrast with this backdrop. At this distance, because of their low level of contrast and their apparent slimness, they will appear to fade into the sky to a large degree, greatly reducing their visual salience and any sense of scalar contrast with the surrounding landscape. Because of their low level of visual salience, the turbines will have relatively small effects on this view's	Low

Table 5.1.4-3 Analysis of Impacts to Visual Resources During Project Operation				
			levels of vividness, unity, and intactness.	
Iron Horse Trail				
Simulation View 11 (Exhibit 22-3, Figures 14a and 14b) View looking north from a viewpoint along the Iron Horse/John Wayne Trail at Taneum Road	Moderately High	Low	Over 30 turbines from Strings A, B and C and from strings on ridges located further to the north will be visible on the ridgelines located 2 miles and further from this viewpoint. The closer turbines will be seen against the sky, but their neutral gray color will reduce their degree of contrast with this backdrop The more distant turbines will be seen against the slopes of distant hills, and under some lighting conditions, may contrast with their backdrop, increasing their visual salience. The turbines visible in this view will have little effect on this view's level of vividness, but will reduce its level of unity to a small degree and its level of intactness to a slightly greater extent. Because the sensitivity of this view to visual change is low, the moderate degree of visual change will result in a low level of overall visual impact.	Low
Thorp				
Simulation View 12 (Exhibit 22-3, Figures 15a and 15b) View looking north from the Thorp Highway in the center of the community of Thorp	Moderate	Moderate	Over 20 turbines from Strings A, B and C and from strings on ridges located further to the north will be visible on the ridgelines located 3 miles and further from this viewpoint. Most of the turbines will be seen against the sky, but their neutral gray color will reduce their degree of contrast with this backdrop, and at this distance, they will have a relatively low level of visual salience. Some of the turbines will be seen in front of the tops of the peaks of the Stuart Range, but because of their relatively low level of bulk at this viewing distance, will not detract from the views toward the Stuarts to a substantial degree. The turbines visible in this view will have little effect on this view's levels of vividness, unity and intactness and will result in a low level of overall visual impact to this view.	Low
Sunlight Waters				
	Moderately High to High	Moderate	Over 40 turbines from many of the Project's turbine strings will be visible on the ridgelines located 2.8 miles and further to the east and northeast of this viewpoint. All of the turbines will be seen against the dark, forested slopes of distant hills, and under some lighting conditions, may contrast with their backdrop, increasing their visual salience. The presence of the turbines will have little effect on the vividness of this view, but will have	Moderate

Table 5.1.4-3 Analysis of Impacts to Visual Resources During Project Operation				
			some adverse effect on the view's unity, and because of the visual clutter introduced by the large number of turbines, will have a more substantial effect on the view's level of intactness. In light of this view's moderate level of sensitivity, the overall level of visual impact will be moderate.	
I-90				
Simulation View 14 (Exhibit 22-3, Figures 17a, 17b, and 17c) View looking northeast from I-90 at Springwood Ranch	High	Moderate	Over 20 turbines from Strings A, B C and E and from strings on ridges located further to the north and east will be visible on the ridgelines located 2.5 miles and further from this viewpoint. Some of the turbines will be seen against the sky, but their neutral gray color will reduce their degree of contrast with this backdrop The more distant turbines will be seen against the slopes of distant hills, and under some lighting conditions, may contrast with their backdrop, increasing their visual salience. The turbines visible in this view will have little effect on this view's level of vividness, but will reduce its level of unity and intactness to a small degree. This small degree of visual change, when combined with the moderate level of visual sensitivity, will result in a low level of overall visual impact. Exhibit 22-3, Figure 17c is a simulation that illustrates the Project's visual effects under a scenario in which the turbines would be painted with an earth tone color rather than a neutral gray. In this view, the visual contrast of the turbines seen against the backdrop of distant hills would be lower, but the contrast of the turbines seen against the sky would be slightly higher. Although the relative visibility of the various turbines would change a little bit with the use of earth tone colors, the overall level of impact on this particular view would remain the same.	Low
Upper Kittitas Valley				
Simulation View 15 (Exhibit 22-3, Figures 18a and 18b) View looking northwest from Lower Green Canyon Road	Moderately High to High	Moderate	Nearly all of the Project's turbines will be visible on the ridgelines located in the background zone of this view, 5 miles and further from this viewpoint. Most of the turbines will be seen against the slopes of the ridges and more distant hills, and under some lighting conditions, may contrast somewhat with their backdrop, but at this distance, this contrast has little effect on their overall visual salience. Because the visual salience of the turbines will be relatively low, the turbines will have little effect on this	Low

Table 5.1.4-3
Analysis of Impacts to Visual Resources During Project Operation

			view's level of vividness, unity and intactness and will have only a small overall visual impact on this view.	
Ellensburg				
Simulation View 16 (Exhibit 22-3, Figures 19a and 19b) View looking northwest from Reed Park in Ellensburg	High	Low	Essentially all of the Project's turbines will be visible on the ridgelines located in the background zone of this view, 13 miles and further from this viewpoint. Nearly all of the turbines will be seen against the slopes of the ridges and more distant hills, and under some lighting conditions, may contrast somewhat with their backdrop, but at this distance, this contrast has little effect on their overall visual salience. Because the visual salience of the turbines will be low, the turbines will have little effect on this view's level of vividness, unity and intactness and will have only a small overall visual impact on this view.	Low

5.1.4.6 Light and Glare

Based on experience at the Stateline and Nine Canyon Wind projects in Washington, it appears that the white flashing lights that will be mounted on the turbines and flash during daylight hours as required by the FAA for daytime aircraft safety will be visible, but not particularly intrusive to viewers in the areas surrounding the Project and are thus unlikely to create a moderate or high level of visual impact. The flashing red lights (2,000 candela) that the FAA requires be operated at nighttime will introduce a new element into the Project area's nighttime environment. At present, the Project site and surrounding area are relatively dark at night. The major sources of light in the area are floodlights and other outdoor lights at the residential properties located in the vicinity of the Project area, and headlights on the surrounding highways. The flashing red lights will be most noticeable in the areas within a mile or so of the Project, and are likely to be perceived as having an adverse effect on views from residential properties in these areas.

The Project's O&M facility and substation(s) will create sources of light in areas where there are no nighttime sources of light other than the headlights of vehicles on adjacent roadways. However, the impacts of the lighting associated with these facilities will not be substantial. As indicated previously, some night lighting will be required for operational safety and security, but mitigation measures will be put into place to restrict this lighting to the minimum required and to attenuate its effects. High illumination areas not occupied on a regular basis will be provided with switches or motion detectors to light these areas only when occupied. At times when lights are turned on, the lighting will not be highly visible offsite and will not produce offsite glare effects because lighting will be restricted by specification of non-glare fixtures, and placement of lights to direct illumination into only those areas where it is needed. The naturalistic plantings of indigenous trees and shrubs to be installed in the areas around these facilities will further reduce the visibility of their night lighting.

5.1.4.7 Mitigation Measures

Mitigation measures that have been made an integral part of the Project's design include:

- During the construction period, active dust suppression will be implemented to minimize the creation of dust clouds;
- When construction is complete, areas disturbed during the construction process will be restored to natural appearing conditions;
- The wind turbine towers, nacelles, and rotors used will be uniform and will conform to the highest standards of industrial design to present a trim, uncluttered, aesthetically attractive appearance;
- The turbines will have neutral gray finish to minimize contrast with the sky backdrop. Comparison of simulations of towers with a neutral gray finish with simulations of towers with an earth-tone brown finish (Simulation Views 2 and 14) indicate that although the earth tone finish reduces visual contrast in views in which the turbines are seen against a landscape backdrop, it accentuates the visibility of the turbines in views in which they are seen against the sky. Because the turbines are most frequently seen against the sky, particularly in close range views where visual concerns are the greatest, the gray finish is the better choice for minimizing Project aesthetic impacts;
- A low-reflectivity finish will be used for all surfaces of the turbines to minimize the reflections that can call attention to structures in a landscape setting;
- Because of the prevailing wind conditions and the high level of reliability of the equipment being used, the rotors will be turning approximately 80-85%of the time, minimizing the

amount of time that turbines will appear to be non-operational, a condition that the public often finds to be unattractive[8];

- The small cabinets containing pad-mounted equipment that will be located at the base of each turbine will have an earth-tone finish to help them blend into the surrounding ground plane;
- The only exterior lighting on the turbines will be the aviation warning lighting required by the FAA. It will be kept to the minimum required intensity to meet FAA standards. It is anticipated that the FAA will soon be issuing new standards for marking of wind turbines that will entail lighting far fewer turbines in a large wind farm than is now required, and having all the lights be synchronized. These potential regulatory changes are being closely monitored, and if, as is likely, they are made before Project construction begins, the aviation safety marking lighting will be redesigned to meet these standards;
- Nearly all of the Project's electrical collection system will be located underground, eliminating visual impacts;
- On the 1.2 mile segment of the electrical collection system that will be above ground, simple wooden poles, non-specular conductors (i.e. conductors that have a low level of reflectivity), and non-reflective and non-refractive insulators will be used. This line parallels two existing sets of overhead high voltage transmission lines and a paved road;
- To the extent feasible, existing road alignments will be used to provide access to the turbines, minimizing the amount of additional surface disturbance required. Access road widths will be restricted to 20 feet. The roads will have a gravel surface and will have grades of no more than 15%, minimizing erosion and its visual effects;
- The O&M facility building will have a low-reflectivity earth-tone finish to maximize its visual integration into the surrounding landscape;
- The colors of the asphalt and gravel used for circulation and parking areas at the O&M facility will be selected to minimize contrast with the site's soil colors;
- Outdoor night lighting at the O&M facility and the substations will be kept to the minimum required for safety and security, sensors and switches will be used to keep lighting turned off when not required, and all lights will be hooded and directed to minimize backscatter and off-site light trespass;
- At the substation(s), all equipment will have a low reflectivity neutral gray finish to minimize visual salience;
- All insulators in the substations and on takeoff towers will be non-reflective and non-refractive;
- The control buildings located at each substation would have a low-reflectivity earth-tone finish;
- The chain link fences surrounding the substations will have a dulled, darkened finish to reduce their contrast with the surroundings;
- In the areas surrounding the O&M facility and substations, naturalistic groupings of indigenous trees and shrubs will be established to provide partial screening and to visually integrate the facilities into their landscape settings.

5.1.5 Recreation

The listing of recreational sites within the area affected by construction and operation of the facility and description of impacts and of construction and operation are contained in Section 5.3.5, 'Public Service and Utilities-Parks and Recreation Facilities'.

[8] This finding is supported by research by Thayer and Freeman (1987), among others.

5.1.6 <u>Historical and Cultural Preservation</u>

5.1.6.1 Introduction

RCW 27.53.060 provides protection of cultural resources on private and public lands in the state of Washington.

A cultural resources evaluation was implemented to identify and assess any potential impact on cultural resources located within the Kittitas Valley Wind Power Project area. These resources may include previously documented or undocumented historic, cultural and archaeological resources as well as traditional cultural properties. To determine if the Project area contains any significant cultural deposits, Lithic Analysts was contacted to conduct an extensive and systematic on-ground cultural resource survey of the proposed Project area. This included a pedestrian archaeological survey of all turbine generator and turbine string locations as well as the proposed Project substations, existing and new access roads, and any overhead or underground electrical lines. The pedestrian survey was conducted in October 2002.

5.1.6.2 Regional Context

The Project area is located approximately about 12 miles northwest of Ellensburg, and 12 miles southeast of Cle Elum. The Project sits on a series of ridge tops running north/south above the upper Yakima River, in the area often called the Kittitas Valley. The Yakima River flows over 200 miles from its headwaters at the outlet of Keechelus Lake near Snoqualmie Pass to the confluence with the Columbia River at Richland. The upper Yakima River or Kittitas Valley is that portion of the river stretching north of the Yakima Canyon to the headwaters. After the river passes from its high mountain source eastward down from the mountains, the Kittitas Valley opens up east of Cle Elum to a broad valley floor as the landscape sheds layer after layer of green to reveal a scenery of golden browns and yellows. The Wenatchee National Forest is north of the Project area, and the Columbia River is due east.

The Project area receives an annual effective precipitation rate of less than nine inches. The Project area lies within the *Artemisia tridentata/Agropyron spicatum* association of the shrub-steppe vegetation environmental zone (Franklin and Dyrness, 1988:217). This zone occupies the center of the Columbia Basin Province and extends west to the foothills of the Cascade Range. It is often referred to as the Columbia Plateau, an area of about 63,000 square miles of the Columbia River drainage basin.

The Columbia River Basalt formation dominates the underlying geology of this Project area. This formation was the result of an outpouring of a long sequence of Miocene lava flows covering an area of over 500,000 square miles. Individual lava flows were about 27 to 100 feet thick, with a total thickness of 2,000 to 5,000 feet (Franklin and Dyrness, 1988:29). Interspersed between layers of basalt are interbeds of sedimentary deposits called the Ellensburg Formation. It is within these layers that opal, chalcedony, jasper, and chert are found. Prehistoric knappers utilized these lithic materials for flaked stone tool manufacture. Glaciers, 2,000,000 to 10,000 years ago, further carved the Project area, helping to create the narrow, rocky ridges upon which the proposed wind turbines will be erected. For a detailed discussion concerning the geology of the Project area, see Section 3.1, 'Earth'.

5.1.6.3 Prehistory

Culturally, the area is referred to as the Southern Plateau, which stretches from the Okanogan Highlands in the north to the Bitterroots in the east, the southern edges of the Deschutes and John Day Rivers in the south, and the crest of the Cascade Mountains in the west. Within the Southern Plateau, the Kittitas or Upper Yakima and others occupied the subregion called the South-central Plateau (Ames, et.al., 1998). During ethnographic times, the predominant language of the Southern Plateau was Sahaptin, of which the Kittitas spoke the NW dialect along with the Yakima, the Klickitat, the Upper Cowlitz or Taitnapam and the Upper Nisqually (Kincade, et.al., 1998).

There are numerous chronological sequences or phases that have been proposed for the archaeological record on the Columbia Plateau. These assigned phases generally are an effort to place documented cultural material remains within a certain framework. Chronologies usually rely heavily on projectile point characteristics or morphology—instead of technology—to place an archaeological site with a particular prescribed phase. No attempt has been made here to discuss Plateau cultural history within such a context. Rather, the many archaeological studies for the area have been synthesized to arrange Plateau cultural history into three general periods ranging from about 11,500 years ago to A.D. 1720 (Adapted from Ames, et. al., 1998, unless otherwise noted). Following is a brief summary of these time frames. They are strictly academic and do not necessarily reflect tribal viewpoints.

5.1.6.3.1 Period I. 11,500 years ago to 5000/4400 B.C.

Period IA dates from 11,500 to 11,000 years ago. The Richey-Roberts Clovis Cache is the only known site on the Southern Plateau containing intact deposits of this age. Other evidence of these earliest occupations consists entirely of surface finds. There is little available evidence of cultural continuity from Clovis to later-dating periods, though a strong connection with other regions to the south and east is implied. Period IA sites have not been identified in the South-central Plateau.

Period IB dates from 11,000 years ago to 5000/4400 B.C. Post Clovis cultures practiced a broad-spectrum hunter-gatherer subsistence strategy consisting of high seasonal and annual mobility, low population densities, and a technology suited for maximum flexibility. In that economy, wide ranges of foods were exploited. People moved frequently and left no evidence of dwellings or structures.

The great majority of Period IB sites, particularly those dating prior to 7000 B.C., are concentrated in the central and eastern portions of the region. Most major sites are located along the Columbia and Snake Rivers and tributaries; sites are also documented in the surrounding plateaus and mountainous uplands, indicating that all regional environments were used. A documented Period IB archaeological site is located at Ryegrass Coulee near Vantage, due east of the Project area on the Columbia River

5.1.6.3.2 Period II. 5000/4400 to 1900 B.C.

Semi subterranean pit houses appear in the archaeological record for the first time along with evidence of increased exploitation of certain nutritious roots and salmon. Less investment is made in the manufacture of stone tools as judged by their decline in quality. Semi subterranean pit houses are seven to eight meters across, circular to rectangular in plan view, and one to two meters deep. The houses generally lack evidence of superstructures and their contents include clusters of large hopper mortar bases and anvils resting on their floors. The presence of semi subterranean pit houses likely represents a region-wide shift in settlement patterns to some form of semisedentism. However, there are few dated dwellings in the region 2000 to 1800 B.C.

5.1.6.3.3 Period III. 1900 B.C. to A.D. 1700.

The beginning of this period is marked by the widespread reappearance of pit houses, increasing heavy reliance on fishing and storage of salmon, intensive exploitation of camas, and evidence of land use patterns that persisted into the 19th century. These land use patterns include seasonal (usually winter-early spring) villages in the canyons and exploitation of uplands and mountains from special use camps during the summer and fall.

By 500 B.C., pit houses were common and highly variable in size with evidence of superstructures. Large pit houses (diameters greater than 12 meters) became more common after A.D. 1000. Large concentrations of houses – towns and villages – also appeared in the record by A.D. 500; longhouses entered the archaeological record after A.D. 500. Like pit houses, net weights became quite common suggesting greater use of nets. While there is very little evidence of food storage pits in Periods I and II, storage pits with salmon remains are seen at the beginning of Period III. Period III is the only period in Plateau prehistory that is also represented by fiber and wood artifacts and other perishables.

Pit house sites are found along the Columbia and its tributaries and clusters of house pits have been located on terraces of very small streams that flow into larger rivers and in totally unexpected places.

<u>Sub period IIIA. 1900 B.C. to A.D. 1</u>
This sub period in the west-central Plateau reveals: increased population and sedentism, changes in subsistence patterns, large riverine villages and the appearance of communal villages, larger and more functional artifact assemblages, and an increase in trading of non-local items utilizing pre-existing trade networks. A greater diversity in the physical styles of housing and the larger numbers of dwellings documented during this period likely reflect an expanding regional population base.

Artifact assemblages are dominated by expedient tools, and salmon are a dominant component of faunal assemblages. Large mammals are also a principal source of food. Seasonal root and vegetable food gathering and raw material extraction were among the prominent activities pursued from upland camps.

<u>Sub period IIIB. A.D. 1 to 1720</u>.
This sub period marks the appearance of the ethnographically defined winter village pattern. By A.D. 1, pit houses are found among most salmon-bearing rivers and streams, and upland camps and use areas occur in expanded numbers. Hunting and hunting-related activities, plant gathering and processing and lithic quarries and collection areas are among the most common of site occurrences in these areas. The first documented examples of longhouses appear during Sub period IIIB.

The longhouse at Avy's Orchard (East Wenatchee), dated to A.D. 889, was a semi subterranean structure, implying an evolution to a surface structure found later. This change was most likely linked to the adoption of an equestrian lifeway over most of the region after A.D. 1720. Even though there were some changes in housing during sub period IIIB, the circular, semi subterranean pit house or mat lodge remained the dominant form of housing. These were easily adapted to a surface structure with the introduction of the horse and increase in settlement mobility. The number and diversity of nondwelling structures, such as sweatlodges, also increased during this period.

Hunn (1990) states that the Plateau way of life remained "fundamentally the same" throughout prehistory until the rapid changes brought about by European American influences during the 1700s and later. Any changes noted represent subtle shifts of emphasis rather than profound redesign of Plateau economic and social patterns. As stated by Kirk and Daugherty (1978), culture change proceeded at a modest pace through the ages into the historic period. Events that drastically altered the subsistence patterns in Plateau life included the introduction of the horse, the spread of diseases, the fur trade and European American emigration onto native land (Hunn' 1990).

5.1.6.4 Ethnography/Ethnohistory

As part of the Plateau cultural group, the Kittitas utilized a riverine settlement pattern, based upon sharing of diverse resources among bands of related and extended family groups. Beginning in April with root gathering—before the spring Chinook run at the Dalles—they followed a subsistence cycle referred to as the seasonal round, traveling to and from resource procurement grounds. Through spring, summer and fall, they gathered and processed various foods contained within the surrounding areas, including camas, bitterroot, lomatium and other roots, berries, fish, deer, elk and medicinal herbs and other plants and animals (Hunn 1990).

Celilo Falls and The Dalles, great fishing and trading centers, were located down river on the Columbia. Celilo Falls was the principal fishing area for the whole region. There were many other Columbia River fisheries all up and down the river—one at Priest Rapids, for example. Trading and fishing at The Dalles attracted not only the Kittitas, but people from as far away as the Northwest Coast, with trade items available from the Great Plains and Northern California. The Kittitas followed the trails from the Upper Yakima River through Union Gap and on south to Celilo. Other fisheries utilized by the Kittitas during the summer and early fall were located to the northwest at the outlets of Lakes Cle Elum, Keechelus, and Kachess—Lake Cle Elum being the largest (Schuster, 1990). In addition, fishing sites are found along the entire length of the Yakima River, and it is likely that campsites along many stretches in the Kittitas Valley were used for plant gathering and processing as well (DePuydt, 1990).

During ethnographic times, the Kittitas maintained close ties to both Sahaptin and Salish-speaking tribes (Ray 1936; Prater, 1981; Miller and Lentz, 2002), particularly the Wenatchee and Snoqualmie. The Kittitas were expert traders and maintained particularly strong trade relations with the Snoqualmie, and were known to winter with them at their village below Snoqualmie Falls (Prater, 1981). The Kittitas resided all along the upper Yakima River from near Cle Elum Lake to the Yakima Canyon. Camas could be dug near the village located at the mouth of the Teanaway River, also known as a gathering place to trade, gamble, play games and race horses (Schuster, 1975). There were many other villages and well-used trails in the Kittitas Valley (Ray, 1936). Ray placed nine villages in there, two located near the Project area. One village (kła'ła) was located about one mile above present-day Thorp, opposite the mouth of Taneum creek. This was the largest Kittitas village, with a population of approximately 500. The other (ti'plas) was located at the mouth of Swauk Creek, with a population of approximately 50 people.

As it is today, the Kittitas Valley for centuries served as a major transportation corridor across the region. Many trails dotted the local landscape, connecting the villages located at the head of Yakima Canyon with the area west of the Cascades. One trail (Ray, 1936) followed the southern banks of the Upper Yakima River west to the upper reaches of the Cle Elum River. Trails extended north from the Yakima River trail into the mountains and to Wenatchee. Another crossed from the mouth of Naneum Creek to Reecer Canyon and then over to Swauk Creek well above the proposed Project area. Portions of present-day Interstate 90 (Prater, 1981) west of Thorp were literally constructed over the old ancient Indian trail leading westward across the mountains via Yakima and Snoqualmie Pass. Naches Pass was used by the Kittitas and other Yakima to reach Puget Sound to trade at Fort Nisqually (Glauert and Kun,z 1976).

5.1.6.5 Historic Setting

The horse arrived in the Kittitas Valley around 1740, after being traded by the Shoshone to other Plateau Indians and then to the Kittitas. With the resulting increase in mobility, they could then travel greater distances, often to the Great Plains in pursuit of buffalo or to intertribal trade centers and social gatherings. Indians enjoyed competition in horsemanship. Skill in handling became a source of prestige. Status measurements changed and wealth was counted in horses, which thrived on upland grasses on the Plateau. Plateau people were thus influenced by the plains culture and adopted many of their practices, such as dress, dancing style, housing style, decorative beaded horse garments, European trade goods, and changes in inheritance patterns (Meinig 1968, Schuster 1990). Even so, riverine environments remained important and most groups retained their previous subsistence customs. Although horses and European trade items were acquired in the early part of the 18th Century, actual European-American contact began with the Lewis and Clark Expedition in fall 1805, well south of the Project area.

Fur traders soon followed Lewis and Clark, and in 1811 David Thompson placed a marker for the North West Company of Canada at the mouth of the Snake River, claiming the territory for Great Britain. By 1818, North West Company (later merged with Hudson's Bay Company in 1821) forts in Eastern Washington included Fort Nez Perce (later called Fort Walla Walla), Fort Spokane and Fort Okanogan (Meinig 1968).

Alexander Ross of the Northwest Company was the first white man to enter the Kittitas Valley in 1814, though he had passed by on his way up the Columbia in 1811. He came to the valley to purchase much needed horses at the Che-lo-han encampment, otherwise known as the Council Gathering Grounds, located near the present-day town of Kittitas. Ross estimated that Che-lo-han stretched for more than six miles. It was here that he counted over 3,000 Indians, not including women and children, and a vast herd of horses. Ross likely exaggerated his population count (Glauert and Kunz, 1976) to intrigue Eastern audiences. Nevertheless, it is quite true that large numbers of people gathered there from miles around to trade, gather and process roots, to race horses, trade horses and gamble.

Fur trading did not have the early impact on the Kittitas Valley that it did elsewhere. However, construction of Fort Vancouver by the Hudson's Bay Company in 1825 greatly increased contact with fur traders. Trading was also brisk with Fort Nisqually on Puget Sound. Rather than furs, the Yakima used their best asset, the horse, as a trading commodity to acquire all nature of trade items, such as guns, ammunition, beads, blankets, axes, knives and projectile points. Beef gradually became a staple in Indian diet. Some time after 1840, the Kittitas under Ow-hi and later Kamiakin began grazing their own herds in the valley (Schuster, 1990). They imported Black Spanish or Sandwich Island cattle from the Hudson's Bay Company at Fort Vancouver (Glauert and Kunz 1976). As with fur trading, initial European American settlement did not influence the Kittitas Valley as much as elsewhere because the land was not considered good for farming (Schuster 1990).

In May 1841, Lieutenant Charles Wilkes of the United States Exploring Expedition sent Robert Johnson from Puget Sound overland to assess the navigability of the Columbia River and explore the interior of the Columbia (Anglin, 1995). On his way, Lt. Johnson stopped in the Kittitas Valley to purchase fresh horses. His negotiations were not without difficulty because the Kittitas chief, Te-i-was, was reluctant to part with his best mounts. While there, Johnson learned that game was scarce and the beaver had all but disappeared. Johnson observed and recorded camas and other roots being dug by the women, as well as the method of preparation by drying, pounding them into a mass between two stones and then baking them in an oven. Johnson also observed a patch of potatoes being cultivated near the Columbia River within a small square of land surrounded by turf walls (Wilkes, 1845).

Previous to the Wilkes Expedition, the Kittitas Valley, as part of the Oregon Territory, was governed under joint occupancy between the British and Americans. It wasn't long after that, in 1846, that the boundary dispute was put to rest and the Oregon Territory was established below the 49^{th} Parallel. Once that happened, the number of American missionaries and settlers increased throughout the region. Catholic missions were established in the Yakima River Valley in 1847 (Schuster 1982) at the invitation of Ow-hi (Ricard, 1976). Most missions were located a distance away from the Project area at Ahtanum and on Manastash Creek (Glauert and Kunz, 1976). There was possibly one, however, at the mouth of the Taneum on the Yakima River (Olmstead-Smith in Miller and Lentz, 2002). Few, if any, adult Indians were baptized or attended mass on a regular basis (Ricard, 1976). However, the Catholic fathers had an excellent relationship with the Indians, particularly Kamiakin, Ow-hi and Te-i-as. Father Pandosy often served as an interpreter and trusted counsel for them during negotiations with the United States Government (Glauert and Kunz, 1976). Tensions and fears were high throughout the region after the deadly attack on the Whitman Mission near Walla Walla. In addition, the Protestant settlers did not trust the Catholic Priests. Once hostilities broke out in the open in 1855, the Catholic mission at Ahtanum was sacked and burned by vigilantes (Hunn, 1990, Schuster, 1982).

The relative isolation of the Yakima Valley began to disintegrate in the 1850s as events proceeded rapidly. The Donation Land Act was passed and Indian lands in the Northwest were opened for settlement. White settlers began moving into areas on both sides of the mountains. Washington Territory was formed in 1853 and Isaac Stevens was appointed governor and Indian agent. Besides surveying a railroad route across the territory, Stevens's primary motivation was to gain legal and undisputed title to Indian land so settlement could proceed unobstructed (Hunn ,1990). At Stevens's direction, Captain George B. McClellan conducted a preliminary survey to construct a wagon trail over Naches Pass and surveyed the Kittitas Valley.

It was McClellan who first introduced the word "Kittitas" into the geographic lexicon, though it was later misspelled by Stevens's staff when they drew the maps. McClellan reported that his base camp was at Kittitas, the name of a nearby Indian encampment. In addition, the priest, Father Pandosy had baptized his first convert at that location and spelled it in his records as "Ki-tatash". Many meanings have been ascribed to the name, but the early frontiersman, Charles Splawn said that *kittit* means white chalk and *tash* means place of existence. There is a bank of such chalk on the Yakima River just south of Ellensburg. The chalk was used by the Indians to paint their faces and their horses (Glauert and Kunz, 1976)

Also in 1853, James Longmire brought the first wagon train of settlers through the territory and across Naches Pass to the Puget Sound region (Glauert and Kunz, 1976, Schuster, 1982). McClellan discovered gold in the Kittitas Valley in 1853, but no one paid much attention until larger mines were discovered in the Colville area in 1855. Tensions increased as miners rushed to cross through the Upper Yakima to reach the Colville, precipitating a closure of the area by military order. Despite that, soldiers continued to look for gold, eventually discovering several nuggets on the Peshastin (Glauert and Kunz, 1976).

As a result of these events, Plateau bands began moving towards unification and confederation though they did not quite succeed. Yakima tribal leadership began to emerge through Ow-hi and Te-i-was of the Upper Yakima and their nephews Kamiakin, Showaway and Skloom of the Lower Yakima (Schuster, 1982). In the fall of 1854, Kamiakin called a council of all tribal groups on middle Plateau to meet at the Grand Ronde in Eastern Oregon. The purpose was to form a confederacy and organize resistance, but no agreement could be reached (Meinig, 1968).

Once the treaty negotiation process started, Governor Stevens was relentless in pursuit of his goals. He organized a series of grand treaty councils to be held at various locations around the territory. In June 1855, approximately 1,000 Yakimas led by Kamiakin, Ow-hi and Skloom along with other Plateau groups attended negotiations at the Walla Walla treaty grounds, at a place where they had often gathered in the past to trade. In return for ceding their territories, Indians were promised payment in goods, cash and other compensation and exclusive rights to bounded areas called reservations. In reality, their traditional ties were severed and they were denied access to hunting territories and resource procurement areas (Hunn, 1990, Schuster, 1982).

After lengthy discussions and negotiations in which most Indians just gave up so they could go home (Schuster, 1990), the treaty was signed at Walla Walla on June 9, 1855. It established a formal relationship between the U.S. government and the Yakima people. The treaty created the Consolidated Tribes and Bands of the Yakima Nation, now the Yakama Nation. Inadvertently, this formal relationship served to bind together formerly politically autonomous local bands into a nation with a formal sense of tribal unity (Schuster, 1982). As the Consolidated Tribes and Bands of the Yakima Nation, 14 formerly autonomous bands or tribes together ceded almost 11 million acres (29,000 square miles) more than one fourth of the State of Washington. In lieu of those lands, they retained approximately 1,200,000 acres (2,000 square miles) of land for their "exclusive use and benefit". No white man was permitted to reside on the reservation without permission of the tribe (Hunn, 1990). This proved not to be the case.

Within months after the signing of the treaties, Stevens announced that the territory was once again open for settlement. A veritable land rush began. The discovery of gold on the Colville further increased tensions as miners swarmed across the landscape. In September, some Yakimas attacked a group of trespassing miners who had molested Yakima women (Schuster, 1990). When the Indian agent came from The Dalles to investigate, he was attacked and killed by Showaway's son. Soldiers sent to avenge the agent's death were attacked and routed at Toppenish Creek by Kamiakin. Full-scale warfare resulted. In November the Oregon Mounted Volunteers, in pursuit of the Yakima out of Union Gap, looted and burned the Catholic Mission at Ahtanum (Glauert and Kunz, 1976, Schuster, 1982).

Colonel George Wright constructed a fort on the Naches and a base camp in the Kittitas Valley as a show of force, believing that the Indians would be persuaded to negotiate for peace. Even though he met with Ow-hi, no settlement could be reached. Wright then rounded up about 400 Kittitas and Wenatchee and transported them to Fort Simcoe to keep them away from other, more hostile bands. Hostilities continued throughout the Washington Territory until about September 1856. But in 1858, gold was again discovered, this time in British Columbia. Yet another group of miners was attacked while trespassing in Yakima lands. Lt. Jesse Allen retaliated and attacked a village at dawn in the Teanaway-Swauk area, killing three Indians. Lt. Allen also lost his life by friendly fire (Glauert and Kunz, 1976). The War in 1858 continued until a final surrender in September. Ow-hi turned himself in. His son, Qualchon was hanged in the mistaken belief that he was responsible for the earlier death of the Indian agent. Ow-hi was killed while trying to escape. Skloom did not regain his lost prestige. Kamiakin fled to Canada where he lived to be 73 (Schuster, 1990). But, the will of the Indians was finally broken and they were gradually moved onto their reservations.

Congress ratified the treaty on March 8, 1859, and settlement of the Kittitas Valley continued. By the 1860s, cattle were being driven from the Yakima valley to the mines in Canada, and open range became the norm for the Columbia Plateau. Ranchers in the Kittitas Valley followed the example set earlier by Ow-hi and Kamiakin and took advantage of the abundant grass for feed. The area around Thorp was the most active ranching locale in the Kittitas valley by the end of the decade, and homesteading as well as ranching began to increase. After the Snoqualmie Wagon Road was completed in 1867, ranchers in the Kittitas Valley began to use it to drive cattle to Puget Sound (Prater, 1981).

Frederick Ludi and John Goller were the first permanent white settlers in the Kittitas Valley. They came from Montana Territory in 1867. Tillman Houser was the first settler to come into the Kittitas Valley from Puget Sound. He built a cabin for his family and planted wheat in 1868 north of present-day Ellensburg, then returned to the Sound to get his wife and children via the new Snoqualmie Wagon road. Fielding Mortimer Thorp and his father-in-law Charles Splawn soon followed from east of Yakima (Prater, 1981). They raised a herd of Durhams (Glauert and Kunz, 1976). They homesteaded at the mouth of Taneum Creek, near present-day Interstate 90 and the ancient Kittitas village site—a few miles south of the proposed Project area. Thorp and Splawn opened a small trading post and started the first mail route over Snoqualmie Pass, paying an Indian named Washington $10 per round trip delivery. The first school in the Kittitas Valley was started by Charles Splawn. The first students were local Kittitas Indians (Prater 1981). The mill and granary at Thorp opened in 1883 and was in operation until 1946. The Thorp Mill is on the National Register of Historic Places (Kirk and Alexander, 1990).

No account of the history of the Kittitas Valley can go without mention of Robbers Roost, the trading post established in 1870 by Charles Splawn's brother Andrew Jackson Splawn and Ben Burch, who Splawn later bought out (Prater, 1981). They got their supplies from The Dalles and traded mostly with the local Indians and drovers on their way over Snoqualmie Pass because there were not many white families yet in the area. John Shoudy purchased Robbers Roost one year later and platted the town of Ellensburg (Kirk and Alexander, 1990).

Placer mining began in the Swauk Creek area in 1873. The center of the mining district was at Liberty, once called Meaghersville, the center of a small gold rush. Chinese workers were hired for $2 to $3 a day, but were driven out of the area by about 1884. Most claims were north of Liberty and well north of the Project area (Glauert and Kunz, 1976).

Specifically concerning the Project area, the U.S. Department of Interior, General Land Office (GLO, 1874), surveyed Township 19 North, Range 17 East in 1874. The surveyor noted a trail in the northeast corner of Section 22 and the eastern one-half of Section 16. Other surveyor comments included:

- Sections 14, 15, 22, and 23 – "land very broken and hilly: soil 3rd rate: bunch grass in abundance," and;
- Sections 10, 11, 14, and 15 – "land very broken and hilly: soil 3rd rate: fit only for stock grazing."

Township 20 North, Range 17 East, was surveyed much later in 1892 (GLO, 1892). This survey reflected an increase in Euroamerican activities. Several roads were labeled as "wagon roads to timber" (GLO, 1892). By then, the road from Ellensburg to Cle Elum was in place. This road crossed the eastern one-half of Section 34. Much later, this road came to be called State Highway 97. The surveyor reported "no timber or brush" near the southern section line of Section 34.

In 1887, the Northern Pacific Railroad was completed from the Kittitas Valley through Stampede Pass and onto Tacoma, a definite advantage for Ellensburg as the headquarters for the Cascade Division. This provided an opportunity to exploit the timber and coal resources along the route. Ellensburg became somewhat of a hub for transportation of goods to Wenatchee and the surrounding areas and could then provide supplies to markets in Puget Sound (Meinig 1968). Hundreds of men were employed to cut and lay timber for railroad ties (Prater 1981) and later bridges across the Columbia River. The population of Ellensburg doubled from 600 to 1,200 in two years after completion of the railroad (Kirk and Alexander, 1990; Oliphant, 1976).

Lumber was also provided for the ever-increasing number of settlers' homes in the Kittitas Valley. Logging took place in the areas west and north of the Project site. The land around the Project area is too dry to support trees. Sawmills were established in the Kittitas Valley as early as the 1870's and the annual spring log drives continued until 1915, transporting logs from upland sources to the mills below in Ellensburg and Yakima. The drive was a site to see. Schools and even businesses closed during this spectacular event, so that everyone could go down to the river and watch. Once the dams were completed at the lake outlets near Snoqualmie Pass, restricting spring run-off, the logs could no longer be floated in the Yakima River. Also, more bridges and more irrigation canals were constructed along the way, further inhibiting access. Once railroad lines were connected from high mountain logging areas to the Northern Pacific Railroad, floating was no longer necessary (Henderson, 1990). Logging today is still an economic resource for upland areas and mills in the area.

However, once the railroad was complete, the Snoqualmie Wagon Road was used less and less as a conduit for cattle. The construction of the railroad stimulated settlement of the Kittitas Valley and other areas of eastern Washington. Farming was on the increase and cattle was no longer king. However, improvements continued on the Snoqualmie Wagon Road until the dawning of the age of the automobile. Through continuous use over the years, the road has evolved into what it is today, a major east-west thoroughfare connecting the Kittitas Valley with Puget Sound and all parts east.

Once the automobile was introduced, large-scale changes began to occur in the transportation system. Supported by federal highway legislation and funding, state road construction increased dramatically. Portions of old trails and wagon roads were gradually superimposed by primary state highways. The road referred to as the Ellensburg to Cle Elum Road on the 1892 GLO survey map one day became U.S. Highway 97. The Snoqualmie Wagon Road is now Interstate 90, and the wagon road from Ellensburg to Yakima through the canyon is now Canyon Road.

Interest in large-scale irrigation began as early as 1892 in the Kittitas Valley. Preliminary surveys were conducted by the U.S. Reclamation Service in 1905. The first projects, however, were constructed in the lower Yakima River Valley. Construction didn't begin in the upper valley until about 20 years later. The Kittitas Reclamation District organized in 1911 so that landowners could secure financing. Water was to come from the reservoirs at Kachess and Keechelus Lakes. World War I put a stop to plans until the federal government finally provided assistance beginning in 1925. A tunnel for the North Branch Canal is located just south of the southern portions of the Project turbine string B. This canal is a branch of the Kittitas Reclamation District

Main Canal irrigation system, constructed between 1926 and 1932. The water intake is on the south bank of the Yakima River just above Easton. The water from this canal irrigates approximately 2,830 acres in the vicinity of Badger Pocket southeast of Ellensburg. The OAHP inventoried this irrigation system in 1985 (Soderberg, 1985).

Hydroelectric dams on the Columbia River were constructed in the 1940s and 1950s. These dams transformed the once raging river into a series of slack-water lakes and monumental power plants to provide irrigation and electricity to the homes and business of the Pacific Northwest. In spite of the great benefits, there have been many losses, particularly to native fisheries. Irrigation put an end to open stock ranges, though farming became progressively more important. The command center at Wanapum Dam, the nearest to the Project area, is connected by computer to all other dams on the Columbia and tracks by the day how much water is released and held behind each dam. An average of 6.5 million gallons of water per minute pass through its turbines to manufacture electricity to be used as far away as Los Angeles. Bonneville Power Administration transmission lines bisect the Project and the whole of the Kittitas Valley, delivering power from dams on the Columbia (Rocky Reach, Wanapum, and Grand Coulee) to Western Washington.

5.1.6.6 Cultural Resources Assessment

5.1.6.6.1 Previous Work and Background Research

Prior to starting fieldwork, on October 14, 2002, Johnson Meninick, Cultural Resources Director of the Yakama Nation, was contacted by Lithic Analysts, by letter, to inform him of the archaeological work to be conducted on the Project. Prior to this letter, the Applicant contacted Mr. Meninick by telephone and certified mail inviting Yakama Nation participation in the cultural resources survey. A response from Mr. Meninick was not received. In addition, David Powell, Ceded Lands Archaeologist for the Yakama Nation, was also contacted by telephone to inform him of the archaeological work to be conducted on the Project. Mr. Powell was invited to visit the Project area during the archaeological survey, but declined.

Lithic Analysts conducted a literature search of the recorded archaeological sites and other archaeological information at the Washington State Office of Archaeology and Historic Preservation (OAHP) in Olympia. All pertinent files concerning investigations of historic and prehistoric resources were reviewed for archaeological information regarding the immediate Project area and the area surrounding the proposed site.

As mentioned above, no previously recorded historic or prehistoric archaeological sites within the Project area were identified during the OAHP literature search or during the few archaeological surveys conducted in and around the Project area. However, there are seven recorded sites (3 prehistoric and 4 historic) within 1.2 miles of the Project area. They include:

- 45KT350, Section 27, T20N, R17E, Swauk Prairie Quadrangle – prehistoric, open lithic scatter;
- 45KT368, Section 5, T19N, R17E, Swauk Prairie Quadrangle – historic, two log cabins with railroad association;
- 45KT545, Section 2, T18N, R17E, Swauk Prairie Quadrangle – prehistoric, lithic scatter, campsite;
- 45KT1754, Section 24, T19N, R17E, Thorp Quadrangle – prehistoric, lithic scatter, campsite;

- 45KT2182, Section 20, T19N, R17E, Thorp Quadrangle – (formerly numbered 19-224, but recently given a Smithsonian number) historic, irrigation pumping equipment;
- 45KT2183, Section 38, T19N, R17E, Thorp Quadrangle – historic, railroad shack 19-223, Kittitas County, Section 20, T19N, R17E, Swauk Prairie Quadrangle – historic structure.

Very little archaeological research has been conducted in the upper Yakima River basin in Kittitas County. Except for those areas within the Bonneville Power Administration (BPA) power line rights-of-way, the Project area has not been previously surveyed for cultural resources. In addition, according to the OAHP literature search, the Project area does not contain previously recorded prehistoric or historic archaeological sites. However, portions of the surrounding area have been surveyed for cultural resources, and these surveys are detailed below.

In 1990, Eastern Washington University surveyed the Puget Sound Energy Intermountain Transmission Line between Hyak (King County) and Vantage (Kittitas County) (DePuyd 1990). This survey was located several kilometers south to southwest of the proposed Project area along the southwest side of the Yakima River.

Archaeologists from Central Washington University conducted a random archaeological survey of 17 sections found on the Reecer Canyon Quadrangle (Bicchieri 1994). The Reecer Canyon Quadrangle area is situated east of the Project area.

A portion of State Highway 97 north from Section 27, Township 20 North, Range 17 East, was surveyed in 1994 by Eastern Washington University archaeologists at selected Washington State Department of Transportation locations where highway improvements were to be made. (Holstine and Gough, 1994). This highway survey commenced about a two miles northwest of a portion of the Project area located in Section 34 where turbine string G is proposed.

Archaeologists from Historical Research Associates, Inc. (HRA) surveyed the Olympic Pipeline's proposed Cross Cascades Petroleum Products Pipeline for Dames and Moore in 1996 (HRA, 1996). This survey was conducted for a proposed 235-mile underground pipeline to carry petroleum products from western Washington to storage facilities near Ellensburg and Pasco. HRA recorded numerous prehistoric and historic archaeological sites, but none of these recorded archaeological sites are within the proposed Project.

HRA archaeologists conducted another survey in 1998 for the BPA's proposed Seattle-to-Spokane Fiber Optic Cable Project (Thompson, 1998). BPA's Rocky Reach to Maple Valley steel tower transmission line bisects the proposed Project area at turbine strings H (Sec. 2, T19N, R17E) and G (Sec. 34, T20N, R17E). Little ground disturbing activity occurred because most of the cable was installed on existing transmission towers although the cable was buried in six locations throughout the right-of-way. The closest location to the Project area was the Schultz Substation in Section 15, T19N, R18E, several kilometers to the east of the Project area.

5.1.6.6.2 Field Survey and Results

This Project differed from most archaeological surveys in that the areas affected by ground-altering activities will be linear in nature, not large surface parcels. All affected areas were walked in meandering transects by three surface investigators. Ground visibility was excellent in almost all areas of this Project. Only a few very short lengths of transects were covered by thick grass.

All proposed wind turbine generator strings (A, B, C, D, E, F, G, H, I and J) were covered by three meandering transects each at approximately 100 feet intervals. All existing access roads, new access roads, underground electrical lines, and overhead electrical lines were investigated by approximately 35 feet meandering transects. The areas proposed for the Project substations were surveyed by approximately 35 feet meandering transects also.

Two previously unrecorded prehistoric archaeological sites were identified during this survey. Project Site #1 is located at the north end and to the east of turbine string G, just west of a seep and given its location near water, may have been a lithic scatter. Project Site #2 is located just west of the proposed BPA substation location and just north of the BPA power line right-of-way. This site is a small debitage concentration.

5.1.6.7 Impacts

This archaeological survey project covered the entire areas within the Project where ground-altering activities are proposed. Two small prehistoric sites were identified. Both prehistoric archaeological sites should be avoided to prevent any damage to either site.

A qualified archeologist will monitor ground disturbing activities during the construction process. If a cultural resource feature is encountered, all construction will be halted temporarily in the area of the feature. If human remains/burials are encountered, construction will cease immediately in the area of the burial and the area will be secured and placed off limits for anyone but authorized personnel. The cultural resource monitor will notify any and all authorities concerned with such an inadvertent discovery, specifically including the Yakama Nation. The Yakama Nation has been consulted during the planning process beginning in February of 2002. The Yakama Nation will be notified prior to commencement of construction and will be invited to have representatives present during all ground-breaking activities. It is anticipated that a stipulation will be made with the Yakama Nation establishing procedures to be followed in the event of any finds during construction.

Copies of the report developed for this Project and Site Forms have been forwarded to the Yakama Nation Cultural Resources Director, Johnson Meninick, and to the Washington State Office of Archaeology and Historic Preservation in Olympia.

5.1.7 Agriculture and Crops

As described in above Section 5.1.1.1, land uses in the Project area are predominantly open space and grazing, with some rural residential development occurring in certain locations. There is currently no agricultural activity taking place on any of the parcels where Project facilities are proposed other than grazing. None of the land is irrigated and no crops are grown on these parcels. This area is not highly productive rangeland, and most grazing use is seasonal (spring) in nature. Less than half of the private property owners on whose land Project facilities are proposed currently utilize their land for grazing. All but one of these private property owners graze cattle, the other grazes bison and horses. Less than half of the parcels owned by Washington DNR where turbines are proposed are currently being used for cattle grazing.

During construction of the Project, it will be necessary to remove cattle from those areas where blasting or heavy equipment operations are taking place. Applicant will make arrangements with property owners and livestock owners to keep livestock out of these areas during those periods.

Once the Project is completed, grazing activities can resume as before. The operation of wind turbines is highly compatible with grazing activities. Cattle, sheep, and other domestic animals routinely graze underneath operating wind turbines at projects across the US and around the world. The total area that will be permanently occupied by the Project facilities is 90 acres, much of which is not currently being used for grazing. As part of the proposed mitigation package for plants and animals, the Applicant plans to acquire a parcel of approximately 550 acres and exclude cattle from this parcel in order to restore and enhance its value as habitat. In the context of the very large amount of rangeland available for grazing in Kittitas County, this impact is insignificant.

5.2 TRAFFIC AND TRANSPORTATION

WAC 463-42-372 Built Environment—Transportation.

(1) Transportation systems - *The applicant shall identify all permanent transportation facilities impacted by the construction and operation of the energy facilities, shall identify the nature of the impacts, and shall identify the methods to mitigate impacts. Such impact identification, description, and mitigation shall, at least, take into account the following:*

(a) Expected traffic volumes during construction, based on where the work force is expected to reside;

(b) Access routes for moving heavy loads, construction materials, or equipment;

(c) Expected traffic volumes during normal operation of the facility;

(d) For transmission facilities, anticipated maintenance access; and

(e) Consistency with local comprehensive transportation plans.

(2) Vehicular traffic - *The applicant shall describe existing roads and shall estimate volume, types, and routes of vehicular traffic that will arise from construction and operation of the facility. The applicant shall indicate the applicable standards to be utilized in improving existing roads and in constructing new permanent or temporary roads or access and shall indicate the final disposition of new roads or access and identify who will maintain them.*

(3) Waterborne, rail, and air traffic - *The applicant shall describe existing railroads and other transportation facilities and indicate what additional access, if any, will be needed during planned construction and operation. The applicant shall indicate the applicable standards to be utilized in improving existing transportation facilities and in constructing new permanent or temporary access facilities, and shall indicate the final disposition of new access facilities and identify who will maintain them.*

(4) Parking - *The applicant shall identify existing and any additional parking areas or facilities that will be needed during construction and operation of the energy facility and shall identify plans for maintenance and runoff control from the parking areas or facilities.*

(5) Movement/circulation of people or goods - *The applicant shall describe any change to the current movement or circulation of people or goods caused by construction or operation of the facility. The applicant shall indicate consideration of multipurpose utilization of rights of way and describe the measures to be employed to utilize, restore, or rehabilitate disturbed areas. The applicant shall describe the means proposed to ensure safe utilization of those areas under the applicant's control on or in which public access will be granted during project construction, operation, abandonment, termination, or when operations cease.*

(6) Traffic Hazards - *The applicant shall identify all hazards to traffic caused by construction or operation of the facility. Except where security restrictions are imposed by the federal government the applicant shall indicate the manner in which fuels and waste products are to be transported to and from the facility, including a designation of the specific routes to be utilized.*

5.2.1 <u>Existing Conditions</u>

The region within which the Project is located is a rural area with low population density in Kittitas County, Washington between the cities of Cle Elum to the west and Ellensburg to the southeast. The main study area has a triangular shape, bound by State Route 970 in the north, I-90 in the south, and US 97 in the east. The study area also includes roads maintained by Kittitas County such as Bettas Road and Hayward Road. Most of the public roads within the region are paved county roads, with a few state routes traversing the area. The remaining public road system is comprised of county roads that have bituminous pavement, gravel, or unimproved dirt. Exhibit 17-1, 'Project Site and Surrounding Roadway Network', illustrates the locations of the Project's main transportation routes.

5.2.1.1 Street Network

Two kinds of roads are involved in constructing the Project: transporter routes and turbine site access roads. Transporter routes are roads used to bring in equipment, materials and manpower from outside of the Project study area to the Project site. Transporter routes include state and county roads within the study area, as well as existing private roads and newly constructed roads. Site access roads are gravel surfaced roads that run between the individual turbines, and are described in Section 2.3.2, 'Roads and Civil Construction Work'. The site access roads connect to the transporter route. There is currently one main transporter route that will provide access to the site.

I-90 is an interstate highway and the main Project access heading east from the Port of Seattle to the Project site. I-90 has posted speed limits of 60 miles per hour (mph) in urban areas and 70 mph in rural areas. The 70 mph designation begins east of Issaquah. From I-90, US 97 (north of I-90) will be the next leg on the transporter route. US 97 has a posted speed limit that ranges between 40- to 65 mph and is a two-lane, north-south roadway with 4- to 8-foot-wide asphalt shoulders between I-90 and State Route 970. There are no sidewalks on this road, which is classified as a rural-principal arterial, according to the WSDOT road classification system. US 97 is also classified as having rolling terrain, causing trucks to slow down frequently. US 97 provides access to and across Blewett Pass in the north. From US 97, Kittitas County roads that will be used include Bettas Road, (between US 97) and the northern portion of Hayward Road above the KRD canal bridge (which branches off of Bettas Road). These roads only provide local access. Bettas Road is a two-lane, north-south paved roadway that branches off of US 97 approximately 10 miles north of the I-90 interchange. Hayward Road, which will also be utilized for transport, is a two-lane, north-south gravel road that branches off of Bettas Road to the south.

5.2.1.2 Traffic Patterns and Volumes

Table 5.2.1.2-1 shows the average daily traffic (ADT) volumes on roadways in the study area between 1997 and 2001. These volumes are based on available traffic data from WSDOT. US 97 varies as it runs north from a fairly urban setting near I-90 to a much more rural setting near Bettas Road. Therefore, traffic was analyzed in two different sections where data was available from WSDOT. The first 2 mile section immediately north of I-90 represents US 97 in an urban setting and is referred to as US 97 (North of I-90). The 2 mile section immediately before the intersection of Bettas Road represents a rural setting and is referred to as US 97 (South of Bettas Road).

Table 5.2.1-1
Average Daily Traffic (ADT) Volumes and Estimated Percent Trucks

Roadway	1997 ADT	1998 ADT	1999 ADT	2000 ADT	2001 ADT	Estimated % Truck
I-90 (West of US 97)	22,000	23,000	23,000+	22,000+	22,000	20
US 97 (N. of I-90)	2,500	2,600	2,800	2,800	2,800	N/A
US 97 (S. of Bettas Rd.)	2,000	2,100	2,200	2,200	2,200	26
Bettas Road	N/A	N/A	43	36	26	N/A
Hayward Road	N/A	N/A	N/A	29	24*	N/A

ADT = Average daily traffic.
N/A = Not available.
+ 1999 and 2000 ADT for I-90 estimated.
* 2001 ADT for Hayward Road estimated.
Sources: Washington State Department of Transportation, 2000, 2001. Kittitas County Public Works.

5.2.1.3 Truck Volumes and Routes, Weight and Load Limitations

The Kittitas County road network would comprise the primary public haul routes used in the construction of the Project. The regulatory framework for transportation in Kittitas County consists of program and project planning, design standards related to roadway geometry and paving materials, load limits for bridges, and weight limits or closures under defined circumstances. Kittitas County roads are designed to sets of standards with respect to paving materials and methods, and with respect to roadway geometry and design. All new road construction in the County must be in accordance with the current edition of WSDOT's "Standard Specifications for Road & Bridge Construction." Kittitas County Road Standards state the minimum requirements for road construction in the County.

Kittitas County Code 10.28 specifies load and weight restrictions on Kittitas County roads during load sensitive periods. It also authorizes the county engineer to issue emergency permits for the operation of vehicles exceeding the allowable gross load.

Along the Transporter Route, there is a restricted bridge on I-90. This is the Cle Elum River Bridge. This bridge is height restricted only in the westbound direction and thus will not cause problems for loaded trucks carrying oversize equipment eastbound on I-90 to the Project site. Besides this bridge, there are no other weight and load limits on any of the roads in the vicinity of the Project site.

The Cle Elum and Ellensburg School Districts indicate that their buses use US 97 and some stop on the route where shoulders are provided. Given that construction-related traffic is not anticipated to increase total truck volume along the highways by more than 15% over the current level and this increase will be for a short period, it is not expected to cause problems for school bus service in the area.

5.2.1.4 Existing Roadway Levels of Service

To analyze the traffic conditions, ADT data from WSDOT and the County were used to determine a level of service (LOS) for each of the roadways. LOS is a qualitative measure describing operational conditions in a traffic stream, and motorists' or passengers' perceptions of those conditions. A LOS definition generally describes these conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. There are six LOS classifications, each given a letter designation from A to F.

LOS A represents the best operating conditions and LOS F represents the worst. A conservative estimate of 10 percent of the ADT volume is used to estimate the peak hour volumes.

LOS was determined on the basis of the most current Highway Capacity Manual (HCM) (Transportation Research Board Special Report 209, 2000). Daily volumes represent the estimated 2001 ADTs in both directions of travel.

To determine the LOS for selected roadways in the study area, daily traffic capacity was determined by estimating capacities obtained from the HCM. Daily traffic volumes were compared with these capacities to determine volume-to-capacity ratios, which were used to calculate the existing LOS. Table 5.2.1-2 summarizes the existing roadway traffic conditions in the Project vicinity and includes existing roadway classification, number of lanes, daily volume, design capacity, peak-hour volume, and LOS.

Table 5.2.1-2
2001 Conditions of Affected Roadways

Roadway	Classification	No. of Lanes	Average Daily Volume	(a) Hourly Design Capacity	(b) PM Peak Hour Volume	PM Peak Hour LOS
I-90 (W. of US 97)	Rural-Interstate	4	22,000	6,020	2,200	C
US 97 (N. of I-90)	Rural-Principal Arterial	2	2,800	2,800	280	C
US 97 (S. of Bettas Rd.)	Rural-Principal Arterial	2	2,200	2,800	220	C
Bettas Road	County Road	2	26	2,800	3	B
Hayward Road	County Road	2	24	2,800	3	B

a) Maximum number of vehicles per hour in both directions for LOS E.
b) Peak hour volumes estimated at 10% of ADT.

LOS = Level of service.

The overall LOS for the current roadways surrounding the proposed Project site prior to construction is LOS C, which represents generally smooth traffic operating conditions. Individual users feel unrestricted by the presence of others in the traffic stream.

5.2.1.5 Existing Intersection Level of Services

Existing intersections along the Transporter Route include ramp termini at I-90 and State Route 97, and also at State Route 97 and Dolarway Road.

All intersections without traffic signals are expected to operate at LOS C or better during construction due to the low existing traffic on these roadways.

5.2.1.6 Accident Rates

Accidents are generally expressed in terms of accident rate, where accident occurrence is indexed to the amount of traffic using a given roadway. For roadway segments, accident rates are computed as the number of accidents per million vehicle-miles (MVM) of travel. Table 5.2.1-3 shows an estimated number of accidents for the selected roadways based on 1996 average daily traffic volumes and multi-year accident rates. Because the most recent accident rates provided by WSDOT are from 1996, the number of accidents for 2001 had to be estimated. The accident data for 2001 in the table below was estimated from 2001 volumes and 1996 accident rates.

Table 5.2.1-3
Accident Rates and Numbers, 1996, 2001

Roadway	Milepost	Length (mi)	(a) Accident Rate (acc/MVM)	1996 ADT	1996 No. of Accidents	2001 ADT	2001 No. of Accidents
I-90	106.06	3.28	0.80	21,000	20	22,000	21
US 97	135.38	14.31	0.60	1,900	6	2,200	7

a) 1996 Multi-year accident rate. Rate is in accidents per million vehicle-miles. Source: Washington State Department of Transportation, 1996 (Accident Report).
MVM = million vehicle-miles.

There are no records of accidents or collisions on the other roads on the Project's transporter route. Accident data on Bettas Road and Hayward Road were not collected by Kittitas County because of the extremely low average daily traffic.

The 1996 Accident Data on State Highways Report (WSDOT, 1996) indicates an average statewide accident rate of 1.48 accidents per MVM for the type of roadway corresponding to US 97 (Rural – principal arterial). The average statewide accident rate is higher than the accident rate of these roads (0.60 accidents per MVM for US 97). Similarly, the statewide average accident rate for a Rural – interstate type roadway is 0.86, which is higher than the accident rate for I-90 (0.80 accidents per MVM). Therefore, based on the average accident rates, the above roadways are not considered to have safety issues.

5.2.1.7 Future Plans and Projects

Kittitas County Department of Public Works staff stated that there are currently no construction projects planned on county roads in the Project area. Washington State DOT has also stated that there are no projects planned on the state roads in the area.

5.2.1.8 Local Comprehensive Transportation Plans

There are currently no plans for major improvements to the transportation system in Kittitas County.

5.2.1.9 Pedestrian/Bicycle Facilities

Within Kittitas County, State Route I-90 and US 97 are identified for bicycle use on the Washington Bicycle Map. Kittitas County Code 12.10 states that all roadway improvements shall include pedestrian access as part of the design unless otherwise approved by the county. There are currently no planned roadway improvements and no planned pedestrian or bicycle facilities on the roadways near the Project site.

5.2.1.10 Public Transportation

Kittitas County is primarily a rural county where the need for public transportation in or near its towns is not a high priority. The cities of Cle Elum and Ellensburg, near the vicinity of the Project site, currently do not have public transit systems. However, there is an accessible/special needs transportation program provided by the Kittitas County Action Council (KCAC) for citizens. Besides this service, Greyhound bus service is the main form of public transit between cities such as Cle Elum and Ellensburg.

5.2.1.11 Air Traffic

There are no regional or municipal airports in the vicinity of the Project site. The nearest airport is near Ellensburg, approximately 12 miles to the southeast. The Ellensburg airport does not have scheduled air service, but is limited to private and charter plane service. Small planes may use private runways at ranches or farms in the area, but the frequency of this type of use is unknown. It is not planned that any of the equipment or materials necessary for the Project operations or conduction will be transported by air to the Project site.

5.2.1.12 Rail Traffic

Burlington Northern operates an active main line between Auburn and Tri-Cities over Stampede Pass, passing through Ellensburg. Portions of the line had been inactive, until 1996 when the pass portion reopened to freight traffic. Approximately 4-10 trains traverse the route daily. It is not anticipated that any of the equipment or materials necessary for the Project operations or conduction will be transported by rail to the Project site and therefore there will be no rail traffic burden impacts.

5.2.1.13 Waterborne Traffic

Over 100 miles southeast of the Project site, the Ports of Pasco, Benton, and Kennewick have ports on the Columbia River. Grain is the major commodity using barge transportation on this stretch of the river. It is not anticipated that any of the equipment or materials necessary for the Project operations or conduction will be transported by barge or ship up the Columbia River; therefore, there will be no impact to barge or river vessel traffic.

5.2.2 Impacts of the Proposed Action

On the basis of historical ADT levels on the stated roadways, a 1 percent growth factor is assumed in establishing impacts on future background levels of traffic. This growth factor is considered reasonable because of the area's rural nature.

Local policies are aimed at keeping the public road service at or above an accepted level of service determined by the county. Roadways which will experience heavy truck traffic can be assessed on an individual basis by the county during the Project. All of the roadways in the study boundaries currently provide LOS C or better.

Table 5.2.2-1 describes the existing and future daily peak-hour traffic volumes and LOS's without any construction traffic impacts. It is estimated that during the peak hour in 2004, all roadways in the Project vicinity will function at LOS C or better, without the Project.

Table 5.2.2-1
Existing, Future Daily, and Peak-Hour Traffic Volumes and LOS without Project

	No. of	Daily		Estimated Peak Hour without Project			
Roadway	**Lanes**	**2001**	**2004**	**2001**	**LOS**	**2004**	**LOS**
I-90 (W. of US 97)	4	22,000	22,660	2,200	C	2,266	C
US 97 (N. of I-90)	2	2,800	2,884	280	C	288	C
US 97 (S. of Bettas Rd.)	2	2,200	2,266	220	C	227	C
Bettas Road	2	26	27	3	B	3	B
Hayward Road	2	24	25	3	B	3	B

LOS = Level of service.
Source: Washington State Department of Transportation, 2001.

5.2.2.1 Construction

The Applicant will construct a road system on the Project site, with site access roads between the turbines which also run to the planned access way from US 97, Bettas Road or Hayward Road. The access ways or driveway entrances off of US 97 will be constructed with the required slopes and culverts according to WSDOT and Washington State access management under Title 468 Washington Administrative Code (WAC) and Chapter 47.50 Revised Code of Washington (RCW). Driveway entrances from the county Roads (Bettas or Hayward) will be also be constructed with the appropriate slopes and culverts in accordance with Kittitas County roads department requirements for construction in the county right of way.

5.2.2.1.1 Traffic

Construction of the Project requiring the transportation of major equipment and constituting the highest amount of construction traffic will span approximately nine months. It is anticipated that the majority of the construction workers will access the site from within a 75-mile radius.

US 97 will be the primary roadway to and from the Project site. As the primary access route to the site, this roadway will likely have the greatest impact from the construction vehicles and workers. It is anticipated that the majority of the construction workforce traffic will originate from the Ellensburg and Yakima area and travel north on US 97 until reaching the junction with Bettas Road where the workers will then disperse to the various construction locations at the Project site. This is the shortest and most direct route from the major urban areas within a 75-mile radius.

Trucks will be used to deliver construction equipment and materials. Some of these trucks will have a gross vehicle weight of upwards of 105,500 pounds. Any oversize or overweight vehicles will comply with state requirements. Because the surface condition of the pavement near the Project site is built to WSDOT standards and is of good bituminous or asphalt quality, the delivery of construction materials and equipment is not expected to significantly degrade existing conditions.

The wind turbines, towers, transformers and other large equipment will be transported to the site using a semi-truck and lowboy transporter designed for heavy loads (i.e., multiple axles). The truck will deliver the equipment to the Project site. Movement of the transporter will have a short-term impact on traffic along State Route 97 and other roadways used along the Transporter Route.

Construction is anticipated to commence in October 2003 with site preparation. At the time winter weather sets in, major civil work will cease and re-commence after spring thaw and when ground conditions allow. There will be an on site peak workforce of about 160 workers during the 2-month period from June through July as described in Section 2.12 'Construction Schedule and Operation Activities'. The average workforce for the remaining 7 months of construction will be about 100 workers. During the peak construction period, construction workers will generate an estimated 160 daily trips (assuming 1 truck per every 2 workers), 80 of which will occur during the evening peak hour. (This trip estimate includes trip reductions resulting from carpooling). In addition to worker traffic, there will be an estimated 20 light duty delivery trucks daily for the peak of the construction period, resulting in 40 daily trips. Therefore the total of light duty vehicles at construction peak would be 100 (80 vehicles for worker traffic and 20 vehicles for light duty delivery).

Construction-related traffic increases will consist of deliveries of Project equipment and construction materials (such as concrete and steel) by truck. Truck deliveries are anticipated to occur between 8 a.m. and 4:30 p.m. on weekdays. In total, 8,200 heavy duty truck deliveries are expected during the 9 month period. Assuming 180 work days (9 months at 20 workdays per month), this would result in an approximate average of 45 trucks per day or 90 daily truck trips. It is anticipated that truck deliveries will include:

- Major equipment (e.g. tower sections, nacelles, blades);
- Gravel for site access roads, O&M facility area and substation;
- Water trucks for road wetting during compaction and for dust control;
- Construction equipment delivery and pickup;
- Concrete and reinforcing steel;
- Mechanical equipment;
- Electrical equipment and material (transformers, cable, etc.);
- Miscellaneous steel, roofing, and siding;
- Construction consumables;
- Contractor mobilization and demobilization.

Table 5.2.2-2 provides a summary of PM peak hour traffic and LOS during the construction time period of the Project.

Table 5.2.2-2
Total PM Peak Hour and LOS Construction Impacts to the Roadways

Roadway	No. of Lanes	2004 Base ADT	2004 PM Peak	Construction Worker Truck Traffic	Construction Traffic	Total PM Peak	LOS
I-90 (W. of US 97)	4	22,660	2,266	45	145	2,456	D
US 97 (N. of I-90)	2	2,884	288	45	145	478	C
US 97 (S. of Bettas Rd.)	2	2,266	227	45	145	417	C
Bettas Road	2	27	3	45	145	193	C
Hayward Road	2	25	3	45	145	193	C

ADT = Average daily traffic.
LOS = Level of service.

The construction LOS during the PM peak hour with construction worker traffic and delivery traffic causes the Transporter Route to operate at LOS D or better. It is anticipated that the LOS will change back to existing conditions LOS once the Project is completed.

5.2.2.1.2 Parking

During construction, parking will be located at the site of the O&M facility and along the site access roads. The O&M facility site will also serve as a construction staging area. Dust control will be implemented as needed to minimize fugitive dust. Parking along turbine string roads will be primarily for those workers working on turbine foundations and electrical infrastructure and turbine erection crews. Vehicles will park in areas that are already temporarily or permanently disturbed for other construction purposes, no additional ground disturbance is anticipated solely for parking needs. It is anticipated that roughly half of all construction worker vehicles will be parked at the O&M facility location and the other half will be dispersed across the various turbine strings. Assuming a peak workforce of 160 people, the maximum number of worker vehicles anticipated at any one time is 106, assuming that efforts to encourage carpooling will result in about one third of construction workers carpooling to and from the Project site. In terms of acreage necessary for parking, the worst-case scenario (assuming no carpooling) would require less than 2 acres for parking.

5.2.2.1.3 Hazardous Materials

As described in Section 4.1.3, 'Releases or Potential Releases of Hazardous Materials to the Environment', diesel fuel is the only potentially hazardous material that will be used in any significant quantity during construction of the Project. During construction, the EPC contractor will utilize fuel trucks for refueling of construction vehicles and equipment on site. The fuel trucks will be properly licensed and will incorporate features in equipment and operation, such as automatic shut off devices, to prevent accidental spills. Measures to prevent and contain any accidental spills resulting from this fuel transportation and use are described in detail in Section 2.9.2.1, 'Spillage Prevention-Construction'. Construction of the project will not result in the generation of any hazardous wastes in quantities regulated by state or federal law.

5.2.2.1.4 Construction Accidents

Although the additional vehicular and construction traffic attributable to the proposed action would increase the risk of accidents, it is anticipated that the overall accident rate or pattern would be similar to existing conditions.

A Traffic Management Plan will be submitted to EFSEC for review prior to the startup of construction, and that plan will include measures to minimize impacts of construction related traffic and to minimize hazards during construction.

5.2.2.2 Operation and Maintenance

5.2.2.2.1 Traffic

The Project will operate continuously (24 hours per day, 7 days per week) using an automated system. It will employ an estimated 16 to 18 full time workers. The operations crew will normally work 8 hour days Monday through Friday, with one person working half days on the weekends. This equates to a maximum of 36 trips during a 24-hour period. Traffic between the O&M facility and the individual turbines will be minimal during operations, as scheduled maintenance is normally performed only every 6 months on each turbine. The Applicant will be responsible for maintenance of turbine string access roads, access ways, and other roads built by the Applicant to construct and operate the Project.

Table 5.2.2-3 describes current and future traffic volumes, and LOS during the operation phase of the Project, including traffic volumes from the generation plant site. Future year 2030 volumes were estimated using a 1 percent growth factor. This growth factor is considered reasonable because of the area's rural nature. As shown in Table 5.2.2-3, all roadways will operate at LOS D or better during evening peak conditions.

5.2.2.2.2 Parking

During the operational phase, parking will be at the O&M facility parking lot. With an anticipated operations workforce of 16 people, plus occasional guests, delivery vehicles, etc. no more than 20 vehicles are expected to be parked at the facility at any one time. The permanent parking area at the O&M facility will be graveled to reduce dust and soil erosion.

5.2.2.2.3 Hazardous Materials

No substantial quantities of industrial materials will be brought onto or removed from the Project site during Project operations. The only materials that will be brought onto the site will be those related to maintenance and/or replacement of Project facilities (e.g., nacelle or turbine components, electrical equipment). The only materials that will be removed from Project facilities will be those parts or facilities replaced during maintenance activities. Those materials removed or replaced will not constitute a significant amount.

Hazardous materials that will be transported to the site only include minimal amounts of lubricating oils, cleaners, and herbicides in quantities below state and federal regulatory thresholds. Transportation of these materials will be conducted in a manner that is protective of human health and the environment and in accordance with applicable federal and WDOT requirements.

5.2.2.2.4 Accidents

The accident rates during Project operation are not anticipated to exceed the existing accident rates.

Table 5.2.2-3
Existing, Future Daily, and Peak-Hour Roadway Segment Traffic Volumes and LOS with and without Project Impacts

	2001 Existing PM Peak		2004 PM Peak without Project		2004 PM Peak with Project		2030 PM Peak without Project (Horizon Year)		2030 PM Peak with Project (Horizon Year)	
	Traffic	LOS	Traffic	LOS	Traffic	LOS	Traffic	LOS	Traffic	LOS
I-90 (W. of US 97)	2,200	C	2,266	C	2,284	C	2,855	D	2,878	D
US 97 (N. of I-90)	280	C	288	C	306	C	363	C	386	C
US 97 (S. Bettas Rd.)	220	C	227	C	245	C	286	C	309	C
Bettas Road	3	B	3	B	21	B	4	B	26	B
Hayward Road	3	B	3	B	21	B	4	B	26	B

LOS = Level of service.

5.2.2.2.5 Future Intersection Operations

The LOS of the unsignalized intersections in the area would continue to operate at acceptable levels in the future. The LOS during the operational phase of the Project will also include traffic from the Project site.

5.2.3 Movement/Circulation of People or Goods

Sections 5.2.2.1.1, 'Operations and Maintenance -Traffic' and Section 5.2.2.2.1 'Construction-Traffic' above describe impacts on traffic from the Project. Measures to restore and rehabilitate disturbed areas are described in Section 2.14, 'Construction Methodology' and Section 3.4.7.4, 'Post-Construction Restoration of Temporarily Disturbed Areas'. All temporarily disturbed areas will be reseeded with an appropriate mix of native plant species as soon as possible after construction is completed to accelerate the revegetation of these areas and to the prevent spread of noxious weeds. The Applicant will consult with Washington Department of Fish and Wildlife regarding the appropriate seed mixes for the Project area. There will be no public access to Project facilities on privately owned land during construction, operation or decommissioning of the Project. Any access provisions for Project facilities located on land owned by Washington DNR will be arranged in coordination with DNR, in conjunction with the Applicant's land lease and according to agency guidelines. Appropriate measures to protect public safety will be incorporated in any access provisions for DNR lands upon which Project facilities are located. After decommissioning of the Project, public use and access of DNR lands would be unaffected, as no Project infrastructure would remain which might pose a hazard to the public.

The only multipurpose utilization of rights of way envisioned for the Project involves a less than one mile section of the existing BPA right of way (ROW) between Hayward Road and the location of the proposed

BPA substation and turbine string E (see Exhibit 1, 'Project Site Layout'). This ROW is currently a dirt road and is not heavily used by BPA. The Applicant plans to submit an Application for Proposed Use of ROW to the BPA for joint use of this section of ROW. The Applicant will propose to BPA to upgrade this section of ROW from dirt to gravel surface (see Section 2.3.2, 'Roads and Civil Construction Work' for a description of Project road specifications) and to assume responsibility for maintenance of this section of ROW.

5.2.4 Mitigation Measures

No significant unavoidable adverse impacts on traffic and transportation are associated with construction or operation and maintenance of the Project. However, the Applicant has proposed specific mitigation measures for Project construction.

5.2.4.1 Construction

During construction, roadways and intersections in the vicinity of the Project site will provide an acceptable level of passage for traffic, even during the evening peak periods. However, the following mitigation measures are proposed to further reduce the impact of Project construction on roadway traffic in the region:

- The Applicant will prepare a Traffic Management Plan with the contractor outlining steps for minimizing construction traffic impacts;
- The Applicant will provide notice to landowners when construction takes place to help minimize access disruptions;
- The Applicant will provide proper road signage and warnings of "Equipment on Road," "Truck Access," or "Road Crossings;"
- When slow or oversized wide loads are being hauled, advance signage and traffic diversion equipment will be used to improve traffic safety. Pilot cars will be used as DOT codes dictate depending on load size and weight;
- The Applicant will construct necessary site access roads and entrance driveways that will be able to service truck movements of legal weight;
- The Applicant will encourage carpooling for the construction workforce to reduce traffic volume;
- In consultation with Kittitas County, the Applicant will provide detour plans and warning signs in advance of any traffic disturbances;
- Applicant will employ flaggers as necessary to direct traffic when large equipment is exiting or entering public roads to minimize risk of accidents;
- One travel lane will be maintained at all times.

5.2.4.2 Operation and Maintenance

Because Project operation and maintenance will not significantly affect traffic and transportation, no mitigation is proposed.

5.3 Public Services and Utilities

WAC 463-42-382 Built environment -- Public services and utilities. *The applicant shall describe the impacts, relationships, and plans for utilizing or mitigating impacts caused by construction or operation of the facility to the following:*

(1) Fire;
(2) Police;
(3) Schools;
(4) Parks or other recreational facilities;
(5) Maintenance;
(6) Communications;
(7) Water/storm water;
(8) Sewer/solid waste;
(9) Other governmental services or utilities.

5.3.1 Introduction

This section presents an analysis of existing public services and utilities in Kittitas County including Easton, Cle Elum, Roslyn, Kittitas, and Ellensburg, and potential impacts associated with construction and operation of the Kittitas Valley Wind Energy Project (Project). The evaluation includes fire protection, police, medical services, schools, communications, sewer, solid waste, and water supply services. In addition, recreational facilities within approximately 25 miles from the center of the Project, and in some cases, recreational facilities that are beyond the 25 mile radius were included in this section.

The impacts to maintenance of roads is fully describe in Section 5.2, 'Transportation'.

5.3.2 Existing Conditions

5.3.2.1 Police Services

The Kittitas County Sheriff's Department and the Washington State Patrol provide law enforcement services for the entire county, except for some cities that provide their own law enforcement—Cle Elum, Roslyn (covered by Cle Elum), Kittitas, and Ellensburg. All state highway routes (SR-97, SR-970, SR-10, SR-821, I-90, and I-82) are patrolled by the Washington State Patrol. The Project is north of SR-10 and has wind turbines on both sides of SR-97, north of Ellensburg. The Project is southeast of SR-970. The County Sheriff's Department serves the unincorporated areas of Kittitas County.

The law enforcement services provided by the County Sheriff's Departments include traffic control, drug enforcement, search and rescue, and civil calls. The Sheriff's office has recently implemented a traffic safety program and is in the final stages of developing a proposal for a criminal justice facility in the area (Deputy Meyers). Other county services include a K9 unit, SWAT team, marine patrol, and search and rescue (Carolyn Hayes). The Washington State Patrol provides traffic enforcement on state highways and drug enforcement, Hazardous Materials Team (HAZMAT) oversight, and incident response. The Washington State Department of Ecology in Yakima (approximately 35 miles south of Ellensburg) provides a HAZMAT response team.

Sheriff Gene Dana heads the Kittitas County Sheriff's Department. He has 25 deputies on patrol, three detectives, a criminal chief, and an under sheriff. All officers are state-certified, and many have additional training for drugs, search and rescue, traffic control, and accidents. The Sheriff's Department is state accredited and has recently received federal certification.

5.3.2.2 Fire Services

There are three fire districts in the Project area—Fire District No. 1 (Rural Thorp), Fire District No. 2 (Rural Ellensburg), and Fire District No. 7 (Cle Elum). The only district which turbines are proposed for is Fire District 1, where approximately 19 turbines are proposed. There are approximately 25-30 turbines proposed on Department of Natural Resources' (DNR) property, and that area would be under DNR's jurisdiction for fire control. The remaining turbines of the Project are outside of any fire district or DNR property (see Exhibit 19 'Fire Districts'). The City of Ellensburg also has its own fire department.

Fire districts are staffed primarily by volunteers. Fire District 2 has a full-time paid Fire Chief, Stan Baker. Fire District No. 1 has a paid part-time fire chief, D.J. Evans. The City of Ellensburg's fire department staff is fully paid. All rural volunteer fire fighters carry pagers and are notified through the county's 911 service. Fires that occur most frequently are related to wild land fires (grass, brush, and timber), vehicle fires, and structural fires. District fire departments also receive calls for boating (District No. 1 responds to fires on the Yakima River and District No. 2 responds to fires on the Columbia River, near Vantage) and hunting accidents; emergency medical situations such as heart attacks; recreational mishaps; propane spills and fires, and assistance to the State Patrol for HAZMAT. The majority of fires are man-made or caused by arson, with only a few naturally occurring fires, i.e., lightning. There have been fires in the Project area during the last five years (Fire Officials Meeting Notes, August 7, 2002).

All fire districts have emergency medical equipment and extraction equipment for auto accidents. Most fire districts have minimal services (equipment and personnel) for search and rescue. All districts have bimonthly or monthly training meetings. None of the rural fire districts have received special training for fires that might occur in the nacelles of wind turbines. Fire District No. 2 has Basic Life Support (BLS) services. Fire District No. 1 is working towards a BLS (DJ Evans, Fire Chief, Kittitas Fire District No. 1).

All rural county fire districts have mutual aid agreements with neighboring districts and with the City of Ellensburg's fire department. District No. 1 and District No. 7 have contracts with specific landowners. District No. 2 does not have any landowner contracts.

The Department of Natural Resources (DNR) has warning levels that indicate the fire danger on their property (Township 19N Range 17E, Sections 10 and 16 that have public access, and Sections 2 and 22 that have restricted access) The restricted access designation occurs because private property owners must allow access across their land, because there is no legal public access to those parcels. At a Level Five, total shutdown is expected in DNR's entire zone of control, including industrial activity. Spark arresters are required for power equipment (e.g., cutting torches, chain saws, and cutting tools) (Chris Taylor, Zilkha and Fire Officials Meeting Notes, August 7, 2002).

5.3.2.3 Medical Services/Hospitals

Kittitas County Community Hospital in Ellensburg serves the entire County. There are 50 licensed beds, but only 36 are set up to be used, and those beds are not used to capacity. The hospital has Level Four trauma service, with a limited number of specialists available. Patients with head injuries, severe burns, and/or trauma are transported to a different facility, i.e., Harbor View Medical Center in Seattle. Less severe accidents are sometimes transported to Yakima for hospitalization and treatment. There is a heliport on the roof of the hospital, and a helicopter is available for emergency response (Eric Jensen, Kittitas County Community Hospital administrator, personal communication).

The City of Ellensburg fire department provides emergency medical services (EMS) for the entire County and bills patrons for services received that may include treating falls, burns, fractures, lacerations, and heart attacks. Ambulances are located at Ellensburg, and the towns of Kittitas and Cle Elum. Also, Cascade Search and Rescue is located in Ellensburg. Emergency calls are dispatched through the Sheriff's office to the fire districts, which provide search and rescue support.

5.3.2.4 Schools

School districts within the Project area include District 400 (Thorpe), District 401 (Ellensburg), and District 404 (Cle Elum/Roslyn). School bus routes use federal, state and county roads near the Project for student transportation to the schools. Further details on schools and their services are not provided because there will be no significant impact to local schools as a result of the Project. Construction workers who arrive from out of the area are only expected to do so on a temporary basis, and not relocate their families to the area. Of the total 16 to 18 workers required during operations, up to half are expected to be from the local area. Therefore, no enrollment impacts on schools are anticipated.(See Sections 8.1 'Socioeconomic Impact' and 2.12.4 'Operations and Maintenance Labor Force' for more details).

5.3.2.5 Recreation

Table 5.3.2-1 provides a list of recreational facilities and activities available within a 25-mile radius of the Project site or beyond; the radius is centered somewhat near the middle portion of the Project (see Exhibit 20 'Recreational Areas') This study area covers forests and wilderness areas, wildlife areas and refuges, boat launches, beaches and other water use sites, state parks, town parks, campsites, and museums. Ski areas are available beyond the 25-mile radius, at Snoqualmie Pass and Mission Ridge.

Washington State campgrounds are operated on a first-come, first-served basis, and state regulations limit overnight stays to 10 days. The U.S. Forest campgrounds exceed their capacity almost every weekend during the summer and often turn people away (Lucy Schmidt, U.S. Forest Service). National Forests have a 14-day limit on camping. After that, campers must leave the campground for at least 24 hours before returning.

Recreational facilities or activities available near the Project area are as follows:

- Ellensburg Golf and Country Club;
- Carey Lakes Golf Course;
- Horseback riding along Iron Horse Trail/John Wayne Trail;
- Racquet and Recreation Center;
- Swimming Pool/Fitness Center;
- The Sun Country Golf Resort in the Cle Elum/Roslyn area.

Summer recreational activities include water sports such as fly fishing, swimming, boating, river rafting, gold panning, and water skiing; as well as camping, mountain biking, hay rides, hiking, horseback riding, hunting, biking, picnicking, bird watching, rock hounding, berry and mushroom picking, softball, and other team sports. During the winter, recreational activities include cross-country skiing, horse-drawn sleigh rides, inner tubing, snowshoeing, skiing, sledding, snowboarding, and snowmobiling. There are no fishing sites within the properties of the Project.

Table 5.3.2-1
Parks, Recreational Facilities, and Activities within 25 Miles of the Kittitas Valley Wind Power Project Facility

Ellensburg City/Community Parks/Campgrounds	
Burlington Northern Square	Reed Park
Catherine Park	Rotary Pavilion
Irene Rinehart Riverfront Park	Sagebrush Trail
Kiwanis Park	South Main Entry Park
Lions/Mountain View Park	West Ellensburg Park
McElroy Park	Whitney Park
Memorial Park	Wippel Park
Paul Rogers Wildlife Habitat Park	Skate Park
KOA Campground (private campground)	
Ellensburg Museums	
Children's Activity Museum	Olmstead Place State Park and Heritage Center
Clymer Museum and Gallery	Thorp Mill (located in Thorp)
Kittitas County Museum	
Cle Elum/Roslyn City/Community Parks/Campgrounds	
Cle Elum City Park	Whispering Pines (private campground)
South Cle Elum City Park	Trailer Corral (private campground)
Roslyn City Park	
Cle Elum/Roslyn Museums	
Carpenter Museum	Salmon La Sac Guard Station Restoration
Cle Elum Historical Telephone Museum	South Cle Elum Depot Restoration
Roslyn Museum	
State Parks	
Olmstead Place State Park	Squilchuck State Park
Ginkgo State Park (no camping)	Lake Easton State Park
Wanapum State Park	Iron Horse State Park (no camping)
U.S. Forest Service (Okanogan and Wenatchee National Forests)	
Crystal Springs	Mineral Springs
Kachess	Swauk
Owhi	Ken Wilcox at Haney Meadows
Fish Lake	Lion Rock
Salmon La Sac	Taneum
Cayuse	Icewater
Red Mountain	Taneum Junction
Cle Elum River	South Fork Meadow
Wish Poosh	Tamarack Spring
De Roux	Riders Camp
Beverly	Manastash
Red Top	Quartz Mountain

5.3.2.5 Public Utilities

The study area defined for public utilities is Kittitas County. Puget Sound Energy (PSE) and Kittitas PUD No. 1 provide electrical services within the county, except for the City of Ellensburg, which provides its own electrical service. The Project will connect either to the Bonneville Power Administration or PSE transmission system.

5.3.2.6 Communications

Telephone services near the Project are currently supplied by Ellensburg Telephone. Cellular phone service is available from a variety of providers. DSL internet service is provided by Ellensburg Telephone in its service territory and Inland Internet in Cle Elum, Roslyn and Ronald.

Newspapers published and/or distributed in the area include the *Daily Record* (Ellensburg daily newspaper), *Northern Kittitas County Tribune* (weekly), and *Snoqualmie Pass Times* (weekly).

Cable television services are provided by Charter Communications in Ellensburg, R&R in Roslyn, and TCI in Cle Elum. Broadcast television service in the Project area is available for Channels 25, 31, 39, 41, 51, 54, 63, and 69. All of these stations are UHF channels and are broadcast from transmitter antennas located south and east of Ellensburg. Reception quality varies greatly based on local topography and distance from the transmitter antennas.

Radio transmission reception quality varies throughout Kittitas County.

5.3.2.7 Public Water Supply/Stormwater Systems

A description of existing public water supplies within the County is not provided because none of the public water utilities will be used. Water during construction will be supplied by the construction contractor. An on-site domestic well is proposed for the operations and maintenance facility during operations.

There are no existing stormwater systems at the Project.

5.3.2.8 Sewage/Solid Waste Disposal

A description of existing community sewer systems within the county is not provided because none of the public utilities will be used. Sanitary wastes will be collected in “portable toilets” during construction, and an on-site septic system for the operations and maintenance facility is proposed for operations.

Solid waste collection services are provided by two transfer stations, one in the upper county (Cle Elum) and one in the lower county (Ellensburg). The transfer stations are operated by Waste Management and they do not accept hazardous wastes. There are drop boxes for recycling at both transfer stations, but mixed paper recycling is not offered. A new transfer station is planned in the upper county. The local county landfill is closed (Lisa Bach, Kittitas County Solid Waste Programs).

5.3.3 Impacts of the Proposed Action

5.3.3.1 Police

5.3.3.1.1 Construction

Construction activities associated with the Project will increase traffic volume on roadways surrounding the Project area, as a result of both commuting construction workers and the transportation of materials. This increased volume will occur in mid-summer to fall, in addition to current peak demands during the summer months when vacationers use the roadways. It is possible that the number of accidents and calls for service along major roadways (SR-97, SR-10 and, I-90) will increase for about six months, when most of the on-site work will be done. Enforcement activities may peak when employees peak, at about 160 employees for about one month. Since the period of time for construction is short, existing staff should likely be able to provide the adequate enforcement services. The Applicant will consult with the County regarding the impact on County staffing. If additional staffing is required the Applicant proposes to mitigate by prepaying taxes in a sufficient amount to provide adequate staffing levels during construction.

Out-of-area workers are not expected to move their families into the Project area because each craft will be completed within three and one half months or less. They will either commute (from the Seattle area or Yakima area) or stay in temporary housing (RV parks, hotels, motels, or campgrounds) for the period of time needed to complete their tasks. Also, of the total workers, there will be approximately 60 workers that will erect the turbine towers within about four months. These workers will be from out-of-state because specialized workers are required for this type of work and, therefore, they are expected to stay in temporary housing. Based on most workers not changing their family residence, traffic violations are expected to be the largest concern for police enforcement. There should be minimal need to increase civil law enforcement, as well as minimal need for additional jail space. Traffic enforcement should be manageable with existing staff or temporary part-time staff for the Washington State Patrol and the Sheriff's Department. As stated above, since the period of time for construction is short, existing staff should be able to provide the additional law enforcement services.

5.3.3.1.2 Operations

Because the number of employees during operations will range from 12-16 workers, there will be no significant impacts to law enforcement.

5.3.3.2 Fire Services

5.3.3.2.1 Construction

Because of the number of workers and the construction activities occurring in an area susceptible to wild land fires, there is increased potential for calls for emergency fire services. Local fire districts have sufficient staff to meet this increased demand. There is little or no potential for nacelles to catch on fire during construction, as they will not be operating yet.

Turbines located on DNR property are under the fire protection of DNR. There are turbines outside of a fire district, currently without contracted service protection, and these properties would be more vulnerable to the spread of fire. The Project intends to contract with local districts for fire protection during construction.

5.3.3.2.2 Operations

Impacts from fire, either from a turbine or wild land fire in the Project area, could increase or be more difficult to control unless provisions are made for fire fighters to have easy access to the Project property.

Fires caused by lightning are rare when compared to manmade fires, and they usually occur on timbered ground (D.J. Evans, Fire Chief). A lightning-caused fire at the turbines is unlikely because all turbines and towers will be built with engineered lightning protection systems (Chris Taylor, Zilkha). Fires in modern turbine nacelles due to mechanical failures are also extremely rare. In the event of a nacelle fire, Project operations staff and fire personnel will not attempt to put it out but only prevent the fire from spreading to any adjacent land. This can be achieved either by use of fire suppressant material or a small controlled burn around the base of the tower.

All operations personnel working on the turbines will work in pairs. In the unlikely event that an injury occurs while working in the nacelle, all staff will be trained in lowering injured colleagues from the nacelle. A rescue basket specially designed for this purpose will be kept at the operations and maintenance facility and will be available for use by local emergency medical services personnel. Training in its use will also be provided to local EMS personnel.

5.3.3.3 Medical Services/Hospitals

Because the local hospital has capacity for additional patients and there are several ambulances available to service the Project area, there will be no significant impacts to medical services in the Project area during construction and operation. The Applicant will make arrangements with the Kittitas Valley Community Hospital for helicopter transportation service in the unlikely event that any operations personnel are seriously injured and require evacuation from a remote location within the Project area.

5.3.3.4 Schools

5.3.3.4.1 Construction

It is unlikely that construction workers and their families will relocate to the study area during construction because of the short term (maximum of three to three and one half months) of employment for each craft. Therefore, there are no impacts expected to local school districts.

5.3.3.4.2 Operations

There will be an insignificant impact on schools during operations because the number of employees who might have families moving to the area is small. Up to half of the 16-18 employees can be hired locally.

5.3.3.5 Parks and Recreation

5.3.3.5.1 Construction

Some workers may decide to camp at parks and campgrounds that allow overnight camping. These workers could displace existing recreational users. However, recreational demands typically are higher on weekends, while workers will be more likely to use the facilities on weekdays.

In addition, it is possible that some construction workers will take advantage of the recreational opportunities within the county and throughout the region. These areas will probably include boat launches, parks, wildlife areas and refuges, and forest and wilderness areas, thereby increasing the number of users and again possibly displacing existing recreational users.

5.3.3.5.2 Operations

Some parks and recreational facilities exceed capacity now. However, there will be an insignificant impact on parks and recreation during operations because the number of employees (8-9) who might have families moving to the area is small, and these families are unlikely to be using the same recreational facility at the same time.

5.3.3.6 Utilities

Puget Sound Energy, Kittitas PUD No. 1, and the City of Ellensburg provide electric services within the County, and because electric energy needs for the Project during construction and operations are insignificant, the electric utilities will have insignificant impacts. After the Project is operating, there will be positive impacts to electrical utilities in the region from the provision of an additional source of power to the regional grid.

5.3.3.7 Communications

There will be no impacts to telephone, newspapers or cable and satellite television services in the Project area during construction and operations. The Applicant has commissioned an expert analysis of the potential for turbines obstructing telecommunications facilities in the Project area (Exhibit 14, 'Telecommunications Obstruction Analysis'.) As described in Exhibit 14, the proposed turbine locations will not obstruct or interfere with any existing microwave telecommunications facilities.

Based on the location of the transmitter antennas relative to the proposed Project, no impacts to off-air television reception is expected from construction or operation of the Project in any of the population centers in Kittitas County (Ellensburg, Cle Elum, Roslyn, Ronald, Kittitas, Thorp, Vantage, Easton, etc.) While unlikely, it is possible that the Project will affect off-air television reception in a small, sparsely populated area immediately northwest of the Project site. This area is roughly bounded by Lauderdale Junction and the Teanaway River in a recessed valley known as Swauk Prairie.

The current quality of off-air TV reception in this area is highly variable and poor in areas where the line of sight from the transmitter antennas is obstructed by local topography. The Applicant plans baseline field studies in the potentially affected area to more precisely determine the existing quality of TV reception in the area potentially affected by the wind Project (see Section 2.17 'Study Schedules'.) After the Project is built, the Applicant plans a follow-up field study to determine if the quality of television reception is degraded in this area by the Project. In the unlikely event that the Project does create any significant television reception problems for people in this area, the Applicant will develop a solution in cooperation with affected residents.

5.3.3.8 Public Water Supply/Stormwater

There will not be an impact to public water systems because none of the public water utilities will be used. Water during construction will be supplied by the contractor. An on-site domestic well is proposed for the operation and maintenance facility during operations.

There are no existing stormwater systems in the Project area. The Project will manage stormwater based on an NPDES permit for stormwater and a stormwater pollution control plan. Therefore, there will be no significant impacts during construction or operations.

5.3.3.9 Sewage/Solid Waste Disposal

5.3.3.9.1 Construction

There will be no significant impacts to community sewer systems because the Project will not be connected to a sewer system during construction and operation, and because of the small number of employees and their probable local residency during operations. Sanitary wastes will be collected in "portable toilets" during construction, and an on-site sewage disposal system for the operations and maintenance facility is proposed for operations.

There will be no significant impacts to solid waste disposal services because the construction wastes (primarily metal, cable, wire, wood pallets, and cardboard) will be stored in dumpsters until hauled away to a licensed landfill, by either the construction contractor to a transfer station or the construction contractor will contract with the local service provider, probably Waste Management, to dispose of the wastes. The volume of construction wastes is expected to be less than ten tons.

5.3.3.9.2 **Operations**

Solid wastes during operations will be either contracted for collection at the operations and maintenance facility, or employees of the Project will haul solid wastes to a local transfer station for disposition at a licensed landfill. Existing facilities are reaching capacity for solid wastes, but future plans for another transfer station in the upper county will provide additional capacity for the area.   Solid waste generation during operations will be minimal.

5.3.4 Mitigation Measures

Potential impacts to public services and utilities will be mitigated by tax revenues generated by the Applicant. Tax revenue generation by the Project, in net present value, will include the following:

Property taxes: Based on an estimated value of $750,000 per turbine and the 1.35 percent property tax rate in Kittitas County, it is estimated that the Project will contribute directly to an increase of $1,221,000 in property tax revenue to Kittitas County. The estimated increase in value of other properties, as a result of the Project, will result in an additional $85,000 in property taxes annually for the County. Thus, it is estimated that Kittitas County will receive approximately $1,306,000 in added property tax revenue each year from the Project (see Section 8.1 'Socioeconomic Impact').

Sales taxes: As construction workers and full-time employees will purchase goods and services in the Project area, increased retail sales in local communities are estimated to be approximately $17,000. Sales taxes are also expected to increase in the Project area as a result of Project purchases (for annual operating supplies and materials) within the surrounding communities.

Should there be construction impacts requiring additional staffing levels during construction or other impacts or costs related to services which will not be covered timely by tax revenues the Applicant will enter into agreement(s) with the respect local governmental agency for prepayment of taxes for mitigation of the cost impacts. This would include fire, police and county roads.

5.3.4.1 Construction

Because construction activities at the Project are not expected to result in significant impacts to medical services, schools, public utilities, communications, water supplies, sewage/solid waste disposal, or stormwater systems, no mitigation measures will be necessary for those services or utilities.

The following mitigation measures will be implemented to reduce impacts to public services resulting from construction of the Project:

- The Applicant will provide all police, fire, and emergency medical personnel with emergency response details for the Project including Applicant contact information, procedures for rescue operations to the nacelles, and location of rescue basket.

Additionally, potential impacts to fire services will be mitigated by the following:

- Contract with fire district(s) for protection services during construction;
- Provide special training to fire district personnel for fires related to wind turbines, and to EMS personnel in how to use a rescue basket that will be kept at the operations and maintenance facility for the purpose of removing injured employees from the towers;
- Provide detailed maps that show all access roads to the Project;
- Provide keys to a master lock system that will enable emergency personnel to unlock gates that would otherwise limit access to the Project;
- Use spark arresters on all power equipment, e.g., cutting torches, and cutting tools;
- Inform workers at the Project of emergency contact phone numbers and train them in emergency response procedures;
- Carry fire extinguishers in all maintenance vehicles; and
- Coordinate with DNR when the fire danger is high.

5.3.4.2 Operation and Maintenance

During operation and maintenance of the Project, impacts to local services and utilities are expected to be insignificant. However, emergency preparedness planning will be implemented as mentioned above, to reduce potential impacts in the event of an emergency. No additional mitigation will be required.

6.1 Prevention of Significant Deterioration

WAC 463-42-385 PSD application. *The applicant shall include a completed prevention of significant deterioration permit application.*

WAC 173-400-110 New source review (NSR). *The applicant must file a Notice of Construction Application and an order of approval must be issued by EFSEC prior to establishment of any project that qualifies as a major stationary source by emitting or having the potential to emit one hundred tons per year or more of any air contaminant regulated by the state or Federal Clean Air Acts.*

Pursuant to WAC 463-42-115 the Applicant requests a waiver of the information required by WAC 463-42-385 and WAC 463-400-110, which respectively calls for a PSD permit application and a Notice of Construction Application. The fuel source for the Project is wind which is transformed from kinetic energy into electrical energy by wind turbine generators. No air emissions will be generated from operation of the wind turbine generators at the Project and thus a PSD Permit and Notice of Construction Application are not required.

7.1 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT APPLICATION

WAC 463-42-435 NPDES application. *The applicant shall include a completed National Pollutant Discharge Elimination System permit application.*

7.1.1 NPDES Permit Application Requirements and Statutes

The Project will require a Stormwater General permit for construction activities because construction of the facility will disturb more than five acres of land. EFSEC has jurisdiction regarding the National Pollution Discharge Elimination System (NPDES) Permit over the Project pursuant to Chapter 463-38 WAC. The applicable statutes and regulations which establish permits applicable to the discharge of waste material from industrial, commercial and municipal operations into groundwaters are as follows:

- Chapter 90.48 RCW Water Pollution Control Act
- Chapter173-226 WAC Waste Water General Permit Program establishes general stormwater permits for the Washington Department Of Ecology (DOE) National Pollutant Discharge Elimination System Permit Program (NPDES)
- Chapter 173-201A WAC Washington Department Of Ecology Water Quality Standards For Surface Waters Of The State Of Washington, which regulates water quality of surface waters; and
- Chapter 173-216 WAC Washington Department Of Ecology Waste Water Discharge Program,

Federal statute(s) and regulations implemented by the above state statute(s) and regulations include: 42 USC 1251 Federal Clean Water Act; 15 CFR 923-930. An NPDES Pemit will also be required for construction activities.

7.1.2 NPDES Permit Application

Below is the completed Washington DOE Application for General Permit to Discharge Stormwater Associated with Construction Activity.

Application for General Permit to Discharge Stormwater Associated with

Construction Activity

(Notice of Intent)

☐ Change of Information

Permit # SO3 - _____

(Please print in ink or type)

Please Read NOI Instructions Before Filling Out This Form

I. Contact Person

Contact Name		Phone No.
Andrew H. Young		503-222-9400 x2
Company		
Zilkha Renewable Energy		
Mailing Address		
210 SW Morrison St, Suite 310		
City	State	Zip + 4
Portland	OR	97204-3151

II. Owner/Representative of Site

(All correspondence will be mailed here)

Owner's Name		Phone No.
Sagebrush Power Partners, LLC &		503-222-9400
Company Name		
Zilkha Renewable Energy		
Mailing Address		
1001 McKinney St, Suite 1740		
City	State	Zip + 4
Houston	TX	77002

III. Site Location/Address

Site Name	
Kitttias Valley Wind Power Project Site	
Street Address (or Location Description)	
NW Corner of Bettas Road & Highway 97	
City (or nearest city)	Zip + 4
Ellensburg	99826-9477
County	
Kittitas	
Provide legal description if no address for site (attach separate sheet if necessary)	

IV. Billing Address

Contact Name		Phone No.
Andrew H. Young		503-222-9400
Company Name		
Zilkha Renewable Energy		
Mailing Address		
210 SW Morrison St., Suite 310		
City	State	Zip + 4
Portland	OR	97204-3151

V. Receiving Water Information (check all that apply)

A. Does your construction site discharge stormwater to:

1. ☐ Storm drain system - Owner of storm drain system (name) N/A
2. ☐ Indirectly or directly to surface waters (☐ River ☐ Lake ☐ Creek ☐ Estuary ☐ Ocean ☐ Wetland)
3. ☒ Directly to ground waters of Washington state. ☐ Dry Well ☐ Drainfield ☒ Other (drainage to porous soils)

B. Name(s) of receiving water(s) N/A

Initial discharge is to an unnamed receiving water? ☐ Yes ☒ No

C. **Location of discharges** (Use any of the following to most accurately identify location of discharge. Attach a supplemental sheet if more than one discharge point and/or numerous receiving waters.):

1. Map enclosed (Mark discharge point on map and provide distance from receiving water.)
(see Exhibit 1 – Project Site Layout for locations of roadways and other Project facilities)

2. Township 19N Range 17E Sections 2,3, 9,10,11,12, 13,14,15,16, 21, 22, 27
Township 20N Range 17E Section 34, S ½ , SE ¼

(Specify degrees, minutes, and seconds.)

3. Latitude 47°-08'-25.64" N Longitude 120°-41'-08.17" W (NAD 27) (Approx. Center of Project Site Area)

VI. Construction Activity Information

1. Total size of site 90 acres (perm. footprint) Total area to be disturbed 390 Acres (300 ac. temp. disturbed) How many phases? 1
2. Will any portion of the project be sold to private developers? ☐ Yes ☒ No
3. Projected startup date 10/2003 (month/year) Proposed completion date 12/2004 (month/year)
4. Will there be dewatering activity? ☐ Yes ☒ No If yes, give brief description of location of such activity and how water will be disposed of: _____
5. Check all construction (soil disturbing activities) that apply. Attach a supplemental sheet if necessary.

☒ Clearing	☒ Utilities	☒ Landscaping	Homes (How many?)	☒ Other 121 Wind turbines
☒ Grading	☐ Stormwater Facilities	☐ Trails	☐ Single-family _____	☐ Other _____
☐ Demolition	☒ Roads/Streets	☐ Parks	☐ Multi-family _____	☐ Other _____
☒ Importing Soil	☐ Retaining Walls	Industrial Buildings	☐ Townhomes _____	☐ Other _____
☒ Exporting Soil	☐ Piping Systems	Type O&M Barn Bldg	☐ Condominiums _____	☐ Other _____
☒ Stockpiling	☐ Filling Wetland	Site NW Corner of Hwy. 97 & Bettas Road		

VII. Stormwater Pollution Prevention Plan (SWPPP)

A. **Best Management Practices (BMPs)** (Check all that apply.) Attach supplemental list if needed to include other BMPs.

☒ Silt Fencing	☐ Wheel Wash Area	☐ Riprap Channel Lining	☐ Slope Reduction
☐ Vegetated Strips	☐ Nets and Blankets	☒ Interceptor Trenches/Ditches	☐ Chemical Treatment (Polyacrylamides)
☒ Straw Bales	☒ Swale	☒ Culverts	☐ Kiln Dust
☒ Mulching	☒ Diverted Flows	☐ Pipes	☒ Dust Control
☐ Hydroseed	☐ Dikes	☒ Berms	☐ Other _____
☒ Plastic Covering	☒ Check Dams	☐ Terracing	☐ Other _____

B. **Stormwater Pollution Prevention Plan (SWPPP)**

Has a SWPPP been developed that includes a narrative and drawings? ☐ Yes ☒ No

If NO, will a plan be developed prior to the start of construction? ☒ Yes ☐ No

If you answered "NO" to the above question, notify Ecology in writing when a final Plan has been developed. A permit will not be issued until a confirmation letter has been received by Ecology. The SWPPP is to be implemented when construction activity commences on your project.

VIII. State Environmental Policy Act (SEPA)

If the SEPA process has not been completed at the time of NOI submittal, a follow-up letter must be sent to Ecology with the following information prior to Ecology granting permit coverage.

Has a SEPA review been completed? ☐ Yes ☒ No ☐ Exempt

Type of SEPA document ☐ DNS ☒ Final EIS ☐ MDNS

Agency issuing DNS, Final EIS, or Exemption EFSEC ; Date currently under review

Are you aware of an appeal of the adequancy of the SEPA document? ☐ Yes ☒ No
(If yes, please attach explanatory letter.)

SEPA requirements must be complied with prior to permit issuance.

IX. Public Notice

The public notice must be published at least once each week for 2 consecutive weeks, in a single newspaper which has general circulation in the county in which the construction is to take place. See the NOI instructions for the public notice language requirements. Permit coverage will not be granted sooner than 31 days after the date of the second public notice. ***Note: This NOI must be submitted to Ecology on or before the date of the first public notice.***

PUBLIC NOTICE

Sagebrush Power Partners, LLC, care of Zilkha Renewable Energy, LLC of 210 SW Morrison St., Suite 310, Portland, OR 97204-3151is seeking coverage under the Washington Department of Ecology's NPDES General Permit for Stormwater Discharges Associated with Construction Activities.

The proposed 90 *acre* project, known as the Kittitas Valley Wind Power Project is located at the NW corner of Highway and Bettas Road in Ellensburg, WA. Approximately 390 acres will be disturbed for construction of the wind turbines, substation, gravel roads, gravel crane pads, fied access ways, O&M building, laydown areas, underground cable and overhead power lines for the project.

Stormwater will originate from the roadways and graveled areas around on the project site. Stormwater shedding will be controlled through the implementation of a stowm water pollution prevention plan (SWPPP) both on the project construction grading plan and construction specifications. The SWPPP shall incorporate measures as lited above in section VII.

Any person desiring to present their views to the Department of Ecology concerning this application, may notify Ecology in writing within 30 days from the last date of publication of this notice. Comments may be submitted to: Dept. of Ecology, Stormwater Unit, PO Box 47696, Olympia, WA 98504-7696

Provide the exact dates (mm/dd/yy) that the first and second public notices will appear in the newspaper:

Date of the first notice _____ / _____ / _____ ;

Date of second notice _____ / _____ / _____-- Dates yet to be determined

Name of the newspaper which will run the public notices Ellensburg Daily Record

Ecology is no longer requiring the submittal of the affidavit of publication.

Complete the above public notice information or provide a copy of the notice to be published.

X. Regulatory Status

A. ☐ NPDES Permit (e.g., industrial stormwater) Permit No. _____	C. ☐ Air Notice of Construction, Permit, or Order Agency _____
B. ☐ State Waste Discharge Permit Permit No. _____	D. ☐ State/USEPA Hazardous Waste ID No. _____

XI. Certification of Permittee(s)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Andrew H. Young
Owner/Representative's Printed Name

NW Development Director, Zilkha Renewable Energy, LLC
Title

Owner/Representative's Signature

Date

Sign and return this document to the following address; for questions call (360) 407-6437: Washington Department of Ecology, Water Quality Program, Stormwater Unit, PO Box 47696, Olympia, WA 98504-7696

The Department of Ecology is an equal opportunity agency and does not discriminate on the basis of race, creed, color, disability, age, religion, national origin, sex, marital status, disabled veteran's status, Vietnam Era veteran's status, or sexual orientation.

(Rev. 3/01)

7.2 EMERGENCY PLANS

WAC 463-42-525 Emergency plans. *The applicant shall describe emergency plans which will be required to assure the public safety and environmental protection on and off the site in the event of a natural disaster or other major incident relating to or affecting the Project and further, will identify the specific responsibilities which will be assumed by the applicant*

7.2.1 Introduction

On-site emergency plans will be prepared to protect the public health, safety and environment on and off the Project site in the case of a major natural disaster or industrial accident relating to or affecting the Project. The Applicant shall prepare the plans and be responsible for implementing the plan with its operations team in coordination with the local emergency response support functions. The plans will describe the emergency response procedures to be implemented during various emergency situations that may affect the Project or the surrounding community or environment.

The emergency plans described in this section are an outline of the details that will be included in the detailed emergency plans to be developed prior to the construction and operating phases of the Project. This outline is based on Applicant's experience in operating other similar wind power projects. For wind power projects, the key element of an effective emergency and safety plan is the ability to communicate. During both construction and operation of the Project, all operations and construction team leaders will be equipped with two-way short-band radios and cellular phones.

Preliminary construction emergency plans will be developed and submitted for review by EFSEC prior to the start of construction activities. Preliminary operations and maintenance emergency plans will also be developed and submitted for review by EFSEC and prior to the start of plant operations. During the Project construction and startup period, the emergency plans will be updated to conform to manufacturer and vendor safety information for the specific equipment installed at the Project.

7.2.2 Events Covered By Emergency Plans

The emergency plans cover a number of events that may occur at or near the Project site by natural causes, equipment failure or by human mistake. The following is a list of potential events that will be covered by the emergency plans.

- Personnel injury;
- Construction emergencies;
- Project evacuation;
- Fire or explosion;
- Floods;
- Extreme Weather Abnormalities;
- Earthquakes;
- Volcanic eruption;
- Facility Blackout.

The Project operating and maintenance (O&M) group and third party contractors will receive regular emergency response and safety training to assure that effective and safe action will be taken to reduce and limit the impact of an emergency at the Project site.

7.2.3 Personnel Injury

The following actions will be taken for personnel injuries:

- The Site Construction Manager(s), O&M Manager, or designee, will be notified of the injury(s);
- A qualified first aid attendant will administer first aid until medical assistance arrives;
- The Site Construction Manager(s), O&M Manager, or designee, will notify Kittcom, the county-wide emergency response (911) system;
- All key supervisors will be paged or called and advised of the injury;
- For off-site assistance, the Construction Manager(s), O&M Manager, or designee, will meet the emergency responders at a prearranged gate and direct them to the location of the emergency;
- Should an employee become injured and require emergency off-site medical transportation, they will be accompanied by a Project representative to give pertinent information needed;
- In the event of death, only a professional medical practitioner can confirm the death. The paramedics will be called first and then a physician on retainer. Notification of the Kittitas County Sheriff's office and the local Emergency Medical Service (EMS) is required plus OSHA per the requirements of the OSHA Health and Safety Act of 1970 which requires the notification within eight hours after the death of any employee from a work-related incident or the in-patient hospitalization of three or more employees as a result of a work-related incident;
- If a medical practitioner declares death, the Construction Manager(s) or O&M Manager, as the case may be, will inform the deceased's next of kin.

7.2.4 Construction Emergency Plan

The Project will be managed and constructed by personnel and contractors experienced and familiar with the construction of wind power projects of the type proposed for the Project. The construction specifications will require that the contractors prepare and implement a Construction Health and Safety Program that includes an emergency plan. The Construction Health and Safety Program will include the following provisions:

- Construction Injury And Illness Prevention Plan;
- Construction Written Safety Program ;
- Construction Personnel Protective Devices;
- Construction On-Site Fire Suppression Prevention; and
- Construction Off-Site Fire Suppression Support.

Each contractor will develop its own plans which will be tailored to suit the specific site conditions, design and construction requirements for the Kittitas Valley Wind Power Project. The outline, as presented in this section and Section 4.1.2, 'Risk of Fire or Explosion', will provide the minimum requirements for the Project.

In the event of a construction emergency, the construction plan will require an alert broadcast to all on-site personnel and the requirement that all employees gather at a predetermined gathering place to receive further instructions. The construction emergency plan will focus primarily personnel injury, construction related accidents and on weather related events. The Construction Emergency Plan will be submitted to EFSEC prior to the start of construction.

7.2.5 Project Evacuation

Under the most severe weather events, a potential threat to the Project property or workers such as a bomb threat, the Project site area may have to be evacuated. The Construction Written Safety Program, the operating power plant Emergency Action Plan or the Plant Operational Safety Program, whichever is in force, will provide the plans for the site evacuation and include the following actions:

- A predetermined evacuation area will be designated unless the evacuation area is in danger;
- The Site Construction Manager(s), O&M Manager, or designee, will broadcast via two-way short band radio and over cell phones, a predetermined alarm and announce the specific egress, gathering area and the nature of the emergency. Acknowledgement from each on-site team leader and their crews will be required;
- The Site Construction Manager(s), O&M Manager, or designee, will notify the appropriate local authorities such as Kittcom (911) for fire, injury or hazardous material spills or other disturbances;
- For off-site assistance such as from the local fire district, Ellensburg EMS, or the Kittitas County Sheriff's Office, the Site Construction Manager(s), O&M Manager, or designee, will meet the off-site emergency response assistance at a prearranged location and direct them to the source of the emergency;
- All visitors and vendors/subcontractors will be guided by their key on-site contact;
- If required, the Project will be shut down using the central SCADA system or by opening breakers at the main substation as required. If a shut down is performed, the utility transmission system operator (either BPA or PSE) will be notified of the anticipated outage;
- The Site Construction Manager(s), O&M Manager, or designee, will proceed to predetermined evacuation area, perform a head count and provide further instructions to evacuated personnel;
- After all employees are accounted for, the employees may leave the area or go back to work, whatever the situation calls for.

7.2.6 Fire Or Explosion

Prevention of fires or explosions is discussed in detail in Section 4.1.2, 'Risk of Fire or Explosion'. Detailed measures will be spelled out in a number of the on-site safety programs including: the Construction Written Safety Program, the Construction On-Site Fire Suppression and Prevention Program, the Operational Safety Program, the Operations Written Safety Program and the plant Emergency Action Plan and the plant Fire Prevention Plan.

All on-site employees will be responsible to contribute to prevention through the following programs:

During Construction:

- Construction Written Safety Program;
- Construction On-Site Fire Suppression And Prevention;
- Construction Off-Site Fire Suppression Support.

During Operation:

- Operational Safety Program;
- Operations Written Safety Program;
- Emergency Action Plan;
- Fire Prevention Plan.

7.2.7 Floods

Since Project facilities are located significantly outside the floodplain of the Yakima River and is more than 500 feet in elevation above the level of river or other water body, the risk of flood impacts is insignificant and is therefore not discussed here. It is extremely unlikely that the 100-year rainstorm event will occur during Project construction, which could produce local short term sheet flooding on the Project site. However, most of the construction activities at the Project site will be outdoors and require access to roads which would be exposed to such local sheet flooding. Therefore, the Applicant has developed the following list of actions to be performed under these unlikely conditions:

- The Project Construction Manager(s) will consult with appropriate authorities at the County to determine the severity of local flooding;
- Construction materials that can be damaged by water or pollute waters if submerged will be moved to either enclosed areas or elevated areas above the short-term local sheet flooding to remain dry;
- If the flooding is severe, construction work will be shut down.

7.2.8 Extreme Weather Abnormalities

Extreme weather events might include blizzards, massive sleet or hail, ice storms, or extremely high winds. In the event of extreme wind gusts, the wind turbine generators automatically shut down and go into standby mode. All Project transportation vehicles will be maintained in good running condition with full fuel tanks. The Project will have adequate foul weather gear for personnel. If extreme weather events occur, the following actions will be taken:

- When there is a weather warning issued by the National Weather Bureau, the Site Construction Manager(s), O&M Manager, or designee, will consult with appropriate authorities at the local weather service offices and at the county to determine the anticipated severity and duration of the weather event;
- The O&M Manager will hold planning meetings prior to a foul weather incident to prepare and implement a foul weather prevention plan;
- Loose materials that can be blown around or damaged will be moved inside or tied down;
- All doors will be secured;
- If the Project is shut down, the O&M Manager, or designee, will notify the electric transmission line operator (BPA or PSE) of the anticipated outage;
- Communication equipment will be checked;
- The substation high voltage line transmission facilities will be double checked for secure terminations on poles, relays, transformers and supports.

7.2.9 Earthquake

Project facilities including the wind turbines, towers, foundations and substation are all designed for the seismic class zoning at the Project site. Earthquakes occur without warning, thus damage prevention measures and plans must be made in advance. The probability of a severe earthquake at the Project site is described in Section 2.15, ‘Protection from Natural Hazards’. The wind turbines are all equipped with an over vibration sensors which will automatically shut down the turbine in the event of a severe earthquake.

Injuries and fatalities can be reduced by properly storing heavy objects and placing furniture to prevent displacement and overturning that will injure personnel. The following actions will take place during an earthquake:

- All personnel will seek safety at the nearest protected location;
- Personnel located inside the wind turbines will be instructed to get out of the turbine immediately, or if they are up-tower, they should stay there and take cover;
- Personnel will take cover so displaced material is not a problem and wait until the shaking has stopped;
- All personnel will check the immediate area to identify injuries and equipment failures and report to the Site Construction Manager, O&M Manager, or designee;
- All personnel will be instructed to report to a protected area, as necessary, or will continue monitoring the operating equipment;
- A determination will be made on missing personnel and a search and rescue effort will be taken if safe and appropriate;
- If the conditions warrant, Kittcom and BPA or PSE, (the electric transmission line operator), will be notified;
- Turbines will be shutdown manually as required depending on the severity of the quake and brought back on-line after they have been cleared for re-starting;
- Off-duty personnel will report, if they can, as designated in the emergency plan;
- The O&M Manager will approve re-entry to any turbines to carry out search and rescue efforts if the structures are intact and other plant safety issues are under control.

7.2.10 Volcanic Eruption

Volcanic eruption can result in ash falling on the Project site, which can cause lung damage, respiratory problems, and death by suffocation under extreme conditions. In addition, ash clogs machinery, filters, causes electrical short circuits, and makes roads slippery. Ash will damage computer disk drives and other computer equipment, strip paint, corrode machinery, and dissolve fabric. Communications and transportation may also be disrupted over a large area.

Precursory activity prior to eruption may provide early warning of impending eruptive activity. The decision to take shelter in-place or initiate a Project site evacuation will depend upon information concerning the safety of roadways. The actions to be taken are:

- Close all O&M building vents to prevent ash from entering buildings;
- Data processing equipment will be covered and all computers not required for safe Project operation or shutdown and other electronic equipment sensitive to dust will be shutdown;
- If the dust load is heavy enough, the Project will be shut down;
- If the conditions warrant, Kittcom and BPA or PSE (the electric transmission line operator) will be notified;
- A determination will be made if employees should be sent home immediately before roads become unsafe or if personnel must be sheltered on-site;
- Any ash cleaning operations would be initiated with cleanup personnel wearing protective equipment;
- The Project would coordinate all ash disposal activities with local Kittitas County officials.

7.2.11 Facility Blackout

A facility blackout would occur if the main utility grid power (either BPA's or PSE's system) de-energized or if a grid fault causes the substation's main circuit breaker to open. If the transmission system is shut down, the substation main circuit breaker connecting the power plant to the transmission system will be opened immediately, if not already opened. Such a power outage causes the turbines to shutdown, trip open the turbine main breaker and lock the rotors in place all automatically. Back up batteries at the substation main control house will be tripped on for emergency power to the substation relay controls and also to emergency lighting inside the control house. The O&M Facility will also have emergency indoor lighting which will come on-line. The central Supervisory Control and Data Acquisition (SCADA) system's Uninterruptible Power Supply (UPS) comes on-line automatically to provide backup power to the system and allow for controlled shut-down of the computer system.

In the event of a facility blackout, the following procedures will be followed:

- Station service switchgear will be checked and breakers not opened by under-voltage will be opened;
- Breaker control relays inside the substation control house will be inspected;
- The central SCADA system will be inspected;
- The O&M manager or designee will immediately contract the lead transmission system operator (BPA or PSE) on duty to determine the status, expected delay and appropriate course of action;
- If the main transmission system is energized, the restart will commence only when cleared by the transmission system operator;
- Once the transmission system is re-energized, the turbines will be brought back on-line manually or automatically depending on the appropriate course of action as permitted by the Transmission System Operator.

7.3 INITIAL SITE RESTORATION PLAN

WAC 463-42-655 Physical Environment *- Initial Site Restoration Plan. The applicant or certificate holder shall in the application, or within twelve months after the effective date of this section, whichever occurs later, provide an initial plan for site restoration at the conclusion of the plant's operating life. The plan shall parallel a decommissioning plan, if such a plan is prepared for the project. The initial site restoration plan shall be prepared in sufficient detail to identify, evaluate, and resolve all major environmental, and public health and safety issues presently anticipated. It shall describe the process used to evaluate the options and select the measures that will be taken to restore or preserve the site or otherwise protect all segments of the public against risks or danger resulting from the site. The plan shall include a discussion of economic factors regarding the costs and benefits of various restoration options versus the relative public risk and shall address provisions for funding or bonding arrangements to meet the site restoration or management costs. The plan shall be prepared in detail commensurate with the time until site restoration is to begin. The scope of the proposed monitoring shall be addressed in the plan.*

7.3.1 <u>Project Design Life</u>

The Projects will be designed to meet utility grade standards as well as a number of other stringent codes and requirements. As a result, the design life of all of the major equipment such as the turbines, transformers, substation and supporting plant infrastructure is at least 20 years. Based on the site conditions, it is expected that the proposed turbine technology will continue to perform well into its third decade of operation.

The trend in the wind energy industry has been to replace or “repower” older wind energy projects by upgrading older equipment with more efficient turbines. A good portion of the value in the Project is in its proven wind resource, land agreements and in-place infrastructure. It is likely that after mechanical wear takes its toll, that the Project would be upgraded with more efficient equipment and, therefore, far beyond just the design life of 20years.

7.3.2 <u>Project Decommissioning</u>

Prior to commencement of construction the Applicant will submit to and obtain approval from EFSEC, a detailed Initial Site Restoration Plan.

If the Project were to terminate operations, the Applicant would obtain the necessary authorization from the appropriate regulatory agencies to decommission the facilities. A Final Site Restoration plan would be developed and submitted to EFSEC for review and approval. Experience in other regions with older wind power projects indicates that a non-operating wind power project does not present any significant threats or risks to public health and safety or environmental contamination.

<u>Decommissioning Economics and Financial Surety</u>
Experience with older wind plants which have been decommissioned and/or repowered has shown that the scrap value of the materials and equipment contained in the Project infrastructure (steel towers, electric generators, steel, copper, etc.) would exceed the cost of dismantling the Project, based on historic and current scrap prices. The Applicant will provide adequate financial

assurances to cover all anticipated costs associated with decommissioning. In all cases, final financial responsibility for decommissioning will rest with the Applicant.

As described in the Applicant's agreements with Project landowners, all foundations would be removed to a depth of 3 feet below grade and unsalvageable material would be disposed at authorized sites. The soil surface would be restored as close as reasonably possible to its original condition. The Project substation is generally valuable and often times in older power projects, the substation would revert to the ownership of the utility (PSE or BPA). If the overhead power lines could not be used by the utility, all structures, conductors, and cables would be removed.

Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed, and would include regrading, adding topsoil, and revegetation of all disturbed areas. Revegetation would be done with appropriate seed mixes, based on native plant types in the Project area. Decommissioned roads would be reclaimed or left in place based on landowner preferences, and right of ways would be vacated and surrendered to the landowners.

Restoration plans and activities would meet the following standards and requirements:

- Any future use of the Project site will be consistent with the planned uses described in the Kittitas County Comprehensive Plan.
- Demolition or removal of equipment and facilities will occur, to the extent necessary, to meet environmental and health regulations, to salvage economically recoverable materials or to recycle the Project site for future uses.

7.3.3 Preparation of the Final Restoration Plan

Near the end of the useful operating life of the Project, the Applicant will review the Initial Site Restoration Plan and modify the plans to accommodate conditions, at that time, to meet both future needs for the Project site and site restoration laws and regulations then in force. To the extent then required by law or regulation, the Final Restoration Plan will be reviewed by appropriate regulatory agencies and any required permits obtained. Permits that may be required include demolition permits, special transportation permits and waste disposal permits.

Should the Project be suspended or terminated during construction, the Project will prepare and submit a Restoration Plan to EFSEC for review and approval. The Restoration Plan will include:

- Methods for securing the Project site for a specific period of time while attempts are made to obtain alternative financing or to seek an alternate owner.
- Methods for final restoration of the Project site should the Project terminate operations.

7.3.4 Hazardous Materials Survey

Although no hazardous materials will be used on the site, an audit will be performed of the relevant operation records and a Project site survey will be performed to determine if a release of any hazardous material has occurred. A review of all facilities will be performed to determine if any hazardous or dangerous materials (as then defined by regulation) are present as construction materials or materials utilized in the operation of any facility components such as cleaning and maintenance fluids, lubricating oils, and gases). An inspection of the Project site will be performed to determine and record the location, quantity and status of all identified materials.

Any solid waste generated during the facility shutdown or decommissioning will be disposed of, as necessary, to comply with the solid waste regulations then in place.

8.1 SOCIOECONOMIC IMPACT

WAC 463-42-535 Socioeconomic impact. *The applicant shall submit a detailed socioeconomic impact study which identifies primary and secondary as well as negative impacts on the socioeconomic environment with particular attention and analysis of impact on population, work forces, property values, housing, traffic, health and safety facilities and services, education facilities and services, and local economy.*

8.1.1 Introduction

This section presents an analysis of existing socioeconomic conditions in Kittitas County, and potential impacts associated with construction and operation of the Kittitas Valley Wind Energy Project (Project). Impacts addressed include population, housing, employment, income, property values, County revenues, community cohesion, and environmental justice.

The evaluation of impacts to employment, income, property values, and County revenues is based on a recent study titled "Economic Impacts of Wind Power in Kittitas County", prepared for the Phoenix Economic Development Group by ECONorthwest in November 2002 (Exhibit 23). That report addresses two prospective wind energy projects in Kittitas County; thus, the results from that study were adjusted to apply to this Project only. Throughout this document that study is referred to as the "Phoenix Study".

8.1.2 Existing Conditions

8.1.2.1 Housing

Table 8.1.2-1 displays the estimated number of housing units for Kittitas County and for the State of Washington. From 1990 to 2000, housing in the County grew at an average annual rate that was slightly greater than that of the State. Kittitas County's average annual growth rate was 2.2 percent, and the number of housing units increased from 13,215 in 1990 to an estimated 16,475 in 2000.

Table 8.1.2-1
Housing Units in Kittitas County and Washington State

	Housing Units		% Average Annual Growth	Number of Vacant Units, 2000	
Location	1990	2000	1990-2000	Total Vacant Units	Seasonal, Recreational, or Occasional Use
Kittitas County	13,215	16,475	2.2%	3,093	1,791
State of Washington	2,032,378	2,451,075	1.9%	179,677	55,832

Source: U.S. Census Bureau, 2002.

According to the 2000 Census, the County has 3,093 vacant housing units. Of the total vacant units, 1,791 were classified as seasonal, recreational, or occasional use. The occasional use units represent approximately 10.9 percent of the total units in the county. These units are generally lake or hunting cabins, quarters for seasonal workers, or time-share units. Nearly 59,000 of the state's total housing units, or 2.7 percent, were designated as seasonal, recreational, or occasional use units. The higher percentage of occasional use units in the County is attributed to the recreational areas located in the Cascades and other areas of the county.

Of the total units available for rent in the County, the U.S. Census reported a vacancy rate of 6.8 percent for Kittitas County. This vacancy rate is consistent with the vacancy rate reported by the Washington Center for Real Estate Research, which reported an apartment vacancy rate range of as high as 7.0 percent in September 2001 to a low of 3.9 percent in March of 2002. The higher vacancy rate experienced in September could possibly be explained by the fact that Central Washington University's academic year generally begins at the end of September. By comparison, the U.S. Census Bureau reported that the State had a rental vacancy rate of 5.8 percent.

The estimated number of persons per household in the County was 2.3 in 2000, which is less than the State's average of approximately 2.5 persons per household.

8.1.2.2 Population

Population estimates for Kittitas County and Washington State are presented in Table 8.1.2-2. In 2000, the population of Kittitas County was 33,362. Since 1990, the County population has increased at an annual rate of 2.2 percent. During the same period, the State's population increased at an annual rate of 1.9 percent.

Washington's Office of Financial Management (OFM) currently projects that County population will continue to grow through the year 2020; however, the rate of growth is projected to slow to approximately 1.1 percent annually. During the same period, the State's population is forecast to grow at an annual rate of about 1.2 percent.

Table 8.1.2-2
Kittitas County and Washington State Population

Area	1990	2000	Average Annual Growth, 1990-2000	2020 Forecast	Forecast Average Annual Growth, 2000-2020
Kittitas County	26,725	33,362	2.2%	41,776	1.1%
Washington State	4,866,663	5,894,121	1.9%	7,545,269	1.2%

Source: Washington State Office of Financial Management. 2002.

As shown in Table 8.1.2-3, nearly 92 percent of the County's population is Caucasian. The State's population is 82 percent Caucasian. The study area's population has a lower percentage of persons of Hispanic origin than that of the State. Approximately 5.0 percent of the County's residents are of Hispanic origin, compared to approximately 7.5 percent for the State.

Table 8.1.2-3 Kittitas County Demographic Breakdown of Population by Race						
Area	**White Persons**	**African-American**	**American Indian, Eskimo, or Aleutian**	**Asian or Pacific Islander**	**Other Race**	**Two or More Races**
Kittitas County	91.8%	0.7%	0.9%	2.3%	2.3%	2.0%
Washington State	81.8%	3.2%	1.6%	5.9%	3.9%	3.6%

Source: U.S. Bureau of the Census. 2002.

8.1.2.3 Employment

Table 8.1.2-4 displays average employment by industry for the County and the State. In 2000, an estimated 11,822 people were employed in the County. Employment in the study area is concentrated in the government, trade, and service sectors. The government sector (including local, state and federal employees) accounts for approximately 31 percent of total employment in the study area, while trade (including wholesale and retail) and services account for 28 and 19 percent, respectively.

Approximately 2 percent of the County's employees are not placed in a particular industry. The "not elsewhere classified" designation is used for confidentiality reasons if fewer than three firms are displayed in a particular sector, or any one firm has 80 percent or more of the employment at any level of detail in a sector.

Table 8.1.2-4 Kittitas County and Washington State Employment by Industry, 2000				
	Kittitas County		**State of Washington**	
Industry	**Employment**	**Percent of Total**	**Employment**	**Percent of Total**
Agricultural, Forestry and Fishing	811	6.9%	91530	3.4%
Construction and Mining	433	3.7%	152,790	5.7%
Manufacturing	683	5.8%	345,830	12.8%
TCU	432	3.7%	139,684	5.2%
Trade	3,279	27.7%	633,936	23.5%
FIRES	2,194	18.6%	880,985	32.6%
Government	3,717	31.4%	458,482	17.0%
Not Elsewhere Classified	273	2.3%	NA	NA
Total	**11,822**	**100.0%**	**2,703,237**	**100.0%**

Source: State of Washington Employment Security Department. 2002.
Notes:
TCU = Transportation, communication, and utilities
Trade = wholesale and retail
FIRES = Finance, insurance, real estate, and services

Recent unemployment rate trends for Kittitas County and Washington State are shown in Table 8.1.2-5. In 1996, the average unemployment rate for the County exceeded the State's rate by over

2 percentage points, 8.6 percent versus 6.5 percent. By 1999, strong economic growth had resulted in decreases in the unemployment rates for both the County and State to 5.6 percent and 4.7 percent, respectively. With the recent recession, unemployment has risen in both the County and State. The 2001 unemployment rate was 6.5 percent in Kittitas County and 6.4 percent in Washington State, and by September 2002, the unemployment rate for Washington State had risen to 7.4 percent (2002 data for Kittitas County are not yet available).

Table 8.1.2- 5
Unemployment Rate Trends in Kittitas County and Washington State, 1996-2001

Area	1996	1997	1998	1999	2000	2001
Kittitas County	8.6%	6.0%	6.0%	5.6%	5.8%	6.5%
Washington State	6.5%	4.8%	4.8%	4.7%	5.2%	6.4%

Source: State of Washington Employment Security Department. 2002.

8.1.2.4 Income

In 2000, the per capita income of Kittitas County residents of $21,196 was about 68 percent of the State average of $31,230 (Table 8.1.2-6). From 1997-2000, the County's per capita income grew at an annual rate of 3.1 percent. Over the same time period, the State's per capita income grew at an annual rate of 4.2 percent.

Table 8.1.2-6
Kittitas County Per Capita Income (1997-2000)

Area	1997	1998	1999	2000	% Average Annual increase (1997-2000)	% of State Total (2000)
Kittitas County	18,781	19,738	20,164	21,196	3.1%	67.9%
State of Washington	26,469	28,285	29,819	31,230	4.2%	

Source: Bureau of Economic Analysis. 2002.

The poverty rate for the County in 1999 was approximately 19.6 percent, which exceeded the State average of 10.6 percent.

8.1.2.5 Local Government Revenue Sources

According to the Washington State Department of Revenue, Kittitas County had an assessed value of approximately $2.2 billion in 2001. The 2001 average consolidated tax per thousand dollars of assessed value for the County was about $10.67. Revenues from property taxes are used to fund Kittitas County government, local school districts, local fire departments, libraries, and emergency medical services. These property tax revenues are also a major source of revenue for the local governments. Incorporated into the consolidated tax levy are local levies collected by the County Assessor and returned to the local jurisdictions as general fund revenues.

8.1.2.6 Sales and Other Tax Revenue

Recent trends in taxable retail sales in Kittitas County and Washington State are compared in Table 8.1.2-7. In 2001, retail sales in the County totaled approximately $388 million. From 1998 to 2001, retail sales in the County increased at an average annual rate of 1.5 percent. Over the same period, sales statewide increased at an annual rate of 3.4 percent. Both the County and the State experienced a decline in taxable retail sales from 2000 to 2001. This decrease in retail sales is likely attributed to the overall slowdown in the regional and national economies.

Table 8.1.2-7
Kittitas County and Washington State Taxable Retail Sales ($000s)

Area	1998	1999	2000	2001	Avg. Annual % Change 1998-2001
Kittitas County	365,318	367,900	392,536	387,724	1.5%
Washington State	73,865,218	79,683,553	84,747,510	84,356,940	3.4%

Source: Washington State Department of Revenue. 2002.

8.1.2.7 General Fund Revenues

In 2001, the Kittitas County general fund had revenues of about $11 million. As shown in Table 8.1.2-8, approximately 38 percent of the revenue is expected to come from taxes. Other sources of revenue include licenses and permits, fines and forfeits, and intergovernmental transfers. Real and personal property taxes are forecast to be the largest contributors to revenues. Property taxes, which account for about 28 percent of total revenues, generated about $3.1 million in revenues. Sales and use taxes are expected to total approximately $2 million in 2001, providing approximately 18 percent of total revenues for the general fund.

Table 8.1.2-8
Kittitas County General Fund, Total Resources (2001)

Resources	2001	Percent of Total Resources
General Property Tax	$3,113,040	28.0%
Sales and Use Tax	$2,010,140	18.1%
Other Local Taxes	$241,668	2.2%
Licenses and Permits	$593,398	5.3%
Charges and Fees for Service	$823,701	7.4%
Interest on Investments	$596,142	5.4%
Fines and Forfeits	$1,387,397	12.5%
Miscellaneous	$208,728	1.9%
Intergovernmental Revenues	$2,131,520	19.2%
Total Resources	$11,105,734	100.0%

Source: Washington State Auditor, Local Government Financial Reporting System

8.1.3 Impacts

8.1.3.1 Population and Housing

The Project is not expected to result in a substantial increase of population in the county; the Project is expected to require 16 to 18 total workers during operations, and some of them may be persons already residing in Kittitas County. Less than 15 additional workers are projected from additional spending (multiplier effects) in the County.

During major construction projects, there is always a chance that an influx of temporary workers requiring overnight accommodations will outstrip the supply of temporary housing. During construction, the Project would require up to 160 workers during a four-month period when construction activity is at its peak, and up to 90 workers for a couple of months on each end of the peak. Many of these workers would not require overnight lodging as construction crews could come from the local area, or may commute from the Yakima metropolitan area (within a one-hour drive), or the Seattle-Tacoma metropolitan area (a one and one-half to two hour drive).

For those workers that would require overnight lodging, the results of a recent telephone survey conducted by the Applicant of hotel, motel, RV Park, and campgrounds in Kittitas County indicates that there are 1,150 rooms or sites available in the county. The results indicate further that during the peak summer season, there are typically about 240 rooms or sites vacant at any one time. During the non-summer months, vacancy rates are much higher and it is estimated that there are usually around 760 rooms or sites vacant at any one time. As discussed above, there are also more than 1,000 vacant, non-seasonal housing units in Kittitas County. There are also many overnight lodging opportunities in the greater Yakima area, which had a population of 224,500 in 2000, which are within a one-hour drive of the Project. Thus, there appears to be an adequate supply of temporary housing available to accommodate non-local workers.

8.1.3.2 Employment and Income

Construction of the Project would result in increased employment and spending in Kittitas County. As mentioned above, the extent of those impacts are based on the analysis included in the Phoenix Study, adjusted to apply to this Project. The extent of the impacts is estimated using an input-output (I-O) model of Kittitas County. Input-output analysis is a commonly used technique that examines the relationships within a local economy between businesses and between businesses and their customers. I-O analysis includes a model of transactions in the local economy that allows an analyst to track how a change in final demand ripples through the economy in the form of direct, indirect, and induced spending.

In the I-O framework, a project or action that results in new spending for final demand, or a reduction in existing spending, is called a direct effect. The businesses that make the final sales must in turn purchase goods and services from other businesses. These indirect purchases are called indirect effects, which continue until leakages from the region in the form of imports, wages, or profits to persons outside the region end the cycle. Finally, workers at the producing businesses spend their wages in the local economy and purchase additional goods and services. These purchases are referred to as induced effects. The total economic impact of an action is the sum of the direct, indirect, and induced effects. I-O models generate multipliers that can be applied to direct purchases to represent the total direct, indirect, and induced effect of an action to different sectors of the economy.

During the construction phase, the economic impacts are estimated based on the following assumptions about Project construction that were provided by the applicant:

- 40 full and part time *local* construction jobs (for workers from Kittitas County) including construction management;
- $2,708,000 in local spending on construction materials such as gravel and concrete;
- $375,000 in spending on food and lodging by non-local labor in Kittitas County.

The construction impacts are expected to occur over approximately a one-year period. The direct, indirect, and induced economic impacts during construction are shown in Table 8.1.3-1 for total income and jobs. Total income consists of personal income in the form of wages, profits and other income received by workers and business owners, plus income from other sources such as royalty payments to land owners who lease land for the turbines. Jobs are the number of full and part time jobs expected to result from the Project and from the increase in spending in other sectors of the economy. As shown, the construction phase of the Project is projected to result in $5.3 million in total income and 78 jobs in Kittitas County.

Landowner Royalty Income
The operation of the Project will generate revenues for landowners with Project facilities on their land. It is estimated that the Project will generate an approximate long-term average of approximately $600,000 annually in land owner royalties or approximately $11,000,000 over the 20 year life of the Project. As a participating landowner, the Washington Department of Natural Resources (DNR) with approximately one quarter of the wind turbines on its land will collect an annual income of approximately $ 150,000, or $3,000,000 over a 20 year period.

Table 8.1.3-1
Economic Impacts in Kittitas County During Project Construction (2002$)

Impact Type	Total Income	Jobs
Direct	$4,161,000	40
Indirect	$471,000	13
Induced	$638,000	25
Total	$5,270,000	78

Source: ECONorthwest, *Economic Impacts of Wind Power in Kittitas County*. For the Phoenix Economic Development Group. October 2002. Modified for the Kittitas Valley Wind Power Project by CH2M HILL, November 2002.

8.1.3.3 Operations

During operations, it is estimated that 9 local workers from Kittitas County would be employed to operate and manage the wind plant. There would also be spending on equipment and other materials that would be necessary to operate and maintain the wind turbines. The Phoenix Study conservatively estimated that $544,000 per year in income would be received by property owners that lease land for the wind turbines. The annual direct, indirect, and induced income and jobs created by the Project during operations are shown in Table 8.1.3-2. As shown, the Project is projected to result in an estimated $1.8 million per year in added income and 23 additional jobs in Kittitas County.

Table 8.1.3-2 Annual Economic Impacts in Kittitas County During Operations (2002$)		
Impact Type	**Total Income**	**Jobs[a]**
Direct	$1,354,000	9
Indirect	$54,000	1
Induced	$397,000	12
Total	$1,805,000	23

[a]Total may not add because of rounding.
Source: ECONorthwest, *Economic Impacts of Wind Power in Kittitas County*. For the Phoenix Economic Development Group. October 2002. Modified for the Kittitas Valley Wind Power Project by CH2M HILL, November 2002.

8.1.3.4 Property Values

Concerns have been expressed that wind energy projects can have a negative effect on property values by detracting from the views experienced by other property owners. The Phoenix Study includes the results of interviews with tax assessors in counties throughout the U.S. that have wind energy projects in place, and includes the results of a literature review of academic journals into this matter. For comparison purposes, the study also reported on studies that have been done about the impacts of electric transmission lines on property values.

The assessor's survey covered 22 projects in 13 counties. Of those 13 counties, six had residential properties with views of a wind farm, six had no residential properties with views of a wind farm, and one reported that the wind project was too new to assess any property value impact. All six of the counties with residential views of wind projects reported that the turbines have not altered the value of those properties. Of the six counties with no residential views, five reported that there was no impact on property values, while a sixth (Kern County, California) reported that land parcels with turbines on them have increased in value in response to changing the land from a grazing zone to a "wind-energy" zone.

The results of the literature review found only one study that specifically addressed the impact of wind turbines on property values. The study investigated impacts to residential properties in Denmark. The results were based on a small sample of homes, and were not significant statistically.

Because of the paucity of available literature on potential property value impacts of wind energy projects, the Phoenix Study also reported on the published literature about the impact of transmission lines on property values. Unlike wind farms, which some people find attractive, transmission lines are almost universally perceived as unattractive. Thus, the impacts of transmission lines may give an indication of the maximum possible impact that could be experienced by a wind energy project if such a negative impact exists. The results of the literature about the impact of transmission lines on property values can be summarized that their effect on property values is at most about a 10 percent reduction in value, and those impacts are short-lived i.e., the effects diminish over time.

These findings indicate that the Project is not likely to result in a negative impact to property values.

8.1.3.5 County Revenues

The Project would result in a substantial increase in annual property tax revenue to the County. Based on an estimate of $750,000 per turbine and the 1.35 percent property tax rate in Kittitas County, it is estimated that the Project would result directly in an increase of $1,136,000 in property tax revenue to Kittitas County. In addition, development of this Project would result in increasing the value of other properties because of the increase in wages and overall economic activity in Kittitas County. The Phoenix Study estimated that this secondary effect would result in an additional $85,000 in property taxes annually in the County. Thus it is estimated that Kittitas County would receive an estimated total of $1,221,000 in added property tax revenue each year from the Project.

Assuming that revenue would be distributed consistent with the spending patterns in the County's 2002 budget, the added revenue would be distributed as shown in Table 8.1.3-3. As shown, the largest beneficiaries of the added revenue would be local and state schools, followed by county government, county roads, local communities, and hospitals and other local services.

Table 8.1.3-3
Allocation of Added Annual Property Tax Revenue in Kittitas County

Spending Category	Amount
Local schools	$370,000
State schools	$342,000
Fire districts	$73,000
Local communities	$102,000
County roads	$123,000
County government	$153,000
Hospitals and other local services	$58,000
Total	$1,221,000

Source: ECONorthwest, *Economic Impacts of Wind Power in Kittitas County*. For the Phoenix Economic Development Group. October 2002. Modified for the Kittitas Valley Wind Power Project by CH2M HILL, November 2002.

It is possible that the effect of the added tax base would be to reduce other taxes and the increase in tax revenue would be less than shown. Initiative I-747 recently passed in Washington State. This initiative limits total property tax revenue increases to one percent per year. The Phoenix Study conservatively estimated that $500,000 of the value of a wind turbine would be assessed as personal property, thus the installation of 110 windmills would increase the total property value of the County by $55 million, which is a 2.3 percent increase. Because this is greater than the one percent increase limit imposed by I-747, it is possible that other taxes would need to decline to remain under the one percent limitation. Regardless of whether the new turbines would result in an increase in property tax revenue or enable a reduction in other taxes, it is clear that the Project would bring substantial property tax benefits to Kittitas County.

There would be other fiscal benefits that Kittitas County would receive from the Project such as increased sales and use taxes, license and permit fees, and charges for services. Based on an analysis presented in the Phoenix Study, the additional tax revenues shown in Table 8.1.3-4 are projected to be received by the County. In addition to $276,000 in property taxes for county government and roads, the County would receive $17,000 in other sources, which represents about a 0.2 percent annual increase.

Table 8.1.3-4 Additional Kittitas County Government Tax Revenues	
Spending Category	**Amount**
Property taxes – county government and roads	$277,000
Sales and use taxes	$3,000
All other taxes	$1,000
Licenses and permits	$1,000
Charges for services	$4,000
Fines and forfeits	$1,000
State collected taxes distributed to County	$7,000
Total	$294,000

Source: ECONorthwest, *Economic Impacts of Wind Power in Kittitas County*. For the Phoenix Economic Development Group. October 2002. Modified for the Kittitas Valley Wind Power Project by CH2M HILL, November 2002.

8.1.4 Summary of Socioeconomic Impacts

This analysis of the socioeconomic impacts of the Project results in the following conclusions:

- No impacts are expected to population, housing, property values, community cohesion, or environmental justice;
- During construction, the Project is expected to add 78 jobs and $5.3 million in income to the local economy. During operations the Project is expected to add 22 jobs and $1.8 million per year in income to the local economy;
- It is estimated that the Project would result in $1.2 million in added property tax revenue to taxing districts in the County, plus a small amount of additional revenues from sales taxes and other fees. Because of the recently passed Initiative 747, which limits total property tax increases in Washington State, it is possible that this benefit would be received in the form of lower taxes for other property owners rather than an increase in tax revenues.
- It is estimated that the Project will contribute an average of approximately $600,000 annually in landowner royalties to local landowners including Washington DNR, which would receive an annual income royalty of approximately $150,000. The DNR income contributes to the benefit of the state school fund.

8.2 CRITERIA, STANDARDS, AND FACTORS UTILIZED TO DEVELOP TRANSMISSION ROUTE

WAC 463-42-625 Criteria, standards, and factors utilized to develop transmission route. *The applicant shall identify the federal, state, and industry criteria used in the energy transmission route selection and shall identify the criteria used and the construction factors considered in developing the proposed design and shall indicate how such criteria are met.*

As described in Section 2.1, 'Site Description', and Section 2.4, 'Energy Transmission Systems', one of the principal factors in selecting the proposed site for the Kittitas Valley Wind Power Project was direct access to suitable transmission lines without the need for installing long high voltage feeder lines to the point of interconnection. There are several sets of high voltage power lines which cross over the Project site including 5 sets of Bonneville Power Administration (BPA) transmission lines and 1 set of Puget Sound Energy (PSE) transmission lines. The Project will interconnect directly with the BPA and/or the PSE transmission lines near Bettas Road as indicated on the site layout contained in Exhibit 1.

The wind turbines are connected to an electrical collection system primarily through approximately 23 miles of underground cables as described in more detail in Sections 2.4, 'Energy Transmission Systems'. Two short runs of overhead, single pole 34.5 kV distribution line, totaling 2 miles, may be installed near Bettas road to tie some of the turbines in to the main substation. This results in reduced environmental impacts, fewer visual and aesthetic impacts, lower line losses and lower energy costs. The plant electrical system, including the collection system, will be designed and constructed in accordance with the guidelines of the National Electric Code (NEC), National Fire Protection Agency (NFPA) and utility requirements.

9.1 ANALYSIS OF ALTERNATIVES

WAC 463-42-645 Analysis of alternatives. *The applicant shall provide an analysis of alternatives for site, route, and other major elements of the proposal.*

9.1.1 Introduction

This section summarizes the alternatives that were explored during development of the Project. The range of alternatives considered included those that would reasonably accomplish the basic Project objectives while avoiding or lessening any potentially significant, negative impacts of the proposed Project. These include considerations of the Project location, overall size, choice of wind turbine design, turbine and access road locations, and use of alternative generating technologies. The Applicant has carefully considered and weighed all of these aspects of the Project and the proposed Project design reflects these considerations. Numerous changes to the proposed Project were made to address these and other considerations.

9.1.2 Site

The choice of the proposed Project site reflects consideration of a variety of factors, including quality of the wind resource, access to existing high voltage transmission lines with adequate outlet capacity, site accessibility, compatibility of surrounding land uses, landowner receptivity to leasing of land for wind power production, potential visual impacts, and environmental factors such as the presence of rare or endangered species or critical habitat. Compared to conventional thermal power plants, wind power projects have significantly higher capital costs per MW of installed capacity, but no fuel costs. Wind power projects also are generally smaller in terms of rated capacity than thermal power plants.

This has two significant implications for the choice of sites for a wind power project. First, wind power projects must be located where the wind resource is adequate to produce the highest net capacity factor possible. Because wind is by nature intermittent, capacity factors at even the best wind power sites are much lower than for typical thermal plants (30%-40% vs. 85%). Second, wind power projects must be located near existing high voltage transmission lines with adequate outlet capacity. All central station power plants must interconnect to the grid, however the high capital costs of constructing many miles of new transmission lines is generally prohibitive for wind power projects. In contrast, some large thermal plants are able to incorporate these higher capital costs for interconnection by virtue of their larger size and lower overall capital costs per MW of installed capacity.

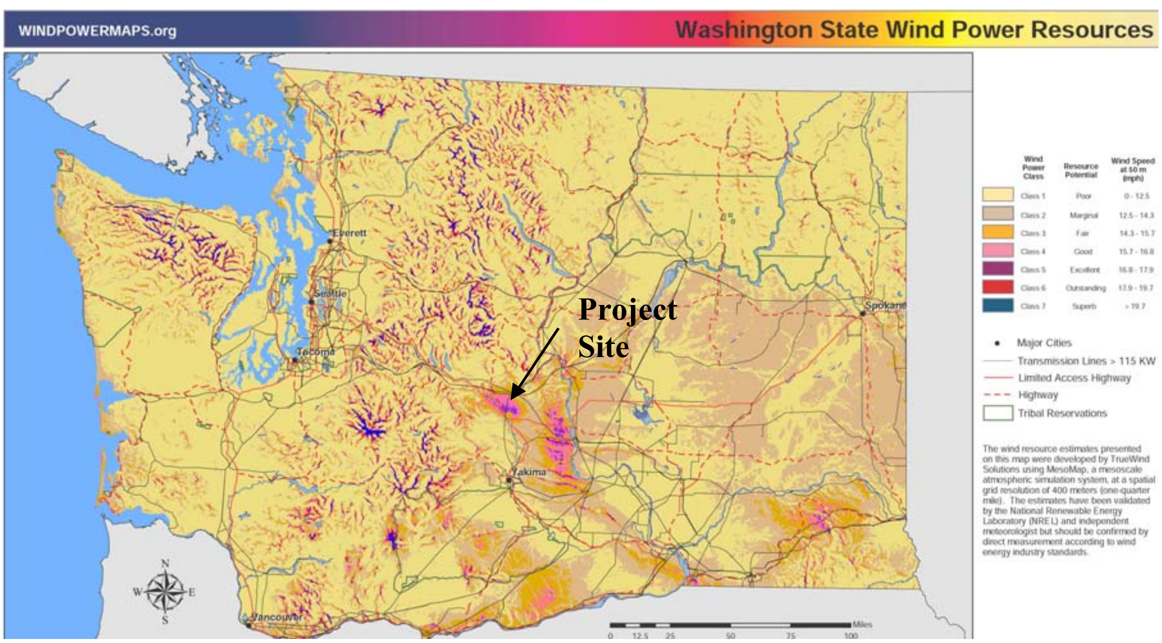
9.1.2.1 Wind Resource

Unlike conventional thermal power plants which can transport fuel to the desired power plant location, it is not possible to transport or direct the wind resource to a particular location. Nature dictates the abundance and distribution of wind resources. Developers must therefore go to where the wind resource is located. The amount of electricity that can be generated by wind is a function of the cube of the wind speed. This means that very small changes in average annual wind speeds at a proposed site translate into very large changes in energy production. For example, a two mile per hour (MPH) difference in annual average wind speed can result in 15% difference in annual electric energy production.

While it is possible to generate electricity at sites with lower wind speeds, the combination of current market prices for electricity in the Pacific Northwest and the efficiency of today's wind turbine technology generally require wind developers to choose sites with average annual wind speeds in excess of 16 to 17 miles per hour (MPH.) Sites with lower wind speeds would have net capacity factors below 30%, which would result in a price for the electricity produced above what the market will currently bear.

In Washington, the choice of potential wind power project sites is severely limited by the lack of sites with adequate wind resource potential to produce electricity at competitive prices. Compared to other states, Washington is ranked in the bottom tier in terms of wind energy potential (Pacific Northwest Laboratory, 1991.) Figure 9.1.2-1 shows a wind resource map of Washington State, based on a model developed by True Wind Solutions, that is commonly used by wind developers to aid in the identification of potential sites. Those areas shaded in purple are the areas that are predicted to have a wind resource adequate for producing energy at competitive prices (Class 5). Long-term ground based measurements are necessary to confirm the wind resource in these areas. Practical experience suggests that this map and model it is based on tends to overestimate the abundance of sites with Class 5 winds. It should also be noted that many of the areas that the map suggests have Class 5 winds are not suitable for wind power development due to site inaccessibility (e.g. Cascade mountaintops) or incompatible land uses (e.g. the Yakima Firing Range.)

Figure 9.1.2-1 Washington State Wind Speed Map



The proposed Project site has a proven wind resource suitable for producing electricity at competitive prices. Measurements were taken at the site for over two years in the mid-1990's by Kenetech, a wind energy developer, and that data is now publicly available from the National Renewable Energy Laboratory (NREL.) The Applicant has also erected nine new meteorological towers around the proposed site and has been gathering wind data since late 2001. This rich wind data set allows accurate estimates of energy production to be made with a high degree of confidence.

9.1.2.3 Access to Transmission Capacity

The second driving factor in identifying a viable site for a wind power project is access to existing transmission lines with adequate outlet capacity. As explained above, wind power projects generally cannot absorb the capital cost of constructing tens of miles of new transmission lines to interconnect with the grid. Again, this is due to their generally smaller size and higher overall capital costs per MW of installed capacity. The proposed site is crisscrossed by six sets of high voltage transmission lines, and several of these lines have adequate capacity and are of an appropriate voltage (230 kV) for a project of this size (MW.) By choosing a site where direct interconnection is possible, many environmental and visual impacts can be avoided. The choice of transmission route is discussed in greater detail in Section 8.2, 'Criteria, Standards and Factors Utilized to Develop Transmission Route'.

9.1.3 Project Size

The proposed Project size (181.5 MW) reflects several important criteria, including: economies of scale, the fixed or non-linear costs of interconnection and permitting, and market demand for larger projects with concomitantly lower prices. While the single largest cost for a wind power project is the wind turbine generators, for which pricing is largely linear, other costs are non-linear, such as the cost of the substation and interconnection, the cost to conduct the extensive studies required for permitting a project and the costs of the permitting process itself. By spreading these costs over a larger project, the cost per MWh of electricity produced is driven down.

It is widely recognized that the Pacific Northwest faces a growing need for electricity in the medium and long term. Recent reports from the Northwest Power Planning Council (NWPPC) and the draft Integrated Resource Plans of several regional utilities, including Puget Sound Energy and Pacificorp, provide evidence of this need for additional power and for the need to diversify the region's power supply away from its current reliance on the highly variable output of hydroelectric dams. Meeting this demand growth will require the installation of significant new generating capacity. In order for the region's power supply to be adequately diversified, it is essential that this new generation capacity not be entirely of one particular source (e.g. natural gas.) These macro conditions are leading regional electrical utilities to seek new and diversified sources of energy. Thus there is currently growing market demand for large power projects with competitive energy prices. The cost savings resulting from a larger project size are passed along in the form of lower wholesale power prices, which will help the state and region meet the growing demand for affordable and non-polluting power.

9.1.4 Wind Turbine Generator Design and Size

As described in Section 2.3.6, 'Wind Turbine Generators and Towers', the types of wind turbine generators being considered for this Project are all MW-class, three-bladed, upwind designs with proven track records. The Applicant has already devoted considerable resources to evaluating various turbine technologies and suppliers and the final turbine selection will be driven by several considerations, such as reliability, efficiency, and economics factors. All of the leading turbine vendors under consideration for this Project utilize similar turbine designs. The ultimate choice will thus be largely a question of the efficiency of the wind turbine generators in terms of cost per MWh of electricity produced. This is a primarily a factor of the site's meteorological characteristics, e.g. wind speed, distribution and shear, and the cost of the various turbine models relative to their output (which is itself a function of the turbines' individual power curves and the wind distribution at the site.)

The choice between larger or smaller wind turbines essentially boils down to a larger number of smaller machines vs. a smaller number of larger machines, as the output of a wind turbine is a function of its Rotor Swept Area (RSA). The larger the RSA is, the greater the annual output will be. The choice of MW-scale turbines, as are proposed for this Project, is intended to generate the most electricity at the lowest cost with the least overall impact on the surrounding area. The choice of a smaller number of large machines result in fewer foundations being excavated and a smaller number of FAA-required lights on the entire Project.

9.1.5 Turbine and Access Road Locations

The location of the wind turbine generators within the overall Project is dictated by four main factors, wind resource, accessibility, landowner preferences, and avoidance of sensitive areas. The proposed locations of the wind turbines and access roads are based on these factors. Wind turbines must be located on exposed ridge tops where the wind speeds are optimal. The Applicant's ability to negotiate lease agreements with individual landowners influences which ridge tops are potential candidates for wind turbines, and those landowners may have preferences regarding the precise location of wind turbines and access roads on their land. Finally, the extensive environmental studies conducted by the Applicant have identified those areas where construction of wind turbines and accompanying access roads will create the least environmental impacts to habitat and wildlife.

The Applicant has proposed to make use of existing access roads to the maximum extent practicable. By doing so, the overall area that will be permanently disturbed by the Project is minimized, as are environmental impacts. The Applicant has proposed access road locations that avoid sensitive habitat areas such as riparian zones, forests and wetlands. Nearly half of all the access roads proposed for the Project are existing roads that will be upgraded (10 miles out of a total of 23 miles) as show in Exhibit 1, 'Project Site Layout'.

9.1.6 Alternative Generating Technologies

The Project is designed to be a state-of-the-art wind power project that will produce affordable, renewable, pollution-free electricity to help meet the region's growing need for power. The Project's output will be sold in the competitive regional wholesale energy market.

9.1.6.1 Criteria

The choice of wind turbine generators vs. other generating technologies for the Project is based on several factors, including:

- Contribution to regional resource diversification;
- Ability to meet the growing regional demand for renewable energy;
- Environmental attributes of the technology;
- Ability to offer stable long term pricing; and
- Economics of wind energy vis-à-vis other renewable energy technologies.

9.1.6.2 Contribution to Regional Resource Diversification

The region currently is heavily reliant on hydropower and the vast majority of new power plants proposed in the region are gas-fired plants. Wind energy currently accounts for less than 2% of the region's total energy production capacity. By adding additional wind energy capacity, the Project will contribute to regional resource diversification. A recent study of the implications of alternative generating technologies for the Pacific Northwest by the RAND Corporation found that the addition of new renewable resources would produce significant environmental and economic benefits for the region (Pernin et al, 2002.)

9.1.6.3 Ability to Meet the Growing Regional Demand for Renewable Energy

The recent passage of Washington's Omnibus Energy Bill (RCW 19.29A.090) has prompted the state's major utilities to offer their customers voluntary green power programs. The growing popularity of these green power-marketing programs demonstrates the public's support for moving toward more sustainable, renewable energy sources. These factors, combined with a desire to reduce current reliance on hydroelectric power through resource diversification, are leading regional utilities to seek new renewable resources.

9.1.6.4 Environmental Attributes of the Technology

Wind turbine generators produce no air emissions, consume no water for cooling, result in zero wastewater discharges, require no drilling, mining or transportation of fuel, and produce no hazardous or solid wastes. Numerous studies have shown that the life cycle environmental attributes (total energy and resources consumed to build and operate vs. energy produced) of wind energy projects are highly favorable compared to other generating technologies (see Section 3.5, 'Energy and Natural Resources'.)

9.1.6.5 Ability to Offer Stable Long Term Pricing

Because wind energy does not rely on volatile fuel prices (e.g. natural gas plants) or highly variable annual snowmelt conditions (e.g. hydroelectric dams), the energy produced by wind power projects benefits from stable, predictable, long term pricing. The main cost associated with generating wind energy is the capital cost of the turbines themselves, which is fixed at the time of construction and not therefore subject to fluctuations. The power from this Project will be sold under a long-term contract which guarantees stable prices for years to come.

9.1.6.6 Economics of Wind Energy Vis-à-Vis Other Renewable Energy Technologies

Wind generated electricity is far less expensive than solar photovoltaic or fuel cell electricity on a cost per MWh produced basis. Hydroelectric dams and geothermal plants are the only renewable energy technologies that can compete with wind on a cost per MWh basis. New sites for major hydroelectric dams are not readily available in the Project area, and their potential impact on imperiled native salmon runs is a growing concern. Environmentally suitable geothermal resources adequate for cost-effective power production are also not readily available in the area. Wind is thus the most cost effective renewable technology for the Project area under current conditions.

9.1.6.7 Likely Alternative

The Applicant is focused on the development of renewable energy projects, and is not in the business of developing fossil fuel power plants. However, based on the types of power plants built in the region over the past several years, and the other power plants currently proposed or under review, it appears that a gas-fired power plant would be the most likely alternative to the wind power project proposed by the Applicant. A gas fired power plant, whether conventional or combined cycle, would have the following disadvantages compared to the proposed wind power Project.

9.1.6.8 Resource Diversity

As described in Section 9.6.1 above, the vast majority of new power plants proposed or built recently in the region are gas-fired. The region currently runs the risk of moving from a system that is overly dependent on hydroelectricity to a system overly dependent on natural gas. Natural gas prices are subject to significant price swings and are currently escalating. As the region's dependence on natural gas increases, the negative effects of a gas price shock are exacerbated.

9.1.6.9 Environmental Impacts

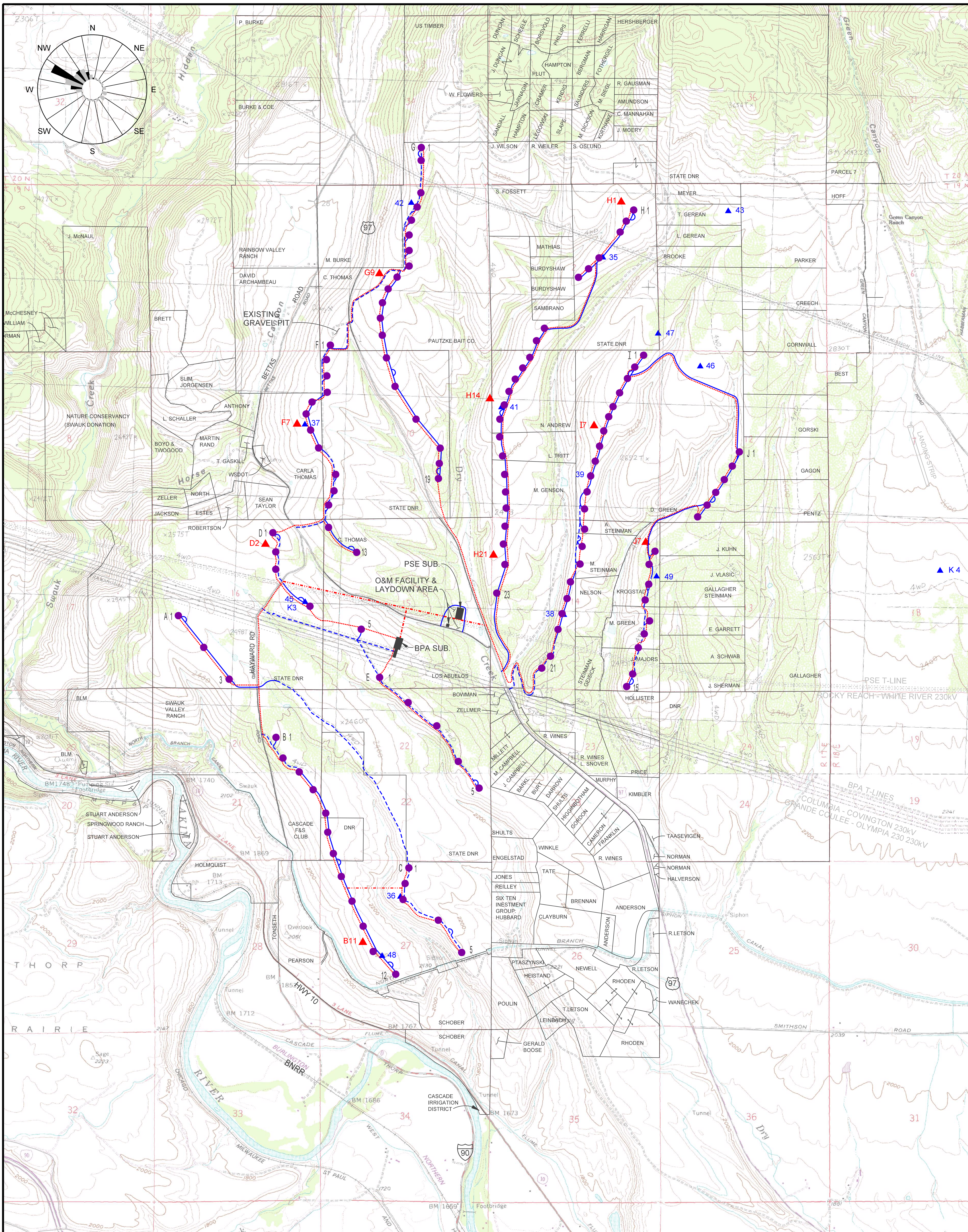
Gas-fired power plants, while significantly cleaner than coal fired plants, have many negative environmental impacts. Major categories of direct impacts include:

- Use and discharge of large amounts of water for cooling;
- Emission of criteria air pollutants such as SO_x and NO_x (these impacts are described in greater detail in Section 3.2, 'Air'); and
- Emission of greenhouse gases such as CO_2 (these impacts are described in greater detail in Section 3.2, 'Air').

Major indirect impacts include degradation of land and habitat and the greenhouse gas emissions associated with drilling and transporting natural gas. The potential for fire, explosions, chemical releases and other industrial accidents are also greater for gas-fired plants than for wind power projects.

9.1.7 Conclusion

For these reasons, the choice of wind turbine technology over gas turbine technology presents clear benefits both for the environment and the region's electric customers.



LEGEND:

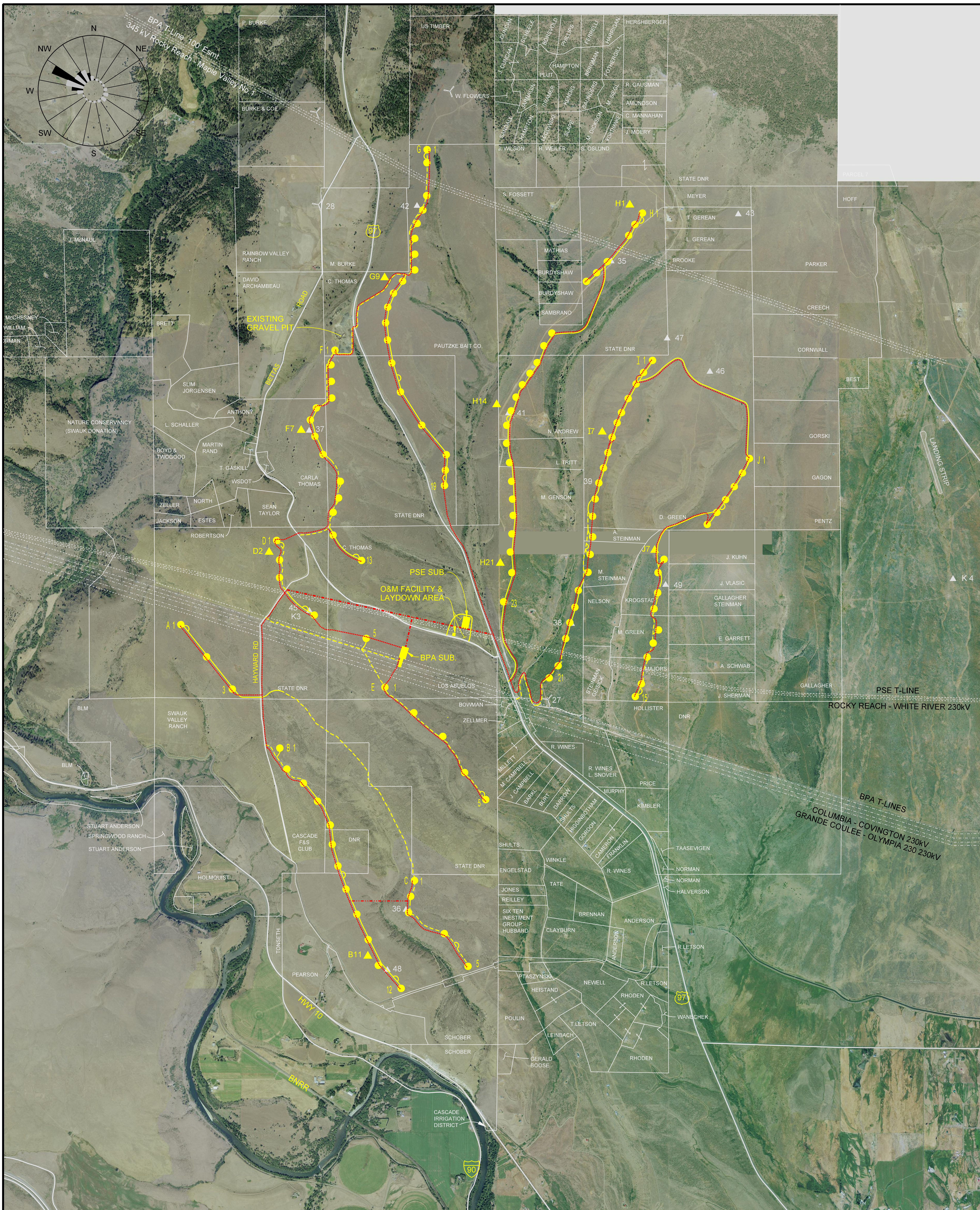
- PROPOSED WTG LOCATION
- N_1 STRING NAME & TURBINE COUNT
- EXISTING ACCESS ROAD
- NEW ACCESS ROAD
- ROAD TURN-AROUND AREA
- UNDERGROUND ELECTRICAL
- OVERHEAD ELECTRICAL
- UGND AND/OR O.H. ELECTRICAL
- 43 MET TOWER - TEMPORARY
- N12 MET TOWER - PERMANENT

0 1500 3000 4500
Scale In Feet

CONFIDENTIAL

PRELIMINARY NOT FOR CONSTRUCTION	CH2MHILL	Sagebrush Power Partners, LLC Zilkha Renewable Energy 210 SW MORRISON SUITE 310 PORTLAND, OR 97204 TEL: (503) 222-9400 FAX: (503) 222-9404	KITTITAS VALLEY WIND POWER PROJECT EXHIBIT 1 PROJECT SITE LAYOUT	SHEET DWG EXHIBIT 1 DATE JAN 2003 PROJ 170365.

FILENAME: z-fig113-layout.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 09:30:37



LEGEND:

- PROPOSED WTG LOCATION
- STRING NAME & TURBINE COUNT
- EXISTING ACCESS ROAD
- NEW ACCESS ROAD
- ROAD TURN-AROUND AREA
- UNDERGROUND ELECTRICAL
- OVERHEAD ELECTRICAL
- UGND AND/OR O.H. ELECTRICAL
- 43 MET TOWER - TEMPORARY
- N12 MET TOWER - PERMANENT

N

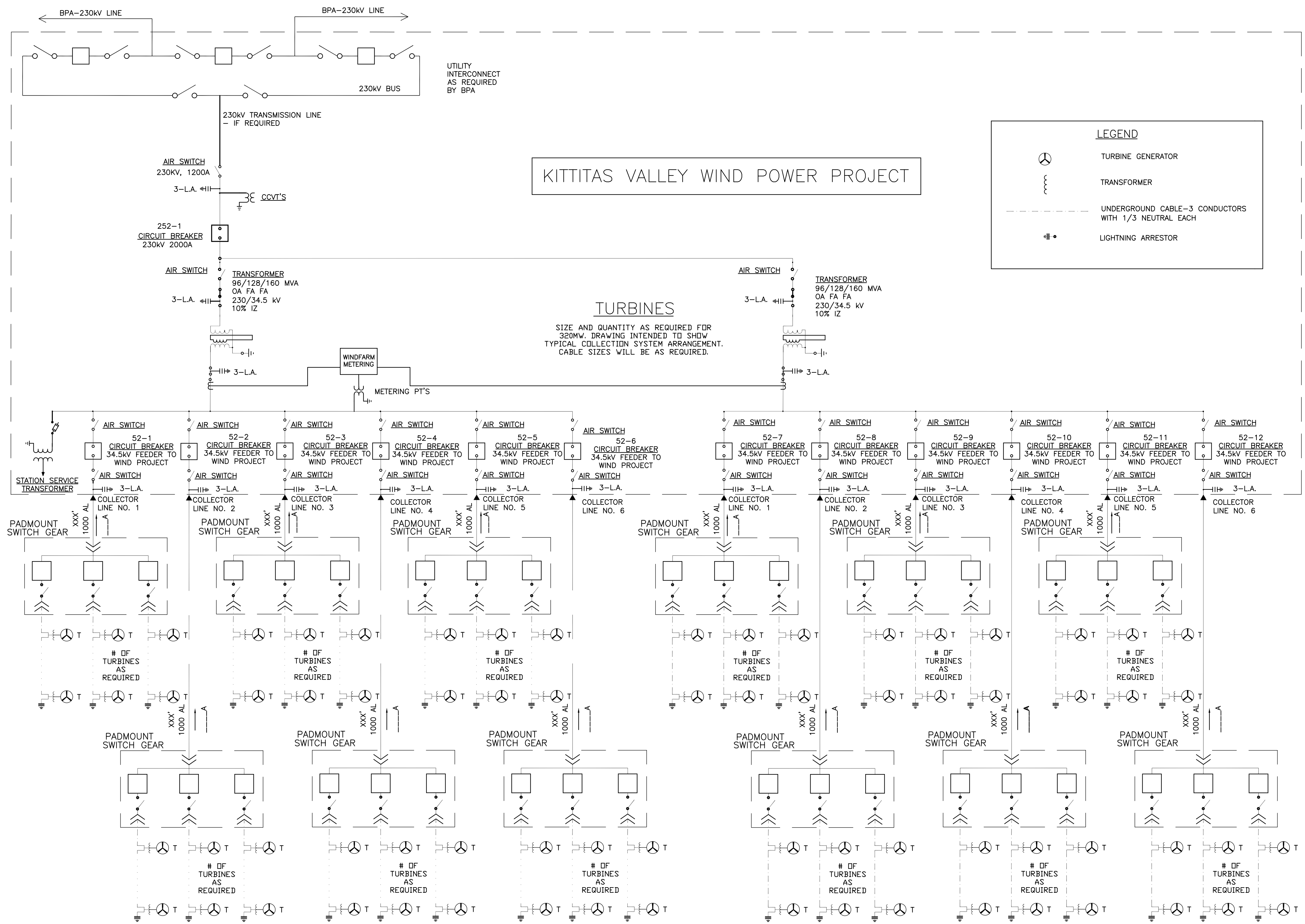
0 1500 3000 4500

Scale In Feet

CONFIDENTIAL

PRELIMINARY NOT FOR CONSTRUCTION	CH2MHILL	Sagebrush Power Partners, LLC Zilkha Renewable Energy 210 SW MORRISON SUITE 310 PORTLAND, OR 97204 TEL: (503) 222-9400 FAX: (503) 222-9404	KITTITAS VALLEY WIND POWER PROJECT EXHIBIT 2 AERIAL PHOTO WITH PROJECT SITE LAYOUT	SHEET DWG EXHIBIT 2 DATE JAN 2003 PROJ 170365.

FILENAME: z-fig110-photo.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 10:20:16



PRELIMINARY

D K A

DONALD KEEF & ASSOCIATES, INC.
CONSULTING ELECTRICAL ENGINEERS
1620 EAST CYPRESS AVENUE, SUITE #2
REDDING, CALIFORNIA, 96002
(530) 223-1413

REGISTERED PROFESSIONAL ENGINEER D. A. KEEF EXP. 9-30-06 8030 ELECTRICAL STATE OF CALIFORNIA

DRAWN:	B.HOCKETT
CHECKED:	DAK
APPROVED:	
ISSUED FOR BID:	
SCALE:	NONE
DATE:	11-25-02

REV	DATE	DESCRIPTION

KITTITAS VALLEY WIND POWER PROJECT

SINGLE LINE DIAGRAM

320MW KITTITAS VALLEY WIND POWER PROJECT

DRAWING NO.	E1
JOB NUMBER:	549
REV NUMBER:	0
SHEET 1 OF 1	

WASHINGTON STATE DEPARTMENT OF
Natural Resources

DOUG SUTHERLAND
Commissioner of Public Lands

December 12, 2002

Zilkha Renewable Energy LLC
Attn: Chris Taylor
22 E. 4th Street
Ellensburg WA 98926

RE: Proposed Wind Power Development Lease 60-074259

Dear Mr. Taylor:

The purpose of this letter is to communicate the current status of leasing process for the following lands in Kittitas County:

Government Lots 1 and 2 (N2NE4), S2NE4, SW4NW4, W2SW4, SE4SW4, SE4, Section 2; W2E2, W2, Section 10; All, Section 16; E2, N2NW4, SE4NW4, SW4SW4, Section 22; all in Township 19 North, Range 17 E. W. M, Kittitas County, Washington, containing 2,075.33 acres.

Zilkha Renewable Energy LLC currently has a land use license for wind power exploration for these lands with a term of December 1, 2004. Wind Power Development Lease No. 60-074259 for the same legal description has been advertised, and Zilkha Renewable Energy has notified the state of its interest in the lease. We also have grazing leases on these parcels. Our leases allow for other uses and cancellation for higher and better use. We anticipate accommodating both uses on these parcels without much trouble.

There is legal access via county roads to Section 10 and Section 16. The state has no legal access to Section 2 and Section 22. We understand that Zilkha Renewable Energy is in the process of obtaining legal access to these parcels.

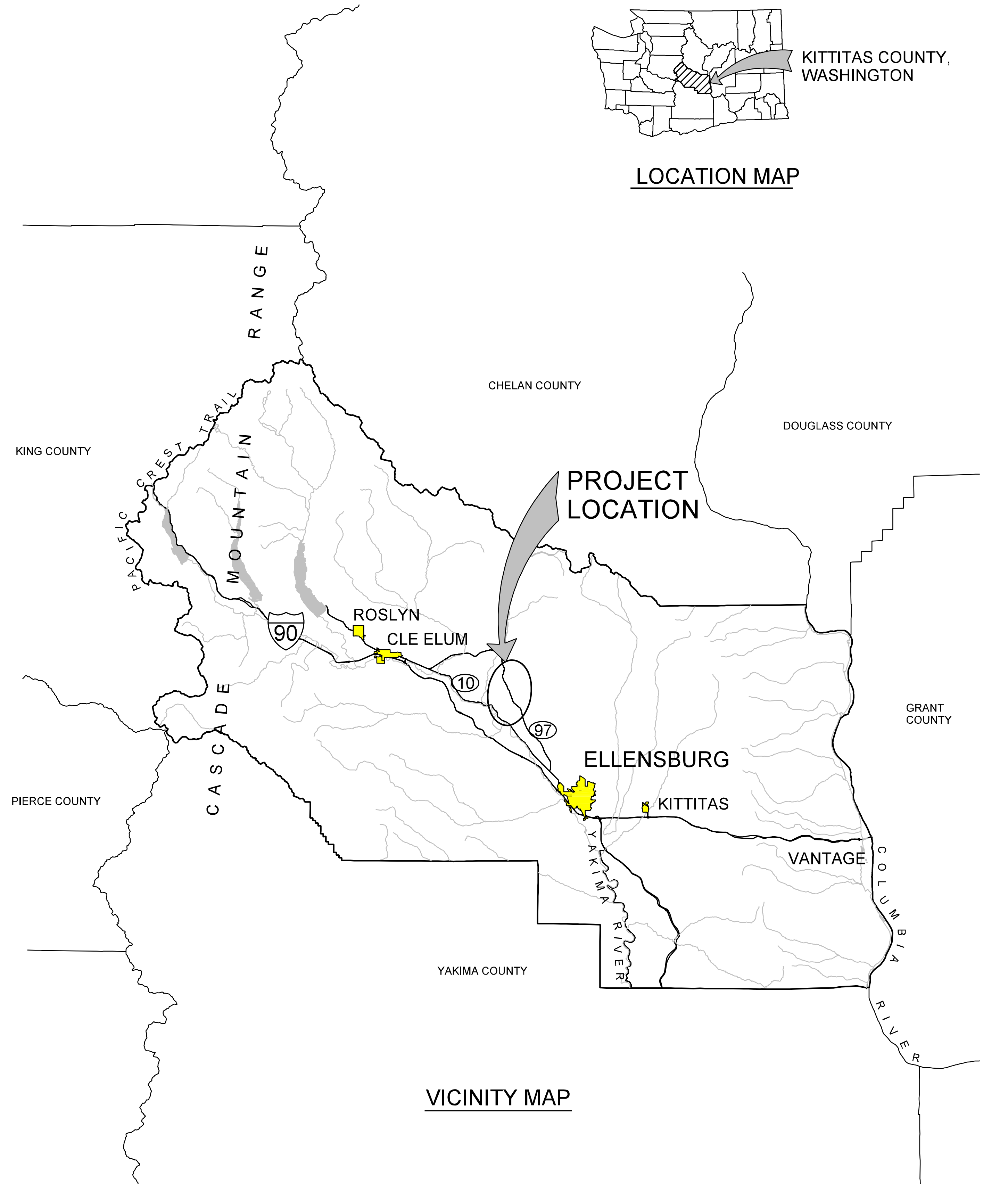
The next step in the leasing process for Lease No. 60-074259 is to provide Zilkha Renewable Energy and other interested parties with a notice of leasing and sample lease. Thirty days after a public notice is published, the sealed bid public auction will be held. At the end of that time period, bids would be reviewed and a decision would be made on the successful bidder. At that time, a lease would be prepared between the state, as lessor and the successful bidder.

Sincerely,

Milton D. Johnston

Milton D. Johnston
Assistant Region Manager

c: Jim Schwartz, AAG

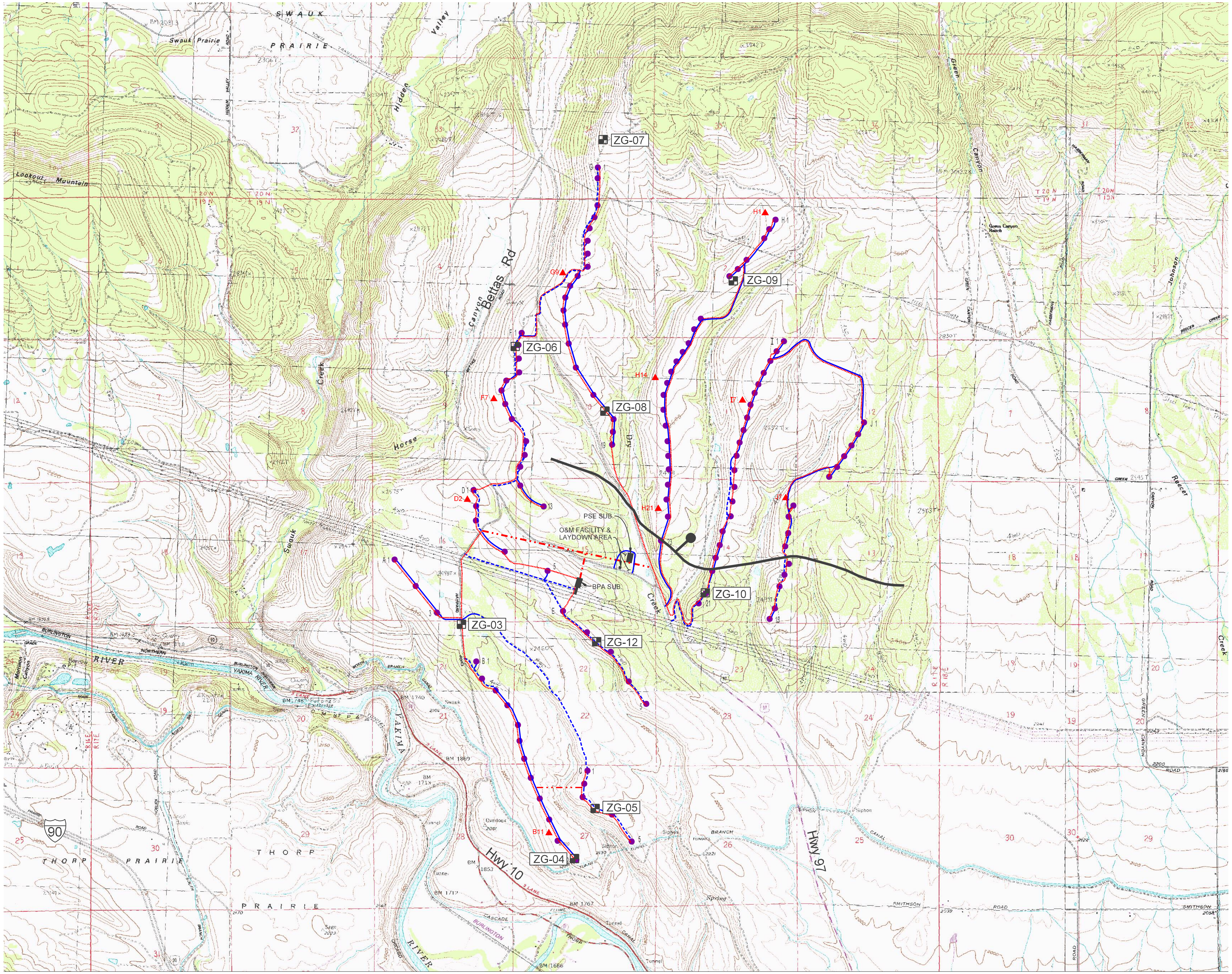


Sagebrush Power Partners, LLC
Zilkha Renewable Energy

VICINITY AND LOCATION MAP
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

zp-fig12-geo.dgn 10-JAN-2003 11:35:11



N

0 2000 4000 6000
Scale In Feet

LEGEND:

ZG-10	TEST PIT LOCATION
●	PROPOSED WTG LOCATION
N 1	STRING NAME & TURBINE COUNT
— —	EXISTING ACCESS ROAD
——	NEW ACCESS ROAD
- - -	UNDERGROUND ELECTRICAL
-·-·-	OVERHEAD ELECTRICAL
-··-	UGND AND/OR O.H. ELECTRICAL
▲ N12	MET TOWER - PERMANENT
—●	DOWNTHROWN SIDE OF LOCAL HIGH-ANGLE FAULT (TABOR ET AL., 1982) LOCATION IS APPROXIMATE

Sagebrush Power Partners, LLC

Zilkha *Renewable Energy*

PROJECT AREA TOPOGRAPHY
GEOTECHNICAL TEST PIT
AND FAULT LOCATIONS

APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

170365.C1

FILENAME: zp-fig04-geo.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 11:40:49

Data Report

Geotech Data Report Kittitas Valley Wind Power Project

Prepared for

Zilkha Renewable Energy

November 2002

CH2MHILL
700 Clearwater Lane
Boise, ID 83712

Contents

Introduction

Purpose and Scope

This geotechnical exploration was conducted to evaluate general subsurface conditions in the proposed project area, to support the Energy Facility Site Evaluation Council (EFSEC) permit application. This phase of permit exploration is only preliminary, and is intended to gain general geotechnical information. Additional exploration and evaluation is necessary to provide geotechnical design information. The work was authorized October 9, 2002, in Task Order No. 3 between CH2M HILL and Zilkha Renewable Energy. The scope of the geotechnical exploration included the following:

- Review geologic and available subsurface information
- Perform a site reconnaissance to identify geology, potential geologic hazards, and proposed test pit locations
- Conduct an exploration of subsurface conditions consisting of nine test pit excavations
- Conduct laboratory testing of selected soil samples
- Prepare this data report summarizing the findings

Project Description

The proposed Kittitas Valley Wind Power Project is located within the Kittitas Valley area of Kittitas County in south central Washington. The Project is located east of the Cascade Range, north of the Yakima River. The project area lies on both sides of State Highway 97, near Bettas Road, approximately 19 kilometers (km) (12 miles) northeast of Ellensburg, Washington (see the Project Area and Test Pit Location Map at the end of this report).

The proposed Kittitas Valley Wind Power Project includes the construction of 10 strings of wind turbines (labeled A through J) along ridges that generally run north to south from the Wenatchee Mountains to the north of the project. Each different string contains between 4 and 27 wind turbines, and range in length from 0.8 to 4.1 km (0.5 to 2.6 miles). Turbines within a string are identified by their sequential number in a string, such as A_1, A_2, and so forth. Individual turbines are connected by an underground electrical conduit, and all strings are linked back to the proposed project substation through either underground or overhead transmission lines. The proposed strings that are part of the project are shown on the map provided at the end of this report.

In general, the wind turbines proposed for this project are 3-bladed rotors with a radius of 30 to 45 meters (100 to 150 feet). The rotors and machine house (nacelle) sit atop a mast that is 60 to 76 meters (200 to 250 feet) high. Mast diameters are commonly 4 to 5 meters. Turbines are typically supported by spread footings with foundation anchoring.

The project area is a 3 by 7 kilometer (2 by 4.5 mile) portion of land that consists primarily of long, north-south trending ridges. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River, which is located just south of the Project area. Slopes within the project area generally range from 5 to 20 degrees, but can reach 40 degrees or more in the transverse direction to the ridges. Elevations in the project area and adjacent lands range from approximately 660 to 1050 meters (2165 to 3445 feet) above sea level. The majority of the project area is open range with minimal vegetation. The vegetation is dominated by native bunchgrass and low shrubs, such as bitterbrush and stiff sage. Most of the ridgetops proposed for development consist of dry, rocky grassland.

Limitations

This report has been prepared for the exclusive use of Zilkha Renewable Energy for specific application to the Kittitas Valley Wind Power Project. This report has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The information contained in this report is based on data obtained from test pit logs that depict subsurface conditions only at the specific locations and times indicated, and only to the depths penetrated. Subsurface conditions and water levels at other locations may differ from conditions at these locations.

CH2M HILL is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data without the express written authorization of CH2M HILL.

Technical Data

Field Exploration

The field exploration was completed on October 30 and 31, and November 1, 2002. Initially, 12 test pits were planned at the project area. However, after one turbine string was eliminated, 9 total test pits were excavated at various locations along the string lines during the exploration (ZG-03 through ZG-10, and ZG-12).

Test pits were excavated by Fulleton-Pacific Construction, Inc., of Ellensburg, Washington, using a John Deere 310D rubber-tired backhoe, and a 0.3-meter (12-inch) bucket. Subsurface conditions were observed and logged by a CH2M HILL geotechnical engineer. Field copies of test pit logs are presented in Appendix A. Soil samples were examined in the field and visually classified in general accordance with ASTM D2488—Description and Identification of Soils (Visual-Manual Procedure). The field classifications are shown on the test pit logs in Appendix A. Test pits were located after completion in the field with a hand-held Global Positioning System (GPS). The accuracy of the locations using this type of GPS is approximately within 6 m. All locations and elevations are based on the North American Datum (NAD 1983). Coordinates given for horizontal location are based on the Universal Transverse Mercator (UTM) grid. Table 1 presents a summary of the test pit locations and depths.

TABLE 1
Test Pit Summary

Test Pit	UTM Northing	UTM Easting	Elevation (m)	Nearest String Position	Depth (m)
ZG-03	5,222,328	673,162	741.9 (2,434 feet)	A_3	3.0 (10 feet)
ZG-04	5,219,707	674,532	691.3 (2,268 feet)	B_{10}	2.7 (9 feet)
ZG-05	5,220,284	674,748	695.2 (2,281 feet)	C_3	2.7 (9 feet)
ZG-06	5,225,504	673,673	825.1 (2,707 feet)	F_1	1.2 (4 feet)
ZG-07	5,227,887	674,596	978.4 (3,210 feet)	G_1	2.4 (8 feet)
ZG-08	5,224,802	674,715	770.2 (2,527 feet)	G_{17}	2.7 (9 feet)
ZG-09	5,226,329	676,126	860.4 (2,823 feet)	H_7	1.5 (5 feet)
ZG-10	5,222,774	675,921	740.4 (2,429 feet)	I_{14}	3.4 (11 feet)
ZG-12	5,222,179	674,705	744.0 (2,441 feet)	E_2	2.7 (9 feet)

Note: Test pits ZG-01, ZG-02, and ZG-11 were not excavated.
All locations and elevations are based on NAD 83. UTM coordinates are zone 10T, NAD 83, meters.

Laboratory Testing

Samples collected during the preliminary field exploration were delivered to a laboratory for testing of index parameters and for verifying field classifications. Laboratory testing was conducted by Strata, Inc., of Boise, Idaho. Testing included the following:

- ASTM D2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock
- ASTM D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422: Particle-Size Analysis of Soils

The laboratory test results are summarized in Table 2. Complete geotechnical laboratory test results are provided in Appendix B.

TABLE 2
Laboratory Test Result Summary

Test Pit	Sample Type	Sample Depth Interval (m)	Soil Type ASTM D 2488	Moisture Content (%)	Atterberg Limits (%)			% Passing 75 μm Sieve
					LL	PL	PI	
ZG-03	Bulk	0.3-1.5	SM					34
	Bag	0.6	SP	15.6				
	Bag	1.5	SC	24.1				
	Bag	2.7	ML	21.9	26	22	4	
ZG-05	Bulk	1.5-2.7	GP-GM					8
	Bag	1.5	SP-SM	8.0				
ZG-06	Bulk	0.3-1.2	GP-GM					6
	Bag	0.6	SP	12.2				
	Bag	0.9	SP	9.7				
ZG-07	Bag	0.9	GP	23.2				
ZG-08	Bulk	0.6-2.4	GM					36
	Bag	0.9	CL	19.2				88
	Bag	1.5	CL	22.6	43	23	20	
	Bag	2.4	ML	21.1				52
ZG-09	Bag	0.6	SM	10.5				
	Bag	1.5	SM	22.1				
ZG-10	Bulk	0.6-2.1	SP-SM					9
	Bag	0.9	SANDSTONE	9.8				
	Bag	1.8	SP	11.1				
	Bag	3.4	SP-SM	10.8				12
ZG-12	Bag	0.6	SP	10.3				
	Bag	1.2	SP-SM	20.2				12
	Bag	2.4	SP-SC	13.0				12

LL = Liquid Limit.
PL = Plastic Limit.
PI = Plasticity Index.
GP = Poorly graded gravel with sand.
GP-GM = Poorly graded gravel with silt and sand.
GM = Silty gravel.
ML = Silt, silt with sand/gravel, and sandy/gravelly silt
SM = Silty sand.
SC = Clayey sand.
CL = Lean clay.
SP = Poorly graded sand with gravel.
SP-SM = Poorly graded sand with silt and gravel.

Interpretation

Geologic Conditions

The project is located in the upper Kittitas Valley, between the Kittitas Valley Syncline and the Naneum Ridge Anticline. The project lies in the Columbia Intermontane physiographic province (Freeman et al. 1945), located on the western edge of the Columbia River Plateau, bordering the Cascade Range. The general geologic conditions are characterized by a mantle of cemented gravel and cobble alluvium overlying both the Grande Ronde Basalt formation and the Ellensburg formation (Tabor et al., 1982).

Mainstream and Sidestream Alluvium Formations. These formations consist of Pliocene-age epiclastic rocks, derived from the Grande Ronde Basalt formation, the Ellensburg formation, and other rock types including quartz, quartzite, opal, and chert. Near the project, this alluvium is weakly cemented and comprised mainly of well-rounded cobble and boulder clasts of the Grande Ronde Basalt, with surface material characterized by thick rinds and spheroidal weathering. The material ranges from a few meters up to 15 meters in thickness.

Grande Ronde Basalt. This material forms the predominant bedrock unit in the area, and consists of multiple basalt flows that are sometimes interbedded with the Ellensburg formation. This formation is a subgroup of the Columbia River Basalt Group, and has been described to have a thickness up to 300 meters, although the thickness in the project vicinity is not known.

Ellensburg Formation. This formation is made up of sandstone, siltstone, and conglomerate derived from volcanism in the Cascade Range. The material is weakly lithified, and is interbedded with the Grande Ronde Basalt formation. Exposures of this formation in the project vicinity were found to be highly weathered and were typically extremely weak. The thickness of the Ellensburg formation is not known.

Seismicity

The project area lies within seismic Zone 2B, based on the 1997 Uniform Building Code (UBC 1997). Seismic sources include the Cascadia Subduction Zone (CSZ), intraslab, and crustal (local fault) sources (Geomatrix 1995). Each of these events has different causes, and therefore, produces earthquakes with different characteristics (that is, peak ground accelerations, response spectra, and duration of strong shaking). The two source mechanisms associated with the CSZ are currently thought to be capable of producing moment magnitudes of approximately 9.0 and 7.5, respectively (Geomatrix 1995).

A single fault is mapped in the project area, trending east-west near the intersection of Highway 97 and Bettas Road. This fault is a high-angle fault with its north side downthrown, and crosses Highway 97 approximately 760 meters (2493 feet) north of Bettas Road. Running east, the fault is inferred in a location that intersects the H, I, and J turbine strings. The fault location underlies the southernmost turbine in string H (H_{25}). It passes approximately between turbines I_{12} and I_{13} on the I-string, and approximately between turbines J_9 and J_{10} on the J-string. The fault is estimated to have last been active during the Miocene epoch. The total length of the fault is approximately 4 kilometers (2.5 miles). The approximate location of this fault is shown on the map attached at the end of this report.

The peak ground acceleration (PGA) at the site corresponding to a 10 percent probability of exceedance in 50 years (approximately 500-year return period) is between 0.119 g and 0.121 g at the bedrock surface, according to USGS seismic hazard mapping. This value of PGA on rock is an average representation of the acceleration most likely to occur at the site for all seismic events (crustal, intraplate, or subduction) for the 500-year return period.

Subsurface Conditions

The predominant subsurface conditions for the project consist of dry to moist, weak to moderately cemented gravels and cobbles overlying basalt bedrock. At other locations (ZG-03 and ZG-10), cemented silt and sandstone was encountered. At one test pit location excavated in a drainage swale (ZG-08), the subsurface consisted of fine-grained alluvium that exhibited only slight cementation. At all locations, the upper 0.1 to 0.3 meter (4 to 12 inches) was dry to moist silt, vegetated sparsely by grasses and brush.

Cemented Gravels and Cobbles. This is the predominant subsurface material across the site, consisting of rounded to well-rounded epiclastic gravels and cobbles, with varying percentages of sand and silt. The material was typically moderately cemented within the upper 2 to 5 feet, with local variations. Cementation is silicic, not carbonateous. Natural moisture contents ranged from 8 to 23 percent, and the material was tested to contain between 6 and 12 percent fines (silt and clay). The majority of the material ranged in size from 0.08 to 0.25 meter in diameter (3 to 10 inches), although some boulders were encountered, up to 1.2 meters (4 feet) in diameter.

During excavation of test pits, dry and dusty conditions were common, with moisture increasing with depth. Discussions with contractors suggests that in the spring and early summer months, this material is saturated and often difficult to drive equipment on. The material is fairly easy to excavate at this time of year, whereas in the late summer, fall, and winter, excavation can be extremely difficult, particularly in the cemented zone. Stability of excavation walls in this material ranged from poor to good, depending on the size of cobbles and degree of cementation. This material is interpreted to be part of the Mainstream and Sidestream Alluvium formations (Tabor et al., 1982).

Cemented Silt and Sandstone. In test pit ZG-03, a highly cemented silt was encountered from 0.3 to 0.9 meter (1 to 3 feet) below ground surface. This test pit was located in a small, relatively flat area that showed signs of seasonal ponding in the vicinity. It is believed that this material is a fine-grained alluvium and loess (wind-blown silt and sand) that has become cemented. The moisture content of this material ranged from 16 to 24 percent, and contained a varying percentage of fine sand. The gravels and cobbles described previously were encountered below this material, at an approximate depth of 2.7 meters (9 feet). This material was extremely difficult to excavate in the cemented zone, although excavation stability was excellent.

In test pit ZG-10, a weak sandstone was encountered for the entire depth of the excavation. This material was cemented from 0.6 to 2.1 meters (2 to 7 feet). Natural moisture content ranged from 10 to 11 percent, and contained between 9 and 12 percent fines. Excavation was the easiest in this material, and excavation stability was moderate to good. This material is believed to be part of the Ellensburg formation (Tabor et al., 1982).

Fine-Grained Alluvium. Test pit ZG-08 was excavated in a small drainage tributary to Dry Creek. At this location, approximately 2.4 meters (8 feet) of lean clay and silt was encountered above the cemented gravels and cobbles described previously. Natural moisture content of this material ranged from 19 to 23 percent, and contained between 12 and 48 percent sand and coarse-grained materials. A single Atterberg Limits test in this material resulted in a liquid limit of 43 percent, and a plasticity index of 20 percent. The consistency of this material was hard, according to pocket penetrometer measurements. Excavation in this material was fairly easy, and excavation walls showed good stability.

Groundwater Conditions

Groundwater was not observed in any of the test pits excavated at the project area. However, in some of the swales and small drainages, groundwater is anticipated to be present seasonally, following periods of precipitation and snowmelt. Groundwater is not anticipated on the ridges where most of the strings are located. However, localized pockets of saturated subsurface soils are anticipated to be encountered on ridges in places where surface water infiltrates the subsurface and collects above zones of cementation. Cemented soils have lower porosity and permeability, and were found in the upper 1 to 7 feet at the project area.

References

Freeman, O.W. Forrester, J.O., and Lupher, R.I., 1945. Physiographic divisions of the Columbia Intermountane Province. Annual Association American Geographer, v. 35, no. 2, p. 50-75.

Geomatrix. 1995. *Final Report, Seismic Design Mapping, State of Oregon*. Report prepared for the Oregon Department of Transportation, Project No. 2442.

Tabor, R.W., Waitt, Jr., R.B., Frizzell, V.A., Swanson, D.A., Byerly, G.R., and Bentley, R.D. 1982. Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington. Department of the Interior, United States Geologic Survey, Miscellaneous Investigations Series, Map I-1311.

Uniform Building Code. 1997.

Insert Project Area and Test Pit Location Map (11x17)

Appendix A

Test Pit Logs

Appendix B

Laboratory Test Results

Zilkha Renewable Energy
www.zilkha.com

Ellensburg Offices
222 Fourth Street
Ellensburg, WA 98926
Phone: 509-962-1122
Fax: 509-962-1123

Northwestern Regional Office
210 SW Morrison
Suite 310
Portland, OR 97204
Phone: 503-222-9400
Fax: 503-222-9404

Mr. Johnson Mininick
Cultural Resources Director
Yakama Nation
PO Box 151
Toppenish, WA 98948

RE: YN role in cultural resources studies for wind power project in Kittitas County

September 10, 2002

Dear Mr. Mininick:

I am writing to follow up on our telephone conversation from this June regarding our interest in involving the Yakama Nation in the cultural resources studies we plan to undertake as part of our proposed wind power project in Kittitas County. I am sorry you were not able to attend the meeting at the tribal natural resources offices on May 29, 2002 to discuss our proposed project in Kittitas County. Hopefully, Carroll Palmer was able to provide you with an overview of what was discussed.

As I said when we spoke over the telephone, we would like to invite Yakama Nation to participate in the cultural resources work that we will soon be initiating at the site located between Ellensburg and Cle Elum. Our consultants have already completed a records search with the state historical preservation office and no records were discovered of any known cultural resource sites within our project area. We hope to begin our cultural resources field surveys shortly in order to complete this portion of the work before snow begins to cover the area and complicate field surveys.

I would like to arrange an in-person meeting at your offices in Toppenish or my offices in Ellensburg to discuss the desired role of the Yakama Nation in these studies. Specifically, I would like to discuss tribal participation in developing an oral history of the area, in the field surveys, and in construction monitoring. You indicated during our phone conversation that you needed to review the work load of your staff to determine what will be possible.

I would also like to know if you have any recommendations or preferences regarding our selection of a cultural resources consultant to perform this work. As you know, we have been in contact with Prof. Morris Uebelacker of Central Washington University about this project but have not made any final decisions regarding consultants for this work.

I look forward to hearing from you. I can be reached at the above address and telephone numbers or by email ctaylor@zilkha.com or mobile phone 509-899-4609.

Sincerely,

Chris Taylor
Project Development Manager

LITHIC ANALYSTS P.O. Box 684 Pullman, WA 99163 (509) 334-9781

October 14, 2002

Mr. Johnson Meninick
Cultural Resources Director
Yakama Nation
PO Box 151
Toppenish, WA 98948

Re: Zilkha Wind Power Project, Kittitas County

Dear Mr. Meninick,

Lithic Analyists has been retained to conduct the required cultural resources survey for the Zilkha Renewable Energy wind power project in Kittitas County. As you may recall, during June, Chris Taylor of Zilkha contacted you by telephone regarding the cultural resources studies Zilkha planned to undertake as part of their proposed project. On May 29, Zilkha met at the Yakama Tribal offices to further discuss their proposed project. In addition, on September 10, Chris Taylor formally notified you by certified mail of the proposed wind power project.

This letter is to further update you on Zilkha's plans. On Friday, October 25, Jeff Flenniken and Pam Trautman of Lithic Analysts will begin conducting an on-ground cultural resources survey of the proposed project area.

As mentioned previously by Chris Taylor, a literature search has been conducted at the Office of Archaeology and Historic Preservation in Olympia, Washington. At this time, there are no recorded historic or prehistoric archaeological sites within this portion of the proposed project. If any tribal staff person would like to monitor our survey, please contact us.

Thank you for your kind assistance in this matter. If you have any questions, please do not hesitate to call Jeff Flenniken at 509/334-9781 or Pam Trautman at 360/943-3388.

Sincerely,

Pam Trautman
Pam Trautman

c: Chris Taylor

EAGLE CAP
CONSULTING

CH2MHILL

An Investigation of Rare Plant Resources Associated with the Proposed Kittitas Valley Wind Power Project (Kittitas County, Washington)

Prepared by:

Eagle Cap Consulting Inc.
4130 SW 117th, #148
Beaverton, Oregon 97005

and

CH2M HILL
825 NE Multnomah
Suite 1300
Portland, Oregon 97232-2146

Technical Report

January 7, 2003

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABREVIATIONS AND ACRONYMS

aMW	Average Megawatt(s)
BPA	Bonneville Power Administration
C	Centigrade (Celsius)
cm	Centimeter(s)
ECCI	Eagle Cap Consulting Inc.
EIS	Environmental Impact Statement
GIS	Geographic Information System
GPS	Geographic Positioning System
ha	Hectare(s)
km	Kilometer(s)
kV	Kilovolt(s)
m	Meter(s)
MW	Megawatt(s)
NRCS	Natural Resources Conservation Service
PNL	Pacific Northwest National Laboratory
USFWS	US Fish and Wildlife Service
WNHP	Washington Natural Heritage Program

EXECUTIVE SUMMARY

Zilkha Renewable Energy, LLC (Zilkha) is proposing to build a wind power facility northwest of the town of Ellensburg, Washington. The project would consist of 100-150 turbines, and have a peak production capacity of up to 250 megawatts. In addition, supporting facilities would be constructed, such as access roads, electrical lines, and an electrical substation. As part of the permitting process, Zilkha is analyzing potential impacts that the project may have on environmental resources. This includes, an investigation of rare plant resources, which is in the process of being conducted. This report presents the 2002 results of the investigation.

The rare plant investigation began with a prefield review of existing data to determine the rare plant species with potential for occurrence within the project area. For the purposes of the investigation, target species included all US Fish and Wildlife Service Endangered, Threatened, Proposed, or Candidate plant species, as well as all Washington State Endangered, Threatened, Sensitive, and Review plant species. The prefield review identified 38 rare plant species that had potential for occurrence within the project area.

Three field surveys of the project area were performed to determine presence for the target species. The survey corridors included all lands within 50 meters of proposed project facilities (turbine strings, access roads, staging areas, etc.) as defined through July of 2002. The first field survey was performed in April of 2002, and covered specific habitats suitable for early season rare plant species. The second survey was performed in early June of 2002, and covered the entire project area. The final survey was conducted in July of 2002 and targeted only the riparian areas.

The field surveys did not locate any Federal or State Endangered, Threatened, Proposed, Candidate, or Sensitive plant species. However, four populations of one plant species on the Washington State ‘Review’ list were found within the project area. The species, white-margined knotweed (*Polygonum polygaloides* ssp. *kelloggii*), was found in vernal draws and low spots within the project area. An estimated 2,500 white-margined knotweed plants were found, with many more known to exist immediately adjacent to the current project area.

Because no direct project-related impacts to any federal or state Endangered, Threatened, Sensitive, Proposed, or Candidate plant species are anticipated, no species-specific mitigation measures are recommended at this time. Three general mitigation measures are proposed, however, to ameliorate potential indirect project-related impacts to rare plant species. These are: 1) performance of rare plant surveys in the potential impact corridors that were not covered in 2002; 2) implementation of a noxious weed control plan; and 3) avoidance of wildfire impacts during construction and operation.

The proposed project, as mitigated, is not expected to have direct impacts on any federal or state listed species. The limited direct impacts to white-margined knotweed (a Washington ‘Review’ species) are not expected to significantly impact the local population. In addition, the mitigated project is not expected to produce significant indirect impacts (resulting from noxious weed increases or fire frequency changes) to local populations of any plant species of concern.

1. INTRODUCTION

1.1 OVERVIEW

Zilkha Renewable Energy, LLC (Zilkha) is proposing to construct and operate a wind power facility which would be located to the northwest of Ellensburg, Washington. The project would consist of 100-150 turbines, arranged in strings along exposed ridges above the Yakima River. In addition, supporting facilities would be constructed, such as access roads, electrical lines, and an electrical substation. The proposed wind farm would be built primarily on private land, and tie into existing high voltage transmission lines that cross the site. As part of the permitting process, Zilkha is preparing an Environmental Impact Statement (EIS) to analyze potential impacts that the project may have on environmental resources. In support of the EIS, an investigation of rare plant resources has been undertaken to evaluate potential project effects on rare plant species. This investigation is ongoing, and the 2002 results are the subject of this report.

1.2 PROJECT DESCRIPTION

The proposed Kittitas Valley wind farm would consist of the installation, operation, and eventual decommissioning of 100-150 wind turbines and supporting facilities. The project is anticipated to produce up to 250 megawatts (MW), or 83 average megawatts (aMW). The power would be sold to one or more regional utilities for transmission to regional consumers. Zilkha has not yet selected the turbine vendor that would be used for the project, but anticipates using 1.5 MW units. The turbines are mounted on 50-75 meter (m) tubular towers, for a total height of 90-105 m (to the tip of the blade). The concrete tower foundations would be approximately 5-15 m square, and extend 6-15 m deep. Towers would be spaced approximately 100-150 m apart in the string.

The project's electrical system would consist of two key elements: (1) a collector system, which would collect energy at 690 volts from each wind turbine, increase it to 34.5 kilovolts (kV) by a pad-mounted transformer, and connect it to the project substation; and (2) the substation, which would transform energy from 34.5 kV to 230 kV. The collector system would consist of primarily underground 34.5 kV lines buried in one-meter-deep trenches. In limited areas, overhead transmission lines would be used. The substation would be located adjacent to existing Bonneville Power Administration (BPA) or Puget Sound Energy lines, and cover less than one hectare (ha).

Although county roads provide access to some of the project area, additional roads would be needed to construct and operate the project. Where possible, existing roads on private land would be upgraded to provide access to the turbine strings and supporting facilities. In other cases, it would be necessary to construct new graveled roads at the site. Access roads would permanently disturb an area approximately ten meters in width, with possible temporary disturbance extending another one to two meters on either side.

1.3 LOCATION

The proposed project is located in Kittitas County, Washington, approximately 14 kilometers (km) southeast of the town of Cle Elum, and 20 km northwest of the town of Ellensburg (Figure 1). The Yakima River flows to the south of the project area, passing within one kilometer of the southernmost turbine string. Interstate 90 roughly parallels the river to the south, and comes within two kilometers of the turbine strings. US Highway 97 runs through the middle of the project area, and State Highway 10 passes just south.

The project is contained in the following sections (Willamette Meridian):

- Township 19N, Range 17E, Sections 1-3, 7, 9-16, 21-23 and 27; and
- Township 20N, Range 17E, Section 34.

1.4 PHYSIOGRAPHY AND SOILS

The Kittitas Valley project area is located at the eastern base of the Cascade Mountain range, at the western edge of the Columbia Basin physiographic province (Franklin and Dyrness 1988). This lowland province, surrounded on all sides by mountain ranges and highlands, covers a vast area of eastern Washington, and extends south into Oregon. The province is characterized by moderate topography incised by a network of streams and rivers which empty into the centrally located Columbia River.

The project area extends over a nine by six kilometer portion of land which consists primarily of long north-south trending ridges. Between the ridges are ephemeral and perennial creeks that flow into the Yakima River, which is located just south of the project area. Slopes within the project area generally range from 5º to 20º, but can reach 40º or more in some of the stream canyons. Elevations in the project area range from 670 m above mean sea level along Highway 97, to 960 m at the top of String ‘G’.

The soils on the project area ridgetops are primarily complexes of very shallow to moderately deep durixerolls that formed in alluvium and glacial drift over a duripan. Loess mixed with volcanic ash is typically present at the surface. Ridgetop soils in this portion of the project area (which includes the majority of the turbines) include the Lablue, Reelow, Sketter, and Reeser series (USDA 2002*a*).

1.5 CLIMATE

The Kittitas Valley project area is located at the western edge of the Columbia Basin physiographic province. This large province occurs within the rain shadow of the Cascade mountain range, and is characterized by semi-arid conditions, as well as a large range of annual temperatures indicative of a continental climate. However, the relatively close proximity of the Pacific Ocean and the dominant westerly winds of the region combine to moderate the continental influence (Franklin and Dyrness 1988).

The Cle Elum, WA weather station is located in the Yakima River valley, approximately 14 km northwest of the project area. The coldest average monthly temperatures at this station occur in January, with an average minimum of -6.7º Centigrade (C), and a maximum of 1.6º C. The warmest average monthly temperatures occur in July, when the minimum is 10.6º C and the maximum is 27.3º C. The average total annual precipitation for Cle Elum is 56.5 centimeters (cm). The wettest month is December with an average total monthly precipitation of 10.6 cm, while the driest month is July with an average total monthly precipitation of 0.89 cm. Snowfall typically occurs from November through March, with the heaviest average monthly snowfall of 62.2 cm occurring in January. The total annual average snowfall is 205 cm (WRCC 2000*a*).

In the other direction, the Ellensburg, WA weather station is located downstream from the project area along the Yakima River, approximately 20 km to the southwest. The coldest average monthly temperatures at Ellensburg also occur in January, and are similar to Cle Elum, with a minimum of -7.6º C, and a maximum of 1.2º C. Likewise the warmest average monthly temperatures in Ellensburg occur in July, when the minimum is 11.5º C and the maximum is 29.0º C. The average total annual precipitation at Ellensburg, is 22.6 cm, less than half that of Cle Elum. Similarly, Ellensburg's average annual snowfall (71.4 cm) is nearly one third that of Cle Elum (WRCC 2000*b*).

It should be noted that the highest point in the project area is over 400 m higher in elevation than the reporting station in both Ellensburg and Cle Elum. Therefore the project area would likely experience cooler temperatures, and perhaps receive slightly more precipitation, than is reported for either station.

1.6 VEGETATION

The project area is at the western edge of the Central Arid Steppe zone defined by the Washington State Gap Analysis (Cassidy *et al.* 1997). Their classifications for Eastern Washington steppe vegetation closely follow Daubenmire (1970). The Central Arid Steppe zone typically contains plant communities dominated by big sagebrush (*Artemisia tridentata*), bluebunch wheatgrass (*Pseudoroegnaria spicata*), and Sandberg's bluegrass (*Poa secunda*). In many areas of the zone, the introduced species cheatgrass (*Bromus tectorum*) is common due to past and present disturbance factors (Cassidy *et al.* 1997). The higher portions of the project area, border the Ponderosa Pine (*Pinus ponderosa*) zone.

The project area lies at the western edge of the big sagebrush/bluebunch wheatgrass vegetation zone as defined by Franklin and Dyrness (1988). They describe a number of other shrub species that may be present in the zone (all in small numbers), in addition to big sagebrush. These include: rabbitbrushes (*Chrysothamnus* spp. and *Ericameria* spp.), threetip sagebrush (*Artemisia tripartita*), and spiny hopsage (*Grayia spinosa*). The bluebunch wheatgrass is supplemented by variable amounts of needle-and-thread grass (*Hesperostipa comata*), Thurber's needlegrass (*Achnatherum thurberianum*), Cusick's bluegrass (*Poa cusickii*), and bottlebrush (*Elymus elymoides*). They also describe a low layer of plants consisting of Sandberg's bluegrass, cheatgrass, and flatspine stickseed (*Lappula occidentalis*).

Franklin and Dyrness (1988) also describe a number of plant associations that occur on lithosols (shallow soils) within the shrub-steppe region. These are particularly important for the purposes of this investigation, as lithosolic habitats occur commonly on the ridgetops within the project area. Daubenmire (1970) recognizes a variety of lithosolic plant associations. All are typically composed of a uniform layer of Sandberg's bluegrass, over a crust of mosses and lichens, with a low shrub layer above. The primary difference in these communities is in the composition of the shrub layer. Within the project area, the shrub layer on these lithosols is principally composed of several different buckwheat (*Eriogonum*) species.

The above descriptions of generalized vegetation zones and associations are based on climax communities, which typically develop over time in the absence of anthropogenic disturbance. Within the project area (as in most of the shrub-steppe region) many of the plant communities have been significantly modified due to numerous disturbance factors. This is especially true of the valley bottoms and side slopes. Cattle grazing, wildfire frequency changes, introduction of exotic plant species, ground disturbance from development activities, and a host of other factors have resulted in plant communities that are kept at an early- to mid-seral stage of development. Non-native aggressive invader species are common, and often dominate the community. Within the project area, the effects of these anthropogenic disturbances are common, although most of the communities are still dominated by native species. In many places, however, cheatgrass and bulbous bluegrass (*Poa bulbosa*) dominate the grass layer, and noxious weeds, such as diffuse knapweed (*Centaurea diffusa*), are common.

Several riparian areas associated with springs, seeps, and creeks are also present in the Kittitas Valley project area. These habitats are typically degraded from heavy cattle use, and much of the riparian vegetation has been removed. Common native riparian associates include chokecherry (*Prunus virginiana*), golden current (*Ribes aureum*), various rush species (*Juncus* spp.), various speedwell species (*Veronica* spp.), and yellow monkeyflower (*Mimulus guttatus*).

Table 1 describes the general cover types and habitat conditions found along the proposed turbine string ridgetops. In addition, a cover type map for the entire project area has been prepared and is on file at Zilkha's Portland offices.

Habitat quality within the project area ranges from 'poor' in many of the valley bottoms, to 'good' along some of the ridgetops and flats (see the legend at the bottom of Table 1 for a description of habitat quality rating criteria). Generally, the ridgetop habitats are in 'fair' to 'good' condition. More specifically, the ridgetop lithosols are typically in 'good' condition, containing a relatively intact vegetative structure and few non-native species. The deeper-soiled ridgetop habitats are generally in 'fair' condition, with certain areas dominated or co-dominated by non-native species in the grass layer.

The non-ridgetop habitats are generally more degraded from past disturbance than the ridgetop areas. This is especially true in the valley bottoms, where cattle grazing and road impacts have created large areas dominated by non-native invader species. Overall, the non-ridgetop habitats within the potential impact corridors are in 'fair' condition. However, habitat quality ranges from 'poor' in many of the valley bottoms, to 'good' on some of the canyon slopes.

1.7 LAND USE

The majority of lands within the project area are privately owned, although several parcels are owned and administered by the State of Washington Department of Natural Resources. Cattle grazing is the primary land use, although some rural homesite development has also taken place. The area is also used, on a much more limited basis, for recreational activities (primarily hunting). In addition, communications antenna clusters are located at several points within the project area. A high-voltage transmission line corridor crosses on a roughly east-west axis through the middle of the project area. This corridor contains four steel-tower 230kV electrical transmission lines. Additionally, there is a wood-pole 230kV transmission line that roughly parallels the four-line corridor, and a steel-tower 345 kV line running through the northern portion of the project area.

Several paved roads run through the project area. Highway 97 parallels the proposed turbine strings in the eastern portion of the project area, and Highway 10 runs along the Yakima River, just to the south of the project area. In addition, numerous smaller unpaved roads and jeep trails are located within the project area boundaries. These range from all-weather gravel roads, to two-track trails.

2. METHODS

2.1 STUDY AREA

For the purposes of the rare plant investigation, the study area included all lands within 50 m of the centerline of proposed facilities, as defined through July of 2002. This included proposed turbine strings, underground and overhead electrical lines, access roads, staging areas, and substation sites. In most cases, the resultant study corridors were 100 m wide, although in many areas, several project facilities are proposed to be located along side each other, resulting in a wider study corridor.

The study area was designed to take in all ground potentially disturbed by the project, however, changes to proposed facilities layouts occurred in late 2002, after the botanical field survey season. This resulted in several areas where facilities are currently proposed to be located outside of the surveyed corridor. These unsurveyed areas total approximately 12 km (7.7 miles) of corridor.

County-maintained roads were not analyzed, as these roads are not proposed for upgrade by the project. All other proposed new or existing access roads likely to be upgraded by the project were included in the rare plant study area.

Although for the purposes of impact analysis, only the study corridors were considered, a larger area was addressed during the prefield review in determining which rare plant species had potential for occurrence within the project area. This was necessary to analyze the project area in a regional context, and ensure that the target species list for the investigation was complete.

2.2 TARGET SPECIES

For the rare plant investigation, the target species included all plant taxa listed as 'Endangered', or 'Threatened' by the US Fish and Wildlife Service (USFWS). In addition, taxa that have been formally proposed, or are candidates for such federal listing, were also considered target species. Target species also included all plant taxa defined as 'Endangered', 'Threatened', 'Sensitive', 'Review', or 'Extirpated' by the Washington Natural Heritage Program (WNHP). Taxa meeting the above criteria were targeted by the investigation to determine their presence or absence within the study area. Determinations of status for rare plant species were based on the WNHP's list of tracked plant species (WNHP 2002*a*), and entries published in the US Federal Register.

2.3 PREFIELD REVIEW

As part of the investigation, a review of available literature and other sources was conducted to identify the rare plant species potentially found within the project area. As per Section 7(c)(1) of the US Endangered Species Act of 1973 (16 USC 1531, *et seq.*, as amended), a letter was sent to the USFWS requesting a list of federally Threatened, Endangered, or Proposed taxa which have potential to occur within the project area. In addition, the WNHP was contacted to obtain element occurrence records for any known rare plant populations in the vicinity. To supplement the information provided by the above agencies, a number of other sources were consulted. These sources provided additional information on the potential rare plant species for the project, including critical information such as habitat preferences, morphological characteristics, phenologic development timelines, and species ranges. Sources included: taxonomic keys and species guides (Flora ID Northwest 2001, USFWS 2001, WNHP 1999, Hickman 1993, Hitchcock and Cronquist 1973, Hitchcock *et al.* 1964); online databases of common and rare plant species (ECCI 2002, USDA 2002*b*); species lists from nearby areas (PNL 2000); environmental documents from other energy projects in the area (BPA 2002, USFS 1998, Dames and Moore Consultants 1998*a,b*); and Natural Resources Conservation Service (NRCS) soils data (USDA 2002*a*). Agency, university, and private botanists with local knowledge of the region were also contacted (Beck 2001, Downs 2001, Simmons 2001).

Using data collected during the prefield review, a list of rare plant species potentially occurring in the project area was compiled. Habitat preferences and identification periods were derived from the literature for each potential species. Using this information, along with topographic maps of the project area, a field survey plan was developed to guide the timing and intensity of the field surveys.

2.4 FIELD INVESTIGATION

All field work was performed by trained botanists who have experience performing rare plant surveys in the region. Appendix 1 contains a summary of each investigator's education and experience.

Immediately prior to the first rare plant survey of the site in April, the surveyors visited a known population of Hoover's tauschia (*Tauschia hooveri*) near Fort Simcoe south of Yakima. This visit served to confirm assumptions regarding identification characteristics for the species, and verified the timing of the early-season surveys.

Three pedestrian field surveys were performed during the 2002 growing season to locate rare plant species within the study area. The first of these took place on April 25 and 26, and was designed to located populations of Hoover's tauschia and other early-blooming species. Only habitats capable of supporting these early-blooming target species were searched (primarily the shallow-soiled ridgetops and talus slopes). However, because these habitats are common in the area, the majority of the study area was surveyed. Two botanists visually surveyed most of the ridgetop habitats within the study area at a level sufficient to determine the presence of the target early-season species. Where road access was available and no suitable habitat existed, the survey was cursory and took place from a vehicle. Where suitable habitat was found, the survey was accomplished by performing meander pedestrian transects, zig-zagging back and forth across the survey corridor.

The second rare plant survey was performed from June 3-7, 2002. This survey was designed to locate those target species that are identifiable during mid- to late-spring (this includes the majority of the target rare plant species). The June survey was conducted by three field botanists, who surveyed all ground within the study area using an 'intuitive controlled' survey pattern. The 'intuitive controlled' pattern is a variable intensity survey protocol designed to cover all ground within a study area at a level sufficient to locate all occurrences of the target species. The botanists, primarily working singly, walked each survey corridor, crossing back and forth from one edge of the corridor to the other in a zig-zag pattern. The intensity of the pattern, and the speed at which the surveyors walked, was variable, and depended on the structural complexity of the habitat, the visibility of the target species, and the probability of species occurrence in a given area. In some high probability, low visibility habitats, a tight grid pattern was walked. Care was taken to thoroughly search all unique features and any high probability habitats encountered.

The third survey took place from July 17 through July 22, 2002 and was designed to locate certain rare plant species not identifiable in the spring. These were all species associated with riparian habitats, and the summer survey focused on the springs, seeps, and creeks of the project area. This survey used a 'targeted' survey pattern to search only the riparian habitats, which had been identified previously during the spring field work. Two botanists traveled, either on foot or by vehicle, to each riparian habitat, intensively searched the area on foot, and then continued on to the next identified riparian habitat.

During all surveys, the investigators kept a list of all vascular plants encountered, and made informal collections of unknown species for later identification in the laboratory. *Vascular Plants of the Pacific Northwest* (Hitchcock *et al*. 1964) and *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973) were used as the primary authorities for vascular plant species identification. Updated taxonomy was referenced in the NRCS PLANTS database, (which also serves as the source for the common plant names used in this document) (USDA 2002*b*). Notes were also recorded regarding plant associations, land use patterns, unusual habitats, etc.

When target plant populations were found, data were collected regarding population size, location, associated habitat, and a number of other parameters. A standard rare plant site form was used to collect the information (Appendix 2). Photographs of the population (both close-ups and general habitat shots) were taken using a Nikon® 950 digital camera. The location of the population was mapped on 7.5" US Geological Survey topographic quadrangle sheets. Garmin® 12-Series Geographic Positioning System (GPS) receivers were used to record the perimeter of the population for later entry into the project Geographic Information System (GIS). In the project area, these GPS units typically self-reported an estimated positional error of seven meters or less.

The entire extent of each population was mapped, where feasible. However, where the populations were extensive and extended well beyond the edge of the study corridors, mapping the entire extent was not undertaken. In these cases, only the part of the population that occurred within the study corridor was mapped.

3. RESULTS

3.1 PREFIELD REVIEW

The USFWS Section 7 response letter listed one federally threatened plant species with potential for occurrence in the project area: *Spiranthes diluvialis* (Ute ladies'-tresses). No other plant species of concern to the USFWS were listed in the letter.

The WNHP reported one element occurrence record for a tracked plant species in the project vicinity (WNHP 2002*b*). This species occurrence, Suksdorf's monkey-flower (*Mimulus suksdorfii*), was reported from Township 19N Range 16E Section 1, which is just north of the project area. The locational information for this population is not precise, and the last reported observation was in 1980. It should be noted that, although the section containing the population is immediately adjacent to the project area, the habitat in that section is primarily forested, as opposed to the project area, which is non-forested.

The final list of rare plant species thought to have potential for occurrence within the Kittitas Valley Wind Power project area is presented in Table 2. It includes all of the species discussed in this section above, as well as a number of others which were suggested by additional contacts and references consulted during the prefield review. Although rare plant species other than those listed in Table 2 were not thought to have potential for occurrence within the project area, all rare plant species known or suspected to occur in Washington were considered during the field survey. The species listed in Table 2, however, received the most focus during the investigation.

3.2 FIELD INVESTIGATION

The field surveys did not locate any USFWS Endangered, Threatened, Proposed, or Candidate plant species. Marginal potential habitat was found for one federally listed species, Ute ladies'-tresses (*Spiranthes diluvialis*), in several of the project area riparian zones. However, the project area is west of the species' known range, and the habitat at these sites was degraded due to past disturbance. Both these factors greatly reduced the potential for occurrence of Ute ladies'-tresses.

Marginal potential habitat was also found for one federal Candidate species; basalt daisy (*Erigeron piperianus*). Although basalt daisy is typically restricted to the extensive cliffs along the Yakima River and Selah Creek, all cliffs within the project area were searched intensively for the presence of the species with negative results.

Marginal potential habitat was also found within the study area for a number of federal 'Species of Concern'. These include Columbia milkvetch (*Astragalus columbianus*), Hoover's desert-parsley (*Lomatium tuberosum*), least phacelia (*Phacelia minutissima*), Seely's silene (*Silene seelyi*), and Hoover's tauschia. In all cases, where potential habitat was found for these species, the area was searched carefully, with negative results.

Likewise, the field surveys did not locate any plants listed as Endangered, Threatened, or Sensitive by the State of Washington. Potential habitat, however, was found for a number of these species throughout the project area. These habitats were searched thoroughly for the presence of the target species, but none was found.

Four populations of one plant species on the Washington State 'Review' list were found within, or immediately adjacent to, the project area. The species, white-margined knotweed (*Polygonum polygaloides* ssp. *kelloggii*), was found in the project area in vernally moist draws and swales (Figures 3 & 4). An estimated 2,500 white-margined knotweed plants were found in these four populations, and totaled over 2.5 ha in gross population area. Much of the suitable habitat present (vernally moist areas) was found to contain the species. Most of the knotweed plants were in full flower, or beginning to fruit at the time of the second survey.

It should also be noted that during the surveys of the original project area, which included a large portion of proposed project area west of Swauk Creek that was subsequently dropped from consideration, eleven populations of white-margined knotweed were found (including the four described above). Several of the populations were extensive and contained tens of thousands of plants within the survey corridor. These populations extended out of the survey corridor for an unknown distance, so estimates of total individuals and population size are likely conservative. An estimated 67,600 white-margined knotweed plants were found within the study corridors (with many more extending outside the corridors). Gross population areas ranged from 0.01 ha to 2 ha within the study corridors, and totaled over 14 ha for all eleven populations.

Locations of the white-margin knotweed populations are shown in Figure 2. A complete list of all plant species encountered during the surveys is included in Appendix 3. Typical habitat encountered in the project area is shown in Figures 5 & 6.

4. DISCUSSION

4.1 SURVEY TIMING AND COVERAGE

The combination of three surveys targeting species identifiable in the early spring, late spring, and summer was thought to be sufficient to identify all of the target species within the areas surveyed. As is common during the permitting process for most large construction projects, however, late-season changes to proposed facilities layouts occurred for the Kittitas Valley project. This resulted in approximately 12 km (7.7 miles) of the current proposed impact corridors that have not yet been surveyed for rare plants. It is unlikely, though, that significant rare plant populations exist within these unsurveyed corridors. In all cases, the habitat in the unsurveyed corridors is similar to that encountered in the surveyed areas. Given that no target plant species were found in the adjacent surveyed corridors (other than white-margined knotweed), the potential for other rare plant populations in these areas is thought to be limited.

In addition, several riparian areas within the survey corridors contained marginal habitat for Ute ladies'-tresses, a late-season rare orchid which blooms from late July through September. When these areas were surveyed in the latter half of July, no orchids of any species were found. Late August surveys of these small areas were not conducted for the following reasons:

1. the project area is well west of the species' known range;

2. the riparian areas contained only marginal potential habitat for the species; and

3. no orchids of any kind were found during the July survey.

It was felt that these three factors indicated that no Ute ladies'-tresses individuals exist within the project area.

4.2 TARGET PLANT SPECIES WITHIN THE PROJECT AREA

Only one target plant species is known to exist within the project area; white margined knotweed. It is a small, annual plant in the buckwheat (Polygonaceae) family, which typically grows in meadows and vernal pools, up to dry subalpine slopes (Hitchcock and Cronquist 1964). It ranges from British Columbia southward on the east side of the Cascade Crest to Northern California, extending east to Montana, Wyoming, Colorado, and Arizona. The taxon was originally considered a separate species (*Polygonum kelloggii*), but the current consensus treats it as a subspecies of *P. polygaloides*.

White-margined knotweed is currently a Washington State 'Review 1' species, indicating that, within the state, the species is a, "[p]lant taxon of potential concern, [but is] in need of additional field work before a status can be assigned" (WNHP 2002*c*). The Review designation carries no legal requirement for protection, however, WNHP personnel are interested in tracking occurrences of Review species to aid in the assignment of status. White-margined knotweed is not currently regarded as Endangered, Threatened, or 'Species of Concern' by the USFWS.

The four populations found within the project area are all located in vernally wet swales, seeps, and draws. These habitats are well represented within the project area, and much of the suitable habitat searched was found to contain the species. In addition, a large amount of suitable habitat exists nearby, adjacent to the survey corridors. Although areas outside of the corridors were typically not surveyed, it is reasonable to assume that much of this suitable habitat also contains white-margined knotweed.

4.3 POTENTIAL PROJECT IMPACTS TO TARGET PLANT SPECIES

Due to the absence of known populations within the project area as surveyed to date, no project-related impacts are anticipated to any federally Endangered, Threatened, Proposed, or Candidate plant species. Likewise, no project-related impacts are predicted for any Washington State Endangered, Threatened, or Sensitive plant species.

Limited impacts are anticipated, however, to one species on the Washington State Review list; white-margined knotweed. Ground disturbance related to construction and operation of the proposed project could cause direct adverse impacts to knotweed individuals if they are located within the impact footprint. However, due to the large size of many of the populations, and the high likelihood that many more populations occur in the area adjacent to the impact corridors, the project is not expected to significantly impact the species' viability in the project area. Of the estimated 2,500 knotweed individuals in the study corridor, less than 10% are expected to be directly impacted by the project. This level of direct impact is not anticipated to jeopardize the continued existence of the local population, or lead to the need for state or federal listing.

Furthermore, in the project vicinity, eleven populations of white-margined knotweed are known, totaling more than 67,500 individuals. Within this larger area the project is expected to impact less than 0.5% of these individuals.

In addition to direct impacts from ground disturbing activities, the project also has the potential to impact white-margined knotweed indirectly if the project leads to the degradation of habitat in the area through the introduction and spread of noxious weeds. Although little is known about how white-margined knotweed responds to competition from non-native species, it is safest to assume that significant increases in noxious weeds in the area would be detrimental to the species. At the present time, the habitat where white-margined knotweed is found is relatively intact. Native species predominate at the sites, although some noxious weeds are present. If the project lead to the degradation of these vernally wet communities by increasing noxious weed densities, it is likely that some level of adverse impact to the knotweed populations would occur.

4.4 RECOMMENDED MITIGATION MEASURES

Because no direct project-related impacts to any federal or state Endangered, Threatened, Sensitive, Proposed, or Candidate plant species are anticipated, no species-specific mitigation measures are proposed at this time. The limited impacts to one, locally common, Washington State Review species (white-margined knotweed) are not expected to significantly impact the species or jeopardize the continued existence of the local population. Therefore, no specific mitigation measures are proposed to ameliorate impacts to this species. However, several measures are recommended to mitigate possible indirect effects to white-margined knotweed, and to other species of concern (if any) potentially in the vicinity, outside of the survey corridors.

1. As is typical with projects that are evolving during and after the period that field work occurs, portions of the currently proposed project lie outside the corridors that were surveyed during 2002. Based on the survey work that was completed, it is unlikely that the unsurveyed areas contain populations of rare plants. However, surveys will be conducted at the appropriate time during the spring of 2003 to confirm that no such populations are present in areas not surveyed in 2002.

2. Because noxious weeds can have numerous detrimental effects on rare plant populations, measures should be implemented to control the introduction and spread of undesirable plants during and after construction. Noxious weed control measures include: cleaning construction vehicles prior to bringing them into the project area from outside areas; quickly revegetating habitats temporarily disturbed during construction; and actively controlling noxious weeds that have established themselves as a result of the project. Prior to construction, a noxious weed control plan should be developed, and the plan should be implemented over the life of the project.

3. Indirect project-related impacts to plant species of concern may also occur as a result of changes in fire frequency patterns in the area. Project access roads can act as fire breaks, thereby decreasing the size of a wildfire. Likewise, the project roads may allow fire crews to access small fires faster, and more effectively fight larger fires. Conversely, project operation and maintenance activities have the potential to ignite wildfires if precautions are not taken. Because it is not clear if these effects would have a positive or negative effect on project area rare plants, the most prudent course of action would be to implement measures to maintain existing fire frequency patterns. While certain factors are out of the control of the proponent, steps can be taken to minimize the risk of wildfire both during the construction and operation phases of the project. Prior to construction, a comprehensive fire control plan should be developed, and implemented project-wide over the life of the project. The fire control plan should take into account the dry nature of the region, and address risks on a seasonal basis.

4.5 SIGNIFICANCE OF IMPACTS

The proposed project, as mitigated, is not expected to have direct impacts on any federal or state listed species. The limited direct impacts to white-margined knotweed (a Washington 'Review' species) are not expected to significantly impact the local population. In addition, the mitigated project is not expected to produce significant indirect impacts (resulting from noxious weed increases or fire frequency changes) to local populations of any plant species of concern.

REFERENCES

Beck, Kathryn (Calypso Consulting Botanist). 2001. Telephone conversation with R. Krichbaum (ECCI) on May 24, 2001.

Bonneville Power Administration (BPA). 2002. Maiden Wind Farm Draft Environmental Impact Statement (March 29, 2002). Bonneville Power Administration, Portland, Oregon.

Cassidy, K. M., M. R. Smith, C. E. Grue, K. M. Dvornich, J. E. Cassady, K. R. McAllister, and R. E. Johnson. 1997. Gap Analysis of Washington State: An evaluation of the protection of biodiversity. Volume 5 *in* Washington State Gap Analysis - Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.). Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle. 192 pp.

Dames & Moore Consultants. 1997*a*. Biological Evaluation for the Olympic Cross Cascade Pipeline Project (February 28, 1997). Washington Energy Facility Site Evaluation Council, Olympia, Washington.

Dames & Moore Consultants. 1997*b*. Vegetation Report for the Olympic Cross Cascade Pipeline Project (February 28, 1997). Washington Energy Facility Site Evaluation Council, Olympia, Washington.

Daubenmire, R. 1970. Steppe vegetation of Washington. Originally Agriculture Experiment Station Publication XT0062. Reprinted in 1988 as EB1446, U.S. Department of Agriculture and Home Economics, Washington State University, Pullman. 132 pp.

Downs, Janelle (PNL Botanist). 2001. Personal communication with R. Krichbaum (ECCI) on May 24, 2001.

Eagle Cap Consulting Inc. (ECCI). 2002. Unpublished database of Northwest plant species. Eagle Cap Consulting Inc., Beaverton, Oregon.

Flora ID Northwest. 2001. Computer-based expert ID system for the plants of the Northwest. Flora ID Northwest, Pendleton, Oregon.

Franklin, Jerry F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 452 pp.

Hickman, James C. *ed*. 1993. The Jepson manual. University of California Press, Berkeley, California. 1,400pp.

Hitchcock, C. Leo, and Arthur Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Washington. 730pp.

Hitchcock, C. Leo, Arthur Cronquist, Marion Ownbey, and J.W. Thompson. 1964. Vascular plants of the Pacific Northwest (5 volumes). University of Washington Press, Seattle, Washington.

Pacific Northwest National Laboratory (PNL). 2000. Hanford Site: Ecosystem Monitoring Project: Hanford Site Species Listings: Plants (last updated December 11, 2000). PNL, Richland, Washington.

Simmons, Dr. Sally A. (Washington State University Botanist, Richland Campus) 2001. Personal communication with R. Krichbaum (ECCI) on May 24, 2001.

US Department of Agriculture (USDA). 2002*a*. Soil Survey Geographic (SSURGO) database for Kittitas County Area, Washington. USDA Natural Resources Conservation Service, Ft. Worth, Texas.

US Department of Agriculture (USDA). 2002*b*. The PLANTS Database: Version 3.5. National Plant Data Center, Baton Rouge, LA. <http://plants.usda.gov>

US Fish and Wildlife Service (USFWS). 2002. Letter to Wally Erickson (WEST Inc.) from Mark G. Miller (USFWS Supervisor: Ephrata, Washington, Ecological Services Office) dated July 9, 2002.

US Fish and Wildlife Service (USFWS). 2001. Section 7 Guidelines – Snake River Basin Office: *Spiranthes diluvialis* Ute Ladies'-tresses (threatened): dated April 24, 2001. USFWS Snake River Basin Office, Boise, Idaho.

US Forest Service (USFS) and Washington Energy Facility Site Evaluation Council. 1998. Draft Environmental Impact Statement: Olympic Cross Cascade Pipeline (September 1998). Washington Energy Facility Site Evaluation Council, Olympia, Washington.

Washington Natural Heritage Program (WNHP). 2002*a*. Rare plant species with ranks: Plants tracked by the Washington Natural Heritage Program (January 2002). WNHP, Olympia, Washington. <http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/lists/plantrnk.html>

Washington Natural Heritage Program (WNHP). 2002*b*. Letter to Greg Johnson (WEST Inc.) from Sandy Swope Moody (WNHP Environmental Coordinator) dated April 3, 2002.

Washington Natural Heritage Program (WNHP). 2002*c*. Definitions of terms used by Natural Heritage Methodology. WNHP, Olympia, Washington. <http://www.wa.gov/dnr/htdocs/fr/nhp/refdesk/lists/stat&rank.html>

Washington Natural Heritage Program (WNHP). 1999. Field Guide to Selected Rare Vascular Plants of Washington. Washington Department of Natural Resources, Olympia, Washington.

Western Regional Climate Center (WRCC). 2001*a*. Cle Elum, WA: Period of record monthly climate summary: 1931-2001. WRCC, Reno, Nevada. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wachee>

Western Regional Climate Center (WRCC). 2001*b*. Ellensburg, WA: Period of record monthly climate summary: 1901-2001. WRCC, Reno, Nevada. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?waelle>

TABLES

Table 1: Summary of Habitats Associated with the Proposed Turbine Strings of the Kittitas Valley Wind Power Project

Facility	Habitat Description[1]
Turbine String 'A'	Shallow-soiled lithosol alternates with deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils.
Turbine String 'B'	The north half of this string is located on a mosaic of shallow-soiled rocky areas and deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. Various limited ground and vegetation disturbance has occurred here from recreational activities (gun club). One noxious weed population was observed along a jeep trail which runs along this section of the proposed string. The south half of this string contains the same mosaic of shallow and deeper soils, however, a fire within the last 10 years has removed most of the shrubs, and the habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs. Habitat quality is generally fair. Weedy species are more common in the deeper-soiled areas, and several populations of noxious weeds are present.
Turbine String 'C'	Shallow-soiled grassland and lithosol alternates with deeper-soiled shrub-steppe habitat. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils.
Turbine String 'D'	The north half of this string is similar to String C with alternating lithosols and deeper-soiled habitats in generally good condition. The south half of this string is a continuation of the same deeper-soiled shrub-steppe habitat.
Turbine String 'E'	This string consists mainly of deeper-soiled shrub-steppe habitat, with inclusions of shallow-soiled lithosol in the north half, and small patches of non-native species throughout. Much of the habitat in the string is in fair to good condition (i.e., dominated by native shrubs and forbs, and a mix of native and non-native grasses), although some areas have been burned recently, and one noxious weed population is present along the jeep trail, which runs the length of the ridgetop.
Turbine String 'F'	This string contains mainly shallow-soiled lithosol, with some areas of deeper-soiled shrub-steppe in the south half. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, a large gravel pit operation at the north end of this string has completely displaced the lithosol habitat in that area. A rough jeep trail runs the length of this proposed string.

Facility	Habitat Description[1]
Turbine String 'G'	This string consists almost entirely of shallow-soiled lithosol habitat, with small areas of deeper-soiled shrub-steppe and deciduous thicket habitats in the north half and at the south end. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. Two noxious weed populations were observed, one along a road at the north end of the string, and another in a small draw near the south end of the string. A well-developed jeep trail is present along the north half of the corridor.
Turbine String 'H"	This string also consists almost entirely of shallow-soiled lithosol habitat, with areas of deeper-soiled shrub-steppe habitat at the north end, midpoint, and the south end. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, there are two areas of major soil disturbance (blading) near the midpoint of the string, where the lithosol species have been largely replaced by non-native forbs and grasses. In addition, three populations of noxious weeds were observed along this string, near roads. Finally, one portion of the lithosol in the south end shows signs of heavy livestock use, although native plants continue to dominate. A well-developed two-lane gravel access road runs the length of this ridgetop, providing access for local landowners.
Turbine String 'I'	This string consists primarily of shallow-soiled lithosol habitat, although portions of the middle section, and all of the southern tip, contain deeper-soiled shrub-steppe habitat, as well as small inclusions of grassland. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, the areas of grassland are only fair quality, dominated by non-native grasses and forbs, and one noxious weed population was observed at the south end of the string.
Turbine String 'J'	The south half of the string is located mainly on deeper-soiled shrub-steppe habitat, with one area of shallow-soiled lithosol. Habitat quality is generally good: native species dominate the shallow soils, and native shrubs and forbs combine with native and non-native grasses to dominate the deeper soils. However, the south tip of the string consists of fair quality, shallow-soiled grassland dominated by non-native grasses and forbs. Two populations of noxious weeds were observed in this half of the string. The north half of this string contains the same general pattern of shallow and deeper soils, however, a fire within the last 5-10 years removed most of the shrubs, and the deeper-soiled habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs. Although overall habitat quality is fair, several small inclusions of generally good quality lithosol are present in this half of the string.

Facility	Habitat Description[1]
Intervening Facilities (access roads, electric lines, O&M facilities, etc., located between turbine strings)	Over 40% of the potential project impact corridor is located off of the ridgetops, between the turbine strings. Primarily, these are connecting facilities such as access roads and electrical lines, but include O&M areas also. These non-ridgetop habitats are typically deeper-soiled, and are generally more degraded from past disturbance than the ridgetop habitats. This is especially true in the valley bottoms, where cattle grazing and road impacts have created large areas dominated by non-native invader species. Overall, the non-ridgetop habitats within the impact corridors are in fair condition. However, habitat quality ranges from poor in many of the valley bottoms, to good on some of the canyon slopes.

Legend: Habitat Description[1]: In the habitat descriptions, ratings of habitat quality are based on general observed patterns of plant species diversity, native versus non-native ratios, and overall vegetative structure. The habitat ratings are qualitative only, based on general visual observations. Quantitative habitat quality information was not collected. The following categories were used: ‘Excellent’ (high species diversity with negligible amounts of non-native weedy species, along with well developed native vegetative structure); ‘Good’ (moderate to high species diversity dominated by native plants, with significant inclusions of non-native species in certain areas, and fair to well-developed native plant structure); ‘Fair’ (moderate diversity with non-native species dominance or co-dominance in some or all layers, and fair native structure); and ‘Poor’ (low species diversity, dominated by non-native, weedy invaders in some or all layers, and poor native plant structure.

Table 2: Rare Plant Species with Potential for Occurrence in the Kittitas Valley Wind Power Project Area

Name	Status[1]	Typical Habitat	ID Period[2]
Agoseris elata **tall agoseris**	S	Meadows, open woods, and exposed rocky ridgetops	June- August
Anemone nuttalliana **Pasque flower**	S	Prairies to mountain slopes, mostly on well-drained soil	May- August
Astragalus arrectus **Palouse milk-vetch**	S	Grassy hillsides, sagebrush flats, river bluffs, and openings in open ponderosa pine and Douglas fir forests	April- July
Astragalus columbianus **Columbia milk-vetch**	LT (SC)	Sagebrush-steppe	March- June
Astragalus misellus var. *pauper* **Pauper milk-vetch**	S	Open ridgetops and slopes	April- mid June
Camissonia pygmaea **dwarf evening-primrose**	LT	Unstable soil or gravel in steep talus, dry washes, banks and roadcuts	June- August
Camissonia scapoidea **naked-stemmed evening-primrose**	S	Sagebrush desert, mostly in sandy, gravelly areas	May- July
Carex buxbaumii **Buxbaum's sedge**	S	Peat bogs, marshes, wet meadows, and other wet places	June- August
Carex comosa **bristly sedge**	S	Marshes, lake shores, and wet meadows	May- July
Carex hystricina **porcupine sedge**	S	Wet ground near creeks, seeps, and springs	May- June
Collomia macrocalyx **bristle-flowered collomia**	S	Dry, open habitats	late May- early June
Corydalis aurea **golden corydalis**	R1	Varied habitats, moist to dry and well-drained soil	May- July
Cryptantha leucophaea **gray cryptantha**	S (SC)	Unstable sandy substrate along the Columbia River	May- June
Cryptantha rostellata **beaked cryptantha**	S	Very dry microsites within sagebrush-steppe	late April- mid June
Cyperus bipartitus **shining flatsedge**	S	Streambanks and other wet, low places in valleys and lowlands	August- September
Cypripedium fasciculatum **clustered lady's slipper**	S (SC)	Mid- to late seral Douglas fir or ponderosa pine forest	early May- mid June
Delphinium viridescens **Wenatchee larkspur**	LT (SC)	Moist meadows, moist microsites in open coniferous forest, springs, seeps, and riparian areas	July
Eatonella nivea **white eatonella**	LT	Dry, sandy, or volcanic areas within sagebrush-steppe	May

Name	Status[1]	Typical Habitat	ID Period[2]
Erigeron basalticus **basalt daisy**	LT (C)	Crevices in basalt cliffs on canyon walls	May- June
Erigeron piperianus **Piper's daisy**	S	Dry, open places, often with sagebrush	May- June
Hackelia hispida var. *disjuncta* **sagebrush stickseed**	S	Rocky talus	May- June
Iliamna longisepala **longsepal globemallow**	S	Sagebrush-steppe and open ponderosa pine and Douglas fir forest	June- August
Lomatium tuberosum **Hoover's desert-parsley**	LT (SC)	Loose talus and drainage channels of open ridgetops within sagebrush-steppe	March- early April
Mimulus suksdorfii **Suksdorf's monkey-flower**	S	Open, moist to rather dry places within sagebrush-steppe	mid April- July
Nicotiana attenuata **coyote tobacco**	S	Dry, sandy bottom lands, dry rocky washes, and other dry open places	June- September
Oenothera cespitosa ssp. *cespitosa* **cespitose evening-primrose**	S	Open sites on talus or other rocky slopes, roadcuts, and the Columbia River terrace	late April- mid June
Ophioglossum pusillum **adder's-tongue**	LT	Terrestrial in pastures, old fields, roadside ditches, and flood plain woods, in seasonally wet soil	June- September
Pediocactus simpsonii var. *robustior* **hedgehog cactus**	R1	Desert valleys and low mountains	May- July
Pellaea breweri **Brewer's cliff-brake**	S	Rock crevices, ledges, talus slopes, and open rocky soil	April- August
Penstemon eriantherus var. *whitedii* **fuzzytongue penstemon**	R1	Dry open places	May- July
Phacelia minutissima **least phacelia**	S (SC)	Moist to fairly dry open places	July
Polygonum polygaloides ssp. *kelloggii* **white-margin knotweed**	R1	Meadows and vernal pools	June- August
Pyrrocoma hirta var. *sonchifolia* **sticky goldenweed**	R1	Meadows and open or sparsely wooded slopes	July- August
Sidalcea oregana var. *calva* **Oregon checker-mallow**	LE (PE)	Moist meadows, open coniferous stands, and along the edge of shrub and hardwood thickets	mid June- late July
Silene seelyi **Seely's silene**	LT (SC)	Shaded crevices in ultramafic to basaltic cliffs and rock outcrops, and among boulders in talus	May- August
Spiranthes porrifolia **western ladies-tresses**	S	Wet meadows, streams, bogs, and seepage slopes	May- August

Name	Status[1]	Typical Habitat	ID Period[2]
Tauschia hooveri **Hoover's tauschia**	LT (SC)	basalt lithosols within sagebrush-steppe	March- mid April

Status[1]: Washington State Status (with USFWS status in parenthesis if applicable)

E: State Endangered. Taxa that are in danger of becoming extinct in Washington within the near future if factors contributing to their decline continue.

T: State Threatened. Taxa that are likely to become Endangered in Washington within the near future if factors contributing to their decline continue.

S: State Sensitive. Taxa that are vulnerable or declining, and could become Endangered or Threatened in Washington without active management or removal of threats.

R1: State Review Group 1: Taxa for which there is insufficient data to support listing in Washington as Threatened, Endangered, or Sensitive.

R2: State Review Group 2: Taxa for which taxonomic questions exist.

X: State Extirpated. Taxa possibly extirpated from Washington.

(LE): Federal Listed Endangered: Taxa in danger of Extinction throughout all or a significant portion of their range.

(LT): Federal Listed Threatened: Taxa likely to be classified as Endangered within the foreseeable future throughout all or a significant portion of their range.

(PE): Federal Proposed Endangered: Taxa proposed to be listed as Endangered (formal rulemaking in progress).

(C): Federal Candidate: Taxa that are candidates for formal listing as Endangered or Threatened.

(SC): Federal Species of Concern: Available information supports tracking the status and threats to these species because of one or more of the following factors: negative population trends have been documented; habitat is declining or threats to the habitat are known; subpopulations or closely related taxa have been documented to be declining; competition or genetic implications from introduction/stocking of exotic species; identified as a species of concern by agencies or professional societies; or in combination with any of the other criteria, information is needed on status or threats to these species.

ID Period[2]: The normal peak period during which the species is identifiable in the field.

FIGURES

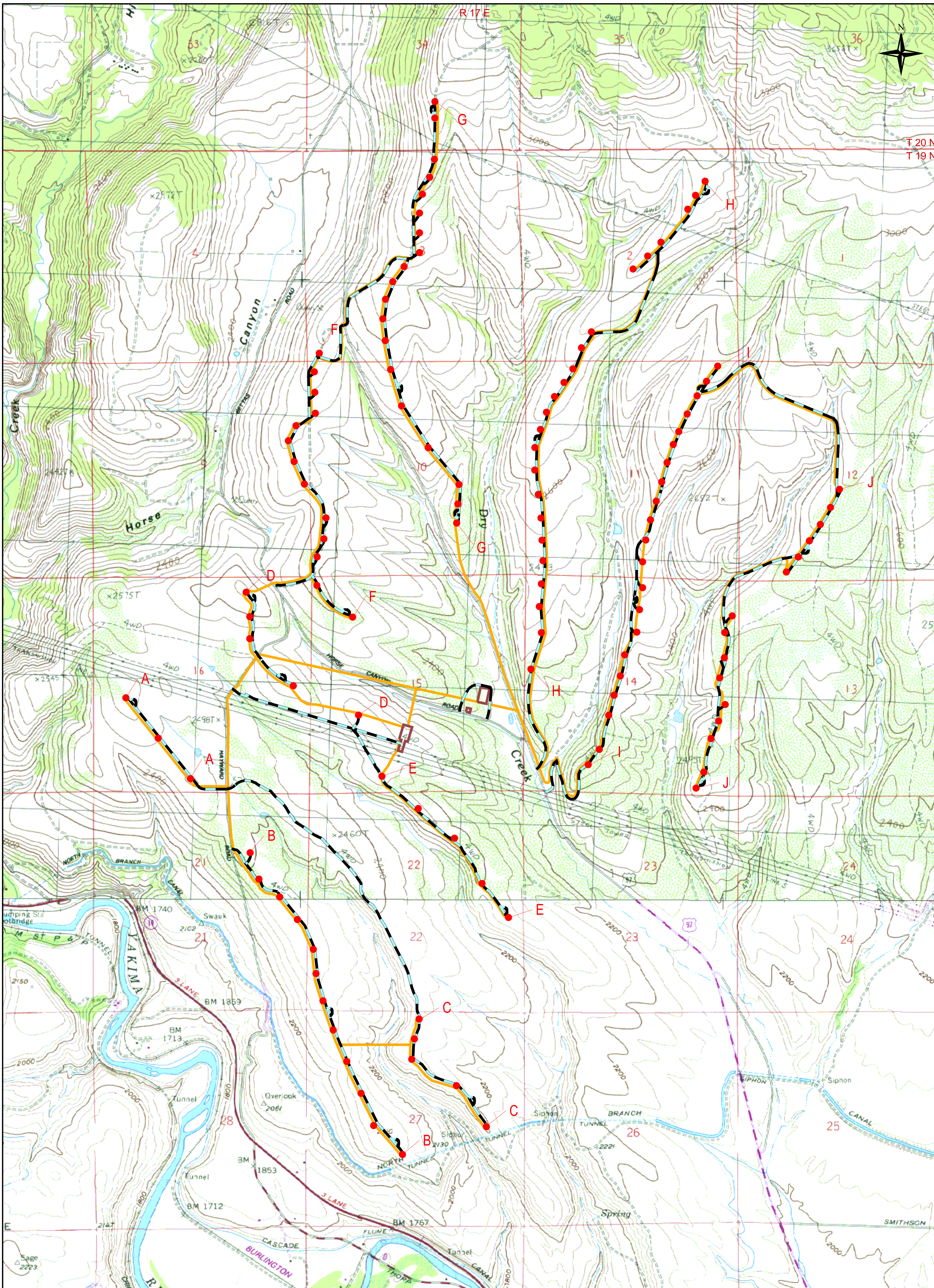


Figure 1: Kittitas Valley Wind Power Project Area

● ● A	Proposed Turbine Locations and String Names		Proposed Access Roads	Contour Interval 40 ft.
▭	Operations & Maintenance Sites		Proposed Electric Lines	Scale 1:27000

1 0 1 2 3 Kilometers

EAGLE CAP CONSULTING

January 6, 2003

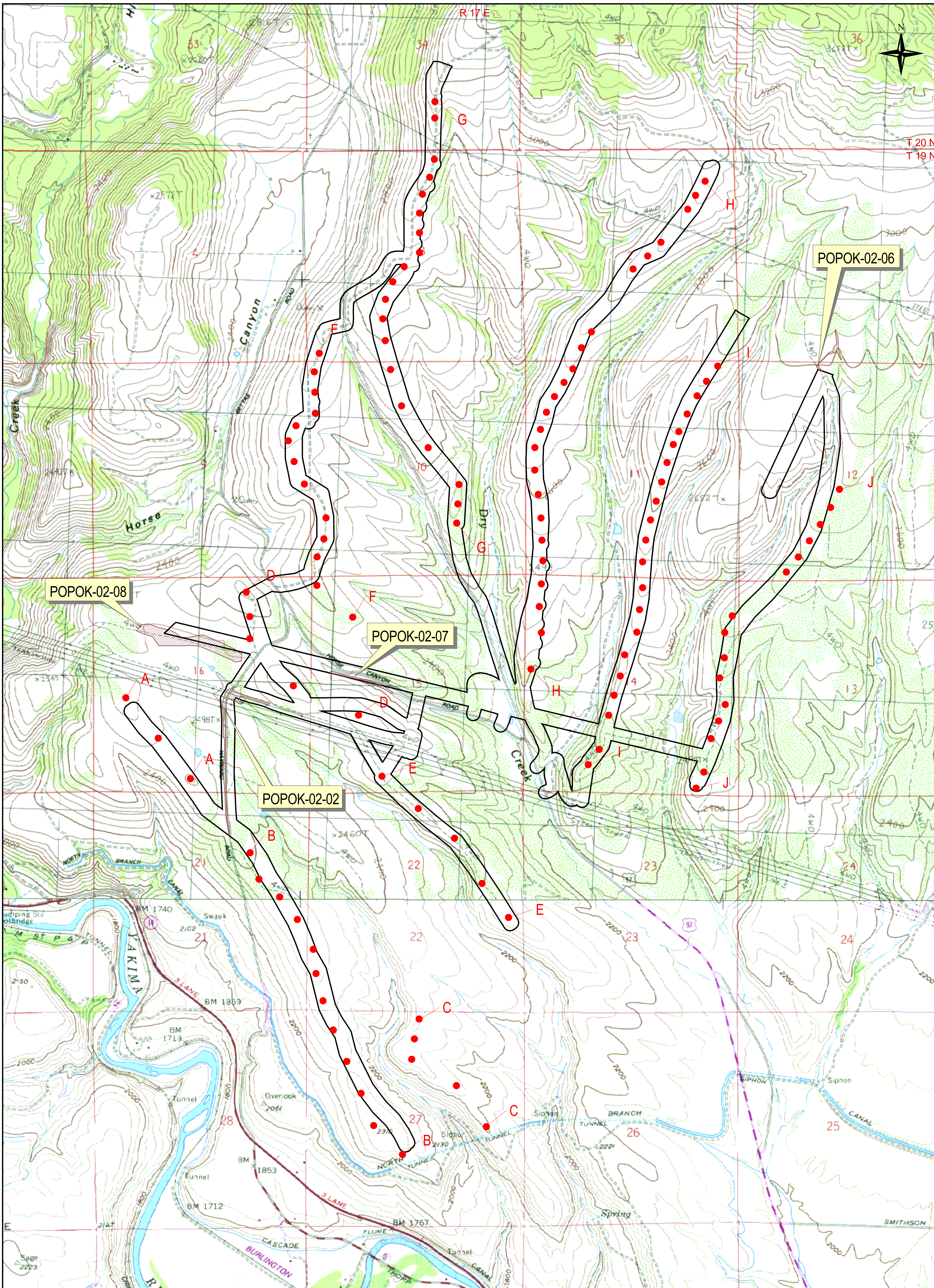


Figure 2: Rare Plant Populations

White-Margined Knotweed Populations

2002 Survey Corridor

A Proposed Turbine Locations and String Names

Contour Interval 40 ft.

Scale 1:27000

1 0 1 2 3 Kilometers

EAGLE CAP CONSULTING

January 6, 2003

Figure 3: Photo of White-Margined Knotweed

Figure 4: Photo of White-Margined Knotweed Habitat

Figure 5: Photo of Habitat Near Bottom of String 'G'

Figure 6: Photo of Habitat Along String 'A'

APPENDICES

Appendix 1: Investigator Qualifications

Suki Cupp – Project Manager (Botanical Studies): Ms. Cupp holds a Bachelor of Science degree in Botany, a Master of Landscape Architecture degree, and a Master of Forest Resources degree. She has a strong background in ecosystems management and has taught college-level biology and botany courses. Ms. Cupp has sixteen years experience performing and documenting resource inventories, rare plant surveys, wetland mitigation and monitoring projects, and feasibility studies. She has worked closely with various federal and state agencies, including the US Army Corps of Engineers, Washington Department of Ecology, and the Oregon Division of State Lands. For the Kittitas Valley project, Ms. Cupp was the project manager for the botanical studies portion of the permitting project. She coordinated the administrative and agency contact tasks of the studies, and served as a primary botanical surveyor for the field investigations.

Randall Krichbaum – Principal Investigator (Botanical Studies): Mr. Krichbaum holds a Bachelor of Science degree in Zoology, and a Master of Science degree in Resources and the Environment. His graduate work investigated the methods used in rare plant studies conducted during the impact assessment process. In 1991 he co-founded Eagle Cap Consulting Inc., an environmental consulting firm that specializes in impact assessment studies for private and public development projects. In his twenty years of experience, Mr. Krichbaum has directed numerous environmental investigations for major energy projects. He has served as the botanical principal investigator on six wind power projects in the Columbia Basin over the past six years. For the Kittitas Valley project, Mr. Krichbaum coordinated the scientific and technical aspects of the rare plant investigation and vegetation mapping, and served as a primary surveyor for all botanical field work.

Margaret Horvath – Botanist/GIS Specialist: Ms. Horvath has a Bachelor of Science degree in Geography, focusing on the physical and biological aspects of the discipline. In addition, she has completed post-graduate training in GIS database management. She co-founded Eagle Cap Consulting Inc. in 1991, and has worked on most of the firm’s projects in her capacity as a field botanist and GIS specialist. Ms. Horvath has completed numerous rare plant field surveys throughout the Northwest for a number of public and private development projects, including six wind power projects in the Columbia Basin. In addition, she also manages the firm’s GIS services, and produces most of the project maps used in the field and in the firm’s technical reports. For the Kittitas Valley project, Ms. Horvath was a primary field survey crew member, and coordinated much of the data gathered during the prefield and field portions of the project. In addition, she maintained the project GIS database, and produced the botanical resources maps for the rare plant task and vegetation mapping task.

Appendix 2: Sample Rare Plant Data Form

Eagle Cap Consulting Rare Plant Observation Form

Project: ____________________________

Sci. Name: ____________________________ **Spp. Code:** _____________ **Site Number:** ______________________

Recorder(s): ____ **Phone:** _______________ **Date:** ________________

Address: ____

Quad Name: ____ **Landowner:** _________________________________

County: ____ **UTM Coord.:** _______________**N** _______________**E**

T: _____ **R:** _____ **S:** _____ _____ **¼ of the** _____ **¼; T:** _____ **R:** _____ **S:** _____ _____ **¼ of the** _____ **¼**

Directions:

New Site? ☐ **EO#:** _____________ **Min. Elevation (m):** _____________ **Max. Elevation (m):** ____________

Total # in pop.: _______________**actual** _______________**estimated** **Survey Intensity:** _____________

What was counted? ☐**Genets (genetically distinct individuals) or** ☐**Ramets (stems of a clonal plant)**

Phenology (% of pop.): _________**Vegetative** _________**Flower** _________**Fruit** _________**Dormant**

Pop. age class (%): ______**Seedlings** ______**Immature** ______**Mature** ______**Senescent** ______**Unknown**

Gross pop. area ___________**m²** **Net area:** ___________**m²** **Slope (deg.):** _________ **Aspect (deg.):** __________

Habitat:

Percent Cover: _______**Trees** _______**Shrubs** _______**Forbs** _______**Grasses** ______**Litter** ______**Bare**

Abundant Species			Common Species			Uncommon Species		

Threats: ____

How was ID made? ____

Other knowledgeable individuals: ____

Photo Roll and No.: _________________ **Collection ID:** _____________ **Herbarium:** ________________________

Comments:

Appendix 3: Vascular Plant Species Found within the Kittitas Valley Wind Power Project Area

Vascular Plant Species
Kittitas Valley Wind Power Project

Survey Date(s): April 26 through July 22, 2002

Botanical nomenclature follows the USDA Natural Resources Conservation Service PLANTS Database (USDA 2002)
** = introduced plants*

Family	Scientific Name	Common Name
ACERACEAE	*Acer glabrum*	Rocky Mountain maple
ALISMATACEAE	*Alisma triviale*	northern water plantain
AMARANTHACEAE	*Amaranthus blitoides*	mat amaranth
APIACEAE	*Cicuta douglasii*	western water-hemlock
	Heracleum maximum	cow-parsnip
	Lomatium canbyi	Canby's desert-parsley
	Lomatium dissectum	fern-leaved lomatium
	Lomatium farinosum var. hambleniae	Hamblen's lomatium
	Lomatium geyeri	Geyer's lomatium
	Lomatium gormanii	Gorman's desert-parsley
	Lomatium macrocarpum	big-fruited lomatium
	Lomatium nudicaule	pestle parsnip
	Lomatium triternatum	nine-leaf lomatium
	Osmorhiza berteroi	mountain sweet-root
	Osmorhiza occidentalis	western sweet-root
	Osmorhiza sp.	sweet-root
	Perideridia gairdneri ssp. borealis	Gairdner's yampah
APOCYNACEAE	*Apocynum sp.*	dogbane
ASCLEPIADACEAE	*Asclepias fascicularis*	Mexican milkweed
ASTERACEAE	*Achillea millefolium*	common yarrow
	Agoseris grandiflora	large-flowered agoseris
	Agoseris heterophylla	annual agoseris
	Antennaria dimorpha	low pussy-toes
	Antennaria flagellaris	stolonous everlasting
	Antennaria luzuloides	woodrush pussy-toes
	Antennaria microphylla	rosy pussy-toes
	Antennaria stenophylla	narrow-leaf pussy-toes
	* *Anthemis cotula*	mayweed chamomile
	Arnica cordifolia	heart-leaved arnica

ASTERACEAE	*Arnica fulgens*	orange arnica
	* *Artemisia absinthium*	wormwood
	Artemisia douglasiana	Douglas' sagewort
	Artemisia rigida	stiff sagebrush
	Balsamorhiza hookeri var. lagocephala	Hooker's balsamroot
	Balsamorhiza sagittata	arrow-leaf balsamroot
	Cacaliopsis nardosmia	silvercrown luina
	* *Centaurea biebersteinii*	spotted knapweed
	* *Centaurea diffusa*	diffuse knapweed
	Chaenactis douglasii	hoary chaenactis
	* *Cichorium intybus*	wild succory
	* *Cirsium arvense*	Canada thistle
	Cirsium hookerianum	Hooker's thistle
	Cirsium sp.	thistle
	* *Cirsium vulgare*	bull thistle
	Crepis atribarba	slender hawksbeard
	Crepis modocensis ssp. rostrata	low hawksbeard
	Crocidium multicaule	spring-gold
	Ericameria nauseosa ssp. nauseosa	gray rabbitbrush
	Erigeron bloomeri	scabland fleabane
	Erigeron filifolius var. filifolius	thread-leaf fleabane
	Erigeron linearis	line-leaf fleabane
	Erigeron poliospermus var. poliospermus	cushion fleabane
	Erigeron pumilus ssp. intermedius	shaggy fleabane
	Eriophyllum lanatum	common eriophyllum
	Gnaphalium palustre	lowland cudweed
	Grindelia sp.	gumweed
	Grindelia squarrosa	resin-weed
	Helianthella uniflora	Rocky Mountain helianthella
	Hieracium cynoglossoides	hounds-tounge hawkweed
	* *Lactuca serriola*	prickly lettuce
	Lagophylla ramosissima	slender hareleaf
	Leucanthemum vulgare	oxeye-daisy
	Madia citriodora	lemon-scented tarweed
	Madia exigua	little tarweed
	Madia glomerata	mountain tarweed
	Madia gracilis	gum-weed
	Matricaria discoidea	pineapple weed
	Microseris nutans	nodding microseris
	Nothocalais troximoides	false-agoseris
	Pyrrocoma carthamoides var. carthamoides	large-flowered goldenweed
	Rigiopappus leptocladus	bristle-head
	Senecio hydrophiloides	sweetmarsh butterweed
	Senecio integerrimus var. exaltatus	western groundsel
	Stenotus lanuginosus var. lanuginosus	woolly goldenweed
	Stenotus stenophyllus	narrow-leaf goldenweed

ASTERACEAE	*Symphyotrichum foliaceum*	leafy aster
	Symphyotrichum spathulatum	western mountain aster
	* *Taraxacum laevigatum*	red seeded dandelion
	* *Taraxacum officinale*	common dandelion
	* *Tragopogon dubius*	salsify
	Wyethia amplexicaulis	northern wyethia
	Xanthium strumarium	common cocklebur
BERBERIDACEAE	*Mahonia aquifolium*	shining Oregongrape
BETULACEAE	*Alnus viridis*	Sitka alder
	Betula sp.	birch
	Corylus cornuta	hazelnut
BORAGINACEAE	*Amsinckia lycopsoides*	tarweed fiddleneck
	Amsinckia menziesii	Menzies' fiddleneck
	* *Asperugo procumbens*	madwort
	* *Buglossoides arvensis*	corn gromwell
	Cryptantha torreyana	Torrey's cryptantha
	Lithospermum ruderale	Columbia puccoon
	Mertensia oblongifolia	leafy bluebells
	Myosotis laxa	small-flowered forget-me-not
	* *Myosotis stricta*	blue scorpion-grass
	Plagiobothrys scouleri	Scouler's plagiobothrys
	Plagiobothrys tenellus	slender popcorn-flower
BRASSICACEAE	* *Alyssum alyssoides*	pale alyssum
	Arabis sparsiflora var. atrorubens	elegant rockcress
	* *Capsella bursa-pastoris*	shepherd's-purse
	Cardaria draba	heart-podded hoarycress
	Descurainia incana	mountain tansymustard
	Draba verna	spring whitlow-grass
	Idahoa scapigera	scalepod
	* *Lepidium campestre*	fieldpeppergrass
	Phoenicaulis cheiranthoides	daggerpod
	Rorippa curvisiliqua	western yellowcress
	* *Rorippa nasturtium-aquaticum*	water-cress
	* *Sisymbrium altissimum*	Jim Hill mustard
	* *Thlaspi arvense*	fanweed
CAPRIFOLIACEAE	*Lonicera ciliosa*	trumpet honeysuckle
	Sambucus nigra ssp. cerulea	blue elderberry
	Symphoricarpos oreophilus var. utahensis	mountain snowberry
CARYOPHYLLACEAE	*Arenaria congesta var. prolifera*	capitate sandwort

CARYOPHYLLACEAE	*Cerastium nutans*	nodding chickweed
	* *Dianthus armeria*	grass pink
	* *Holosteum umbellatum*	jagged chickweed
	Moehringia macrophylla	bigleaf sandwort
	Sagina saginoides	alpine pearlwort
	* *Silene latifolia ssp. alba*	white campion
	Silene menziesii ssp. menziesii	Menzie's silene
	* *Spergularia rubra*	red sandspurry
	Stellaria longipes	longstalk starwort
CELASTRACEAE	*Paxistima myrsinites*	myrtle boxwood
CHENOPODIACEAE	*Chenopodium album*	lamb's quarters
	Chenopodium leptophyllum	slimleaf goosefoot
	Chenopodium sp.	lamb's quarters
	* *Salsola kali*	Russian thistle
CONVOLVULACEAE	* *Convolvulus arvensis*	field bindweed
CORNACEAE	*Cornus sericea*	red-osier dogwood
CRASSULACEAE	*Sedum lanceolatum*	lance-leaved stonecrop
CYPERACEAE	*Carex aquatilis*	water sedge
	Carex bebbii	Bebb's sedge
	Carex geyeri	elk sedge
	Carex lenticularis	lakeshore sedge
	Carex microptera	small winged sedge
	Carex multicostata	many-ribbed sedge
	Carex pachystachya	thick headed sedge
	Carex pellita	wooly sedge
	Carex praegracilis	graceful sedge
	Carex retrorsa	retrorse sedge
	Carex sp.	sedge
	Carex stipata	sawbeak sedge
	Eleocharis palustris	common spike-rush
	Scirpus microcarpus	small-fruited bulrush
EQUISETACEAE	*Equisetum arvense*	common horsetail
FABACEAE	*Astragalus reventiformis*	Yakima milkvetch
	* *Daucus carota*	Queen Anne's lace
	Lathyrus pauciflorus var. pauciflorus	few-flowered peavine
	Lotus pinnatus	meadow deervetch
	Lupinus argenteus ssp. argenteus var. laxiflorus	spurred lupine

FABACEAE	*Lupinus lepidus*	prairie lupine
	Lupinus sericeus ssp. sericeus var. flexuosus	silky lupine
	* *Medicago lupulina*	hop clover
	* *Melilotus alba*	white sweet-clover
	Trifolium cyathiferum	cup clover
	* *Trifolium hybridum*	alsike clover
	Trifolium macrocephalum	big-headed clover
	* *Trifolium pratense*	red clover
	Vicia americana ssp. americana	American vetch
FAGACEAE	*Quercus garryana*	Oregon white oak
GERANIACEAE	* *Erodium cicutarium*	filaree
	Geranium viscosissimum	sticky purple geranium
GROSSULARIACEAE	*Ribes cereum var. cereum*	squaw currant
HYDRANGEACEAE	*Philadelphus lewisii*	mockorange
HYDROPHYLLACEAE	*Hesperochiron pumilus*	dwarf hesperochiron
	Hydrophyllum capitatum	ball-head waterleaf
	Nemophila breviflora	great basin nemophila
	Phacelia hastata	silverleaf phacelia
	Phacelia linearis	threadleaf phacelia
	Phacelia procera	tall phacelia
HYPERICACEAE	* *Hypericum perforatum*	common St. Johnswort
IRIDACEAE	*Iris missouriensis*	western blue fleur-de-lis
	Sisyrinchium sp.	sisyrinchium
JUNCACEAE	*Juncus articulatus*	jointed rush
	Juncus balticus	Baltic rush
	Juncus brachyphyllus	shortleaved rush
	Juncus bufonius	toad rush
	Juncus covillei var. obtusatus	Coville's rush
	Juncus effusus	common rush
	Juncus ensifolius	dagger leaved rush
	Juncus longistylis	long styled rush
LAMIACEAE	*Mentha arvensis*	field mint
	Monardella odoratissima ssp. discolor	mountain monardella
	Prunella vulgaris ssp. lanceolata	self-heal
LEMNACEAE	*Lemna minor*	water lentil

LILIACEAE	*Allium acuminatum*	tapertip onion
	Allium douglasii	Douglas' onion
	Allium macrum	rock onion
	Allium tolmiei	Tolmie's onion
	Calochortus sp.	mariposa
	Camassia quamash	common camas
	Fritillaria pudica	yellow bell
	Maianthemum racemosum ssp. amplexicaule	western Soloman-plume
	Maianthemum stellatum	starry Solomon-plume
	Triteleia grandiflora var. howellii	Howell's triteleia
	Veratrum californicum	California false hellebore
	Zigadenus venenosus	meadow death camas
LOASACEAE	*Mentzelia dispersa*	small-flowered mentzelia
MALVACEAE	*Malva neglecta*	dwarf mallow
	Sidalcea oregana ssp. oregana var. NOT calva	Oregon checker-mallow
ONAGRACEAE	*Camissonia andina*	sun cup
	Chamerion angustifolium	fireweed
	Epilobium brachycarpum	tall annual willow-weed
	Epilobium ciliatum	purple-leaved willowherb
	Epilobium densiflorum	dense spike-primrose
	Epilobium minutum	small flowered willow-weed
OROBANCHACEAE	*Orobanche uniflora*	naked broomrape
PAEONIACEAE	*Paeonia brownii*	Brown's peony
PINACEAE	*Pinus ponderosa*	ponderosa pine
	Pseudotsuga menziesii	Douglas-fir
PLANTAGINACEAE	* *Plantago lanceolata*	ribwort
POACEAE	*Achnatherum lemmonii var. lemmonii*	Lemmon's needlegrass
	Agrostis exarata	spike bentgrass
	* *Agrostis gigantea*	redtop
	* *Alopecurus pratensis*	meadow foxtail
	Bromus carinatus	California brome
	* *Bromus commutatus*	hairy chess
	* *Bromus diandrus*	ripgut
	* *Bromus hordeacus ssp. hordeacus*	soft brome
	Bromus inermis	smooth brome
	* *Bromus japonicus*	Japanese brome

POACEAE	* *Bromus tectorum*	cheatgrass
	Bromus vulgaris var. vulgaris	Columbia brome
	* *Dactylis glomerata*	orchard grass
	Danthonia unispicata	one-spike oatgrass
	Deschampsia danthonioides	annual hairgrass
	Deschampsia elongata	slender hairgrass
	Elymus elymoides	bottlebrush squirreltail
	Elymus glaucus	western rye-grass
	Elymus multisetus	big squirreltail
	* *Elymus repens*	quack grass
	Festuca idahoensis	idaho fescue
	Glyceria striata	fowl mannagrass
	Hordeum brachyantherum	meadow barley
	* *Hordeum marinum*	Mediterranean barley
	Leymus cinereus	giant wildrye
	* *Lolium pratense*	meadow ryegrass
	Melica bulbosa	oniongrass
	Melica fugax	little oniongrass
	Phalaris arundinacea	reed canarygrass
	* *Phleum pratense*	timothy
	* *Poa bulbosa*	bulbous bluegrass
	Poa pratensis	Kentucky bluegrass
	Poa secunda	Sandberg's bluegrass
	Poa wheeleri	Wheeler's bluegrass
	Pseudoroegneria spicata	blue-bunch wheatgrass
	* *Ventenata dubia*	ventenata
	* *Vulpia bromoides*	brome fescue
POLEMONIACEAE	*Collomia grandiflora*	large flowered collomia
	Collomia linearis	narrow-leaf collomia
	Navarretia intertexta ssp. propinqua	needle-leaf navarretia
	Navarretia sp.	navarretia
	Phlox gracilis ssp. humilis	slender phlox
	Phlox hoodii	Hood's phlox
	Phlox speciosa	showy phlox
	Polemonium micranthum	littlebells polemonium
POLYGONACEAE	*Eriogonum compositum var. leianthum*	northern buckwheat
	Eriogonum douglasii	Douglas' buckwheat
	Eriogonum elatum	tall buckwheat
	Eriogonum heracleoides	Wyeth's buckwheat
	Eriogonum sp.	buckwheat
	Eriogonum strictum ssp. proliferum	strict buckwheat
	Eriogonum thymoides	thyme buckwheat
	Polygonum aviculare	doorweed
	Polygonum douglasii	Douglas' knotweed

POLYGONACEAE	*Polygonum polygaloides ssp. kelloggii*	white-margined knotweed
	* *Rumex acetosella*	field sorrel
	Rumex salicifolius var. mexicanus	willow dock
POLYPODIACEAE	*Cystopteris fragilis*	bladder-fern
PORTULACACEAE	*Claytonia lanceolata var. lanceolata*	western springbeauty
	Claytonia perfoliata	miner's lettuce
	Lewisia rediviva	bitterroot
	Montia fontana	water chickweed
	Montia linearis	line-leaf montia
PRIMULACEAE	*Dodecatheon conjugens*	desert shooting-star
RANUNCULACEAE	* *Ceratocephala testiculata*	hornseed buttercup
	Delphinium multiplex	Kittitas larkspur
	Delphinium nuttallianum	larkspur
	Myosurus minimus	tiny mouse-tail
	Ranunculus aquatilis	white water-buttercup
	Ranunculus sceleratus	celeryleaved buttercup
	Ranunculus uncinatus	little buttercup
RHAMNACEAE	*Ceanothus sanguineus*	redstem ceanothus
	Ceanothus velutinus var. velutinus	snowbrush
ROSACEAE	*Amelanchier alnifolia*	western service berry
	Crataegus douglasii	black hawthorn
	Geum triflorum	old man's whiskers
	Holodiscus discolor	oceanspray
	Potentilla glandulosa	sticky cinquefoil
	Potentilla gracilis var. fastigiata	slender cinquefoil
	Potentilla gracilis var. flabelliformis	cinquefoil
	Prunus emarginata	bittercherry
	Prunus virginiana	chokecherry
	Purshia tridentata	bitter-brush
	Rosa nutkana	Nootka rose
	Rosa woodsii	Wood's rose
	Rubus parviflorus	thimbleberry
	Sanguisorba occidentalis	annual burnet
RUBIACEAE	*Galium aparine*	cleavers
	Galium boreale	northern bedstraw
	Galium trifidum	small bedstraw
SALICACEAE	*Populus balsamifera ssp. trichocarpa*	black cottonwood

SALICACEAE	*Populus tremuloides*	aspen
	Salix lucida ssp. caudata	whiplash willow
	Salix prolixa	Mackenzie willow
SANTALACEAE	*Comandra umbellata*	bastard toad flax
SAXIFRAGACEAE	*Lithophragma glabrum*	bulbiferous fringecup
	Lithophragma parviflorum	prairiestar
	Saxifraga integrifolia	swamp saxifrage
SCROPHULARIACEAE	*Castilleja hispida var. hispida*	harsh paintbrush
	Castilleja tenuis	hairy indian-paintbrush
	Castilleja thompsonii	Thompson's paintbrush
	Collinsia parviflora	blue-eyed mary
	Mimulus breviflorus	short-flowered monkey-flower
	Mimulus moschatus var. moschatus	musk-plant
	Penstemon gairdneri var. gairdneri	Gairdner's penstemon
	Penstemon richardsonii var. richardsonii	Richardson's penstemon
	Penstemon rydbergii	Rydberg's penstemon
	* *Verbascum thapsus*	common mullein
	Veronica americana	American brooklime
	Veronica peregrina ssp. xalapensis	purslane speedwell
SOLANACEAE	*Solanum triflorum*	cut-leaved nightshade
VIOLACEAE	*Viola nuttallii*	yellow violet
	Viola trinervata	sagebrush violet

Current Vegetation Types of the
Kittitas Valley Wind Power Project
Vegetation Type
Wetland
Riparian
Riparian Trees
Dense Confiers
Sparse Conifers
Deciduous Shrub Thicket
Dense Shrub-steppe
Moderate Shrub-steppe
Sparse Shrub-steppe
Low Sagebrush
Grassland
Lithosolic Plant Community
Other Features
Surface Water
Talus
Developed
50 m Lithosol Survey Corridor
300 m Buffer Corridor
Turbine Locations and String Name
Scale 1:12500
Contour Interval 40 ft.
500 0 500 1000 Meters
EAGLE CAP CONSULTING
December 4, 2002
T 20 N
T 19 N

Extended Map Legend

Current Vegetation Types of the Kittitas Valley Wind Power Project

December 4, 2002

The attached current vegetation map for the Kittitas Valley Wind Power Project delineates the generalized plant cover types present within the project area as proposed through November 15, 2002. Cover types were delineated within a buffer area extending at least 300 meters (m) from proposed project facilities. In total, 25,131 hectares (ha) were included in the 300 m buffer corridor. In addition, lithosolic (shallow-soiled) plant communities were broken out within a smaller corridor, extending 50 m from the proposed facilities. It should be noted that proposed facilities locations were revised late in 2002. The 300 m buffer area on this version of the map was reduced in overall extent to reflect areas dropped from consideration. Due to slight changes in proposed alignments, the 50 m corridor, in which lithosols were broken out, may not exactly reflect current proposed facilities locations.

It is also important to note that the lithosol areas most often occurred in a mosaic pattern, alternating with deeper-soiled habitats. At the project scale, it was not possible to break out each small inclusion of lithosol. Therefore, a 50% threshold was used: *i.e.* when a polygon contained a total areal lithosol extent of 50% or greater, the polygon was typed as lithosol; and when the lithosol areas made up less than 50% of the mosaic, the polygon was typed as the deeper-soiled habitat.

The initial cover type mapping was accomplished using orthorectified, low altitude, digital true-color aerial photos obtained from Kittitas County. Cover types were delineated visually from these photos, and digitized directly into the project Geographic Information System (GIS) using the ArcView® 3.2a GIS application. Large scale preliminary field maps were then produced showing the vegetation polygons.

The initial vegetation typing was then field verified at the site in July of 2002 by two botanists. Using the preliminary field maps, the botanists visually surveyed the majority of ground within the 300 m buffer corridor to confirm the typing and boundaries of the preliminary map. In addition, they walked or drove the entire 50 m buffer corridor and broke out areas of lithosolic plant communities within the corridor. The lithosols were not distinguishable on the photos from the Grassland and Low Sagebrush cover types, so it was necessary to perform this delineation in the field.

Revisions were made to the current vegetation theme in the GIS based on the data gathered during the field verification process. This theme was then projected onto a USGS topographic base map, and output at a 1:12500 scale for the final version. The cover types delineated are described more fully below.

Wetlands (WE): This cover type includes emergent, scrub-shrub, and forested wetlands. These were typed based on current vegetation and hydrology present in July of 2002. No attempt was made to formally delineate these wetlands, and actual jurisdictional extent may be greater or lesser than shown. In addition, wetlands too small to be delineated from the aerial photos are not shown on this map. A total of 1.6 ha were typed as wetlands, which is 0.01% of the 300 m buffer corridor.

Riparian (RI): The Riparian cover type was used to describe non-forested areas of riparian vegetation along drainages. Many of the drainages within the project area contained only dryland vegetation, and were therefore not typed in this category. In total, 55 ha of land fell into the Riparian category, or 0.2% of the 300 m buffer corridor.

Riparian Trees (RT): This cover type includes areas within riparian zones dominated by trees. Primarily this includes hydrophytic species such as cottonwoods (*Populus balsamifera* ssp. *trichocarpa*), but conifers are also present in some riparian areas. 279 total hectares were typed as Riparian Tree, which is 1.1% of the 300 m buffer corridor.

Dense Conifers (CF1) and Sparse Conifers (CF2): Upland areas dominated by coniferous trees were typed as either Dense or Sparse Conifers depending on the relative spatial density of the trees. In total 174 ha of land were typed as Conifers (0.7% of the 300 m buffer corridor) with 146 ha in the Dense category and 26 ha in the Sparse category**.**

Deciduous Shrub Thicket (TH): This cover type was used to describe upland areas dominated by deciduous shrubs. These tend to be located on more mesic sites than the Shrub-Steppe cover type (described below). Typical shrub species for this cover type include chokecherry (*Prunus virginiana*), bittercherry (*Prunus emarginata*), oceanspray (*Holodiscus discolor*), common snowberry (*Symphoricarpos albus*), and serviceberry (*Amelanchier alnifolia*). The Deciduous Shrub Thicket cover type is present on a total of 611 ha, or 2.4% of the 300 m buffer corridor.

Dense Shrub-Steppe (ST1), Moderate Shrub-Steppe (ST2), and Sparse Shrub-Steppe (ST3): Upland areas dominated by tall shrubs, primarily bitterbrush (*Purshia tridentata*), and which contained an understory of bunchgrasses (or in disturbed areas cheatgrass [*Bromus tectorum*]), were classed as Shrub-Steppe. The category was further broken down based on the relative spatial density of the shrub layer. Shrub-Steppe vegetation is typically found on drier sites than Deciduous Shrub Thicket types. Overall, the Shrub-Steppe category was present on 12,858 ha of land (51.2% of the 300 m buffer corridor), with 595 ha categorized as Dense, 6054 ha as Moderate, and 6209 ha categorized as Sparse.

Low Sagebrush (SL): The Low Sagebrush category was used to describe shallow-soiled areas dominated by low sagebrushes; primarily rigid sagebrush (*Artemisia rigida*). These areas are typically rockier and contain less biomass than the Shrub-Steppe category. Within the 50 m buffer corridor, the Low Sagebrush category was usually broken out as a Lithosolic Plant Community (see below). A total of 1,014 ha (or 4.0% of the 300 m buffer corridor) were typed as Low Sagebrush, however, that figure does not include the Low Sagebrush areas broken out as Lithosolic Plant Communities.

Grassland (GR): This cover type includes a variety of plant associations, all dominated by grass species. In most cases these are bunchgrasses, such as Sandberg’s bluegrass (*Poa secunda*) or bluebunch wheatgrass (*Pseudoroegnaria spicata*), but disturbed areas are sometimes dominated by cheatgrass or bulbous bluegrass (*Poa bulbosa*). Some of the Grassland areas are former

Shrub-Steppe habitats that have lost their shrub component due to fire or other disturbance. Most of the Lithosolic Plant Communities (see below) broken out of the 50 m buffer corridor came out of the Grassland category. A total of 7919 ha of ground (31.5% of the 300 m buffer corridor) were typed as Grassland, although this does not include the Grassland areas that were broken out as Lithosolic Plant Communities within the 50 m buffer corridor.

Lithosolic Plant Communities (LI): This cover type is actually a sub-category of two other cover types (Low Sagebrush and Grassland). It is characterized by a layer of low shrubs (rigid sagebrush) and/or low shrubby forbs (various buckwheats [*Eriogonum* spp.]), over a uniform layer of Sandberg's bluegrass. By definition, this cover type occurs on shallow, rocky soils. Because delineation of the lithosolic plant communities was only possible through on-site inspection, this sub-category was only broken out from the Low Sagebrush and Grassland types within the 50 m buffer corridor. It should be noted that in many parts of the project area, lithosols occur as small inclusions in deeper-soiled habitats. These inclusions are typically too small and numerous to map, even at the large scale presented here. For this reason, a 50% threshold was used in delineating the lithosols: *i.e.* where lithosols comprised 50% or more (as estimated visually) of the ground within a mapping unit, it was classed as a Lithosolic Plant Community. This results in some lithosolic polygons with significant inclusions of deeper-soiled habitats, and some non-lithosolic polygons that contain numerous shallow-soiled areas. In total, 1,836 ha were classed as lithosol, which is 39.0% of the 50 m buffer corridor.

Surface Water (WA): This category includes rivers, streams, and stock watering ponds. 12 ha were classified as Surface Water, which is 0.05% of the 300 m buffer corridor.

Talus (TA): The Talus cover type includes slopes comprised primarily of smaller rocks and boulders. This is a primarily non-vegetated type, although scattered trees, shrubs, and forbs may be present. A total of 50 ha of Talus were identified, which is 0.2% of the 300 m buffer corridor.

Developed (DE): This type includes residential homes, paved roads, farm buildings and yards, urban areas, and industrial/commercial land. It includes areas where human disturbance has removed or altered most or all of the vegetation. A total of 322 ha of Developed land were delineated, which is 1.3% of the 300 m buffer corridor.

MEMORANDUM

TO: CHRIS TAYLOR, ZILKHA RENEWABLE ENERGY

FROM: RANDALL KRICHBAUM, EAGLE CAP CONSULTING INC.

SUBJECT: KITTITAS VALLEY PROJECT - SCHOBER PARCEL VEGETATION DISCUSSION

DATE: NOVEMBER 26, 2002

CC:

Introduction: In order to assist with mitigation planning for the Kittitas Valley Wind Power Project, the following discussion of habitat conditions within the portion of land known as the Schober Parcel has been prepared. This discussion concerns itself only with that part of the parcel lying north of the canal road, and takes in parts of Sections 22 and 27, Township 19N, Range 17E, Willamette Meridian. The parcel consists of portions of two broad-topped north-south trending ridges, with an unnamed creek and associated canyon running between them. Approximately 551 acres are contained within the Schober Parcel north of the canal road.

Cover Types Present: The updated cover type map for the Kittitas Valley Project includes the entire Schober parcel, and is on file at Zilkha's Portland Office. Within the parcel (north of the canal road), five different cover types have been mapped. The largest of these is the Shrub-Steppe type, with a total areal extent of 351 acres (or 64% of the parcel). These are areas dominated by tall shrubs, primarily bitterbrush (*Purshia tridentata*), containing an understory of native bunchgrasses (or in disturbed areas cheatgrass [*Bromus tectorum*]). The category was further broken down based on the relative spatial density of the shrub layer (Dense, Moderate, and Sparse sub-categories). Within the Schober Parcel, 278 acres (50% of the parcel) were categorized as Moderately Dense Shrub-Steppe, and 74 acres (13% of the parcel) were classed as Sparse Shrub-Steppe.

The majority of the remaining ground (189 acres or 34% of the parcel) was classed as Grassland habitat. This cover type includes a variety of plant associations, all dominated by grass species. In most cases these are bunchgrasses, such as Sandberg's bluegrass (*Poa secunda*) or bluebunch wheatgrass (*Pseudoroegnaria spicata*), but disturbed areas are sometimes dominated by cheatgrass or bulbous bluegrass (*Poa bulbosa*). The majority of the grassland habitat, is located on the westernmost ridgetop, and is likely the result of a recent fire that has removed most of the shrub component. The habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs.

Two cover types are exclusively associated with the unnamed creek that runs through the middle of the parcel. The largest of these is the Riparian Tree category which is present on approximately eight acres (1.5%) of the parcel. This cover type includes areas within riparian zones dominated by trees. Primarily this includes hydrophytic species such as cottonwoods

(*Populus balsamifera* ssp. *trichocarpa*), but scattered conifers are also present in some areas. In addition, one 2.8 acre area (0.5% of the parcel) above the creek was typed as Deciduous Shrub Thicket. This cover type describes upland areas dominated by deciduous shrubs. Typical shrub species for this cover type include chokecherry (*Prunus virginiana*), bittercherry (*Prunus emarginata*), oceanspray (*Holodiscus discolor*), common snowberry (*Symphoricarpos albus*), and serviceberry (*Amelanchier alnifolia*).

The final cover type within the parcel is the Open Water type, which was found on only 0.5 acres (0.1% of the parcel). This represents two small areas where an irrigation canal runs through the parcel.

Habitat Condition: In the habitat descriptions that follow, ratings of habitat quality are based on general observed patterns of plant species diversity, native versus non-native species ratios, and overall vegetative structure. The habitat ratings are qualitative only, based on general visual observations. Quantitative vegetative information was not collected. The following categories were used: 'Excellent' (high species diversity with negligible amounts of non-native weedy species, along with well developed native vegetative structure); 'Good' (moderate to high species diversity dominated by native plants, with significant inclusions of non-native species in certain areas, and fair to well-developed native vegetative structure); 'Fair' (moderate diversity with non-native species dominance or co-dominance in some or all layers, and fair native structure); and 'Poor' (low species diversity, dominated by non-native, weedy invaders in some or all layers, and poor native vegetative structure).

The eastern ridgetop contains primarily shrub-steppe habitat in fair to good condition (Photo 1). Native shrubs (primarily bitterbrush) and forbs dominate most of this area, with a mixture of native and non-native grasses. Areas along the jeep trails and canal road contain a higher percentage of non-native species. There are also several small inclusions of lithosol (shallow-soiled) habitat on this ridge (Photo 2). These are in good condition, dominated by native bunchgrasses (primarily Sandberg's bluegrass), as well as native forbs and low shrubs.

The western ridgetop, for most of the Schober portion, has recently burned. The habitat now consists of a mix of native and non-native grasses and forbs, with widely scattered small shrubs (Photo 3). Habitat quality is generally fair. Weedy species are more common in the deeper-soiled areas, and several populations of noxious weeds are present. Further up the ridgeline, there is an unburned portion that is similar in condition to the eastern ridgetop (*i.e.* fair to good condition dominated by native shrubs and forbs, and a mix of native and non-native grasses).

The creek bottom ranges in habitat quality along its length. The upper portions are in poor to fair condition, with little development of riparian vegetation (Photo 4). Non-native species are common in these upper portions, although native species still dominate in areas. The creek appears to be intermittent in this upper section. Lower down, the creek bottom is in fair to good condition. Riparian vegetation is better developed and the creek flows late into the summer (Photos 5 and 6). Riparian trees and shrubs are present along this lower reach, and in places are dense and well-developed.

Enhancement Options: Overall, the Schober Parcel is in fair to good condition. However, several opportunities for enhancement exist that would be expected to raise habitat quality further. Primary among these is management and control of cattle grazing within the entire parcel, and especially within the riparian zone. A grazing management plan could be developed that reduces or eliminates cattle pressure on the most sensitive portions, and allows for re-establishment of native vegetation in specific problem areas.

Although high concentrations of noxious weeds were not found within the parcel, scattered patches and individuals (primarily diffuse knapweed [*Centaurea diffusa*]) are present throughout. An overall noxious weed control effort for the parcel, perhaps incorporating a variety of techniques (chemical, mechanical, cultural, etc.), would likely be effective at reducing or eliminating noxious weeds from the site, increasing the habitat quality and effectiveness.

Finally, certain areas could benefit from active revegetation efforts. Specifically, shrub replanting of the burned area on the western ridgetop could hasten the re-establishment of vegetative structure in that area, and reduce non-native species encroachment. In addition, certain areas along the creek would benefit from riparian replanting designed to re-establish native species in certain problem areas.

Photo 1: Shrub-Steppe Habitat Along the Eastern Ridgetop

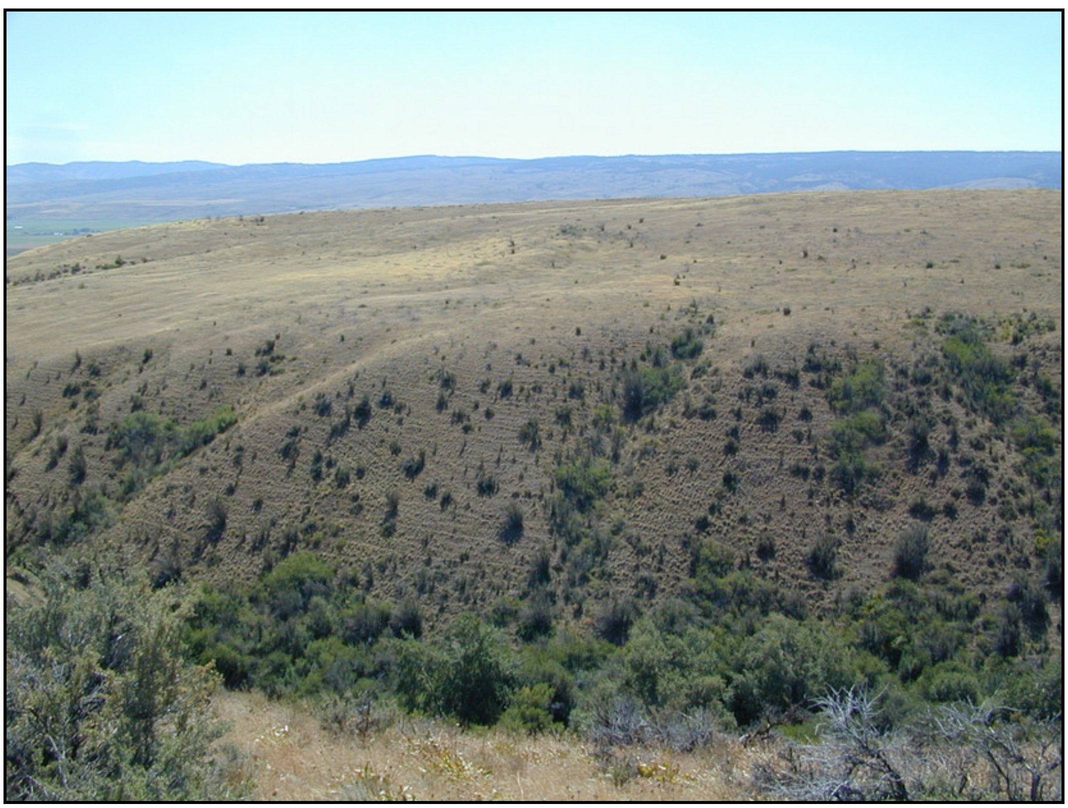
Photo 2: Lithosol Habitat Along the Eastern Ridgetop

Photo 3: Recently Burned Habitat Along the Western Ridgetop

Photo 4: Creek Bottom in Upper Portion of Parcel

Photo 5: Creek Bottom in Lower Portion of Parcel (Canal Road in Foreground)

Photo 6: Overview of Creek in Lower Portion of Parcel (Western Ridge in Background)



Wildlife Baseline Study for the Kittitas Valley Wind Project

Summary of Results from 2002 Wildlife Surveys

Final Report
February 2002– November 2002

January 2003

Prepared for:

Zilkha Renewable Energy
210 SW Morrison, Suite 310
Portland, OR 97204

Prepared by:

Wallace Erickson
Jay Jeffrey
David Young
Kimberly Bay
Rhett Good
Karyn Sernka

WEST, Inc.
2003 Central Avenue
Cheyenne, WY 82001

And

Karen Kronner
Northwest Wildlife Consultants, Inc.
815 NW 4th St.
Pendleton, OR 97801

EXECUTIVE SUMMARY

Zilkha Renewable Energy (Applicant) proposes to construct and operate 100 to 150 wind turbines in the Kittitas Valley northwest of Ellensburg, Washington. The Kittitas Valley Wind Power Project (the Project) is anticipated to provide up to 173 megawatts (MW) of generating capacity. It would be constructed on privately owned land and public land administered by the Washington Department of Natural Resources (WDNR). The project area is bisected by five Bonneville Power Administration (BPA) and one Puget Sound Energy (PSE) high-voltage transmission lines. A project substation, which would connect the project's output to the regional transmission grid, would be constructed near the center of the project site, adjacent to the BPA or PSE lines. The output of the project would be sold under contract to one or more regional utilities for transmission to regional electricity consumers.

The Applicant has contracted with CH2MHILL, Western Ecosystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. (NWC) to develop and implement a survey protocol for a baseline study of wildlife, habitat and plants in the project area. The protocol for the ecological baseline study is similar to protocols used at the Vansycle, Klondike, Stateline, Maiden, Condon and Nine Canyon wind projects in Oregon and Washington, the Buffalo Ridge wind project in southwest Minnesota, and the Foote Creek Rim wind project in Wyoming.

This report summarizes the results of the ecological baseline studies conducted from February 2002 through early November 2002. The wildlife portion of the ecological baseline study consists of 1) point count and in-transit surveys for wildlife species, 2) two aerial surveys within approximately two miles of the project boundary for visible raptor nests in the spring of 2002 and 3) nine driving transect surveys along Highway 10, Highway 97, Bettas Road, and Hayward Road to estimate the number of wintering bald eagles in the project vicinity. Rare plant surveys and habitat mapping were also conducted and has been summarized in a separate report (Eagle Cap and CH2M HILL 2002). Information on sensitive plant and wildlife species within the vicinity of the project was requested from the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Washington Natural Heritage Program (WNHP). The recent synthesis of baseline and operational monitoring studies at wind developments by Erickson *et al.* (2002), as well as other relevant information has been reviewed and will be utilized for predicting impacts from the Kittitas Valley Project. A general wildlife review was conducted by NWC during the fall of 2001. Agency personnel and local bird specialists were contacted at that time for readily available information on wildlife of the general project area.

A total of 97 species were identified during the point count, in-transit, and/or bald eagle surveys at the Project. The mean number of species observed per survey (20-minute point count) was 3.63 with an average of 12.05 bird observations per survey. Higher overall avian-use occurred in the spring (15.14/survey) and fall (12.20/survey) compared with the summer (9.16/survey). The higher use in spring was primarily due to observations of relatively large flocks of birds (e.g., 520 American pipits, 141 Canada geese).

Passerines were the most abundant avian group observed in all seasons. The majority of bird observations were of American pipits (due primarily to one large flock observed), American robins, horned larks, and western meadowlarks. The next most abundant avian group varied by season, with corvids higher in spring and fall, and raptors more prevalent in summer. The most common raptor species observed were red-tailed hawks and American kestrels. Canada geese were observed primarily during spring, and common ravens were observed throughout the study period.

Compared to results of studies at other wind developments including Buffalo Ridge (MN), Foote Creek Rim (WY), Klondike (OR), Nine Canyon (WA), Zintel Canyon (WA), Stateline (OR/WA), and Vansycle (OR), the Kittitas Valley Project site had relatively high spring and summer raptor use and moderate fall raptor use. The higher use is primarily due to the presence of American kestrels and red-tailed hawks, two very common raptor species. Higher red-tailed hawk use is partly due to two nests located within 0.25 mile of two avian point count stations. In general, raptor mortality has been low at all new wind projects. Only one raptor fatality was recorded during a four-year study at the Buffalo Ridge wind project (~ 450 turbines). Five raptor fatalities were recorded over a three-year study at the Foote Creek Rim Phase I wind project (69 turbines), where there is much higher average raptor use as compared to most other sites (especially by golden eagles; Young *et al.* 2002). No raptor fatalities have been observed at the Vansycle wind project in Umatilla County, Oregon during a one-year study, or at the Klondike wind project in Sherman County, Oregon based on five months of surveys, respectively (Erickson *et al.* 2002).

Flight height characteristics were estimated for avian species and groups. Percentages of observations below, within, and above the rotor swept area (RSA) of 25 to 100 m above ground level were reported. Overall, 27.9% of the birds observed were recorded within the defined RSA, 64.9% were below the RSA and 7.1% were flying above the RSA (Table 8). Species commonly observed were often flying within the RSA, for example, 98.2% of 112 flying cedar waxwings, 85.7% of 14 common nighthawks, 79.2% of 322 American robins, 58.8% of 34 barn swallows, and 57.1% of 14 American goldfinches. However, other commonly observed species such as horned larks (8.1%) and western meadowlarks (4.3%), were not often observed within the RSA. Gray-crowned rosy finches, long-billed curlew, Townsend's solitaire, and unidentified swallow and accipiter were always observed within the RSA based upon one bird observation for each species (except for gray-crowned rosy finches which was one group of five individuals).

A relative exposure index (avian-use multiplied by proportion of observations within the RSA) was calculated for each species. This index is only based on flight height observations and relative abundance and does not account for other possible collision risk factors such as foraging or courtship behavior. American robins, cedar waxwings, and American pipits were the top three small bird species with a significant turbine exposure index. Larger bird species with the highest exposure index were common raven, red-tailed hawk and American kestrel. Mortality studies at other wind projects have indicated that although ravens are often observed at wind projects within the zone of risk, they appear to be less susceptible to collision with wind turbines than other similar size birds (e.g., raptors, waterfowl). Red-tailed hawks and American kestrels have been the most common species of the raptor fatalities at older wind projects in California, and a few fatalities of these two species have been observed at new wind projects (one red-tailed hawk at Buffalo Ridge, MN, and three American kestrels at Foote Creek Rim, WY). One common nighthawk fatality was observed at Foote Creek Rim (WY), but apparently no other common nighthawk fatalities have been observed at other U.S. wind projects.

Aerial raptor nest surveys were conducted within approximately two miles of proposed turbine locations. The search area encompassed approximately 70 square miles. The survey was conducted via helicopter by searching suitable habitat for nests, such as stands of trees, shrubs, rocky areas, cliffs, and powerlines. A total of six red-tailed hawk nests and nine inactive raptor nests were found during surveys. Five of the six red-tailed hawk nests produced a total of 9 young for an average of 1.5 young per nest. One previously active red-tailed hawk nest was not found during the second visit. The nest may have been blown out of the tree during a high wind event. Of the 15 nests found during surveys, six were in mature cottonwoods, six were in coniferous trees, one was in a shrub, one was located on a powerline pole, and one was on a cliff. Much of the raptor nest survey area was dominated by coniferous forest. Due to the presence of foliage and interlocking crowns of coniferous forests, detection of raptor nests in many areas was difficult from the helicopter. Based on the current project layout, two of the six nests are within 0.25 mile of a proposed turbine string. One nest is between 0.25 and 0.5 mile of a proposed turbine string, and the other three nests are greater than one mile from proposed turbine strings.

Driving transects to evaluate the numbers of wintering bald eagles and their movements in the project area were initiated in mid-February 2002, and continued through mid-April. The surveys involved driving and counting bald eagles along Highway 10 (paralleling the Yakima River), Bettas Road, Hayward Road and Highway 97. A review of data suggests that 6 to 10 eagles were consistently observed along the survey routes during February and late March, with more observed to the south of the project area (along the Yakima River, and along the southern portion of Highway 97). The number of eagles observed dropped off significantly in late March (after the March 21 survey). There is a cattle pasture and calving area to the southeast of the project site along Smithson road where 2 to 3 eagles were commonly observed during the peak period. Bald eagles were only occasionally sited in the immediate project area, and no night roosting sites were identified in the project area. Overall, bald eagle use in the winter was relatively high at this site compared to other sites; and bald eagles in the vicinity of the project area were found primarily along the Yakima River.

The most probable impact to birds resulting from the project is direct mortality or injury due to collisions with the turbines or guy wires of temporary or permanent meteorological towers. Fatality projections based on the results of studies conducted at the modern 38 turbine Vansycle wind project in Umatilla County, Oregon (Erickson *et al.* 2000), the modern 69 turbine Foote Creek Rim Phase I wind project (Young *et al.* 2002), and the modern 400+ turbine Buffalo Ridge wind project in southwestern Minnesota (Johnson *et al.* 2000a, Johnson *et al.* 2002), indicate a range of 0.6 to 2.8 bird fatalities per turbine per year. Overall raptor mortality for this project is expected to be slightly higher than the Foote Creek Rim wind project, considering the moderate to high raptor use at the Project relative to the Foote Creek Rim project.

Portions of the proposed wind plant are within habitats designated by WDFW as winter range for mule deer and elk, although the human development that has occurred in the project area has likely reduced the quality of the winter range. There is little information regarding wind project effects on big game. The elk and mule deer on site primarily occupy the grassland/shrub-steppe habitats, springs, and riparian corridors. During the construction period, it is expected that elk and mule deer will be displaced from the site due to the influx of humans and heavy construction equipment and associated disturbance. Construction related disturbance and displacement is expected to be temporary for the duration of the construction period. Most construction will take place during the summer months, minimizing construction disturbance to wintering big game. Following completion of the wind project, the disturbance levels from construction equipment and humans will diminish and the primary disturbances will be associated with operations and maintenance personnel, occasionally vehicular traffic, and the presence of the turbines and other facilities. If warranted due to winter weather conditions and the presence of substantial numbers of elk and mule deer in the project area, construction will take not take place during critical winter periods to minimize disturbance to wintering big game.

PARTICIPANTS

Name	Firm	Responsibilities
Kimberly Bay	WEST Inc.	Data Technician
Wallace Erickson	WEST Inc.	Project Manager, Statistician
Rhett Good	WEST Inc.	Field Biologist, GIS Technician
Bob Gritski	Northwest Wildlife Consultants Inc.	Field Biologist
Jay Jeffrey	WEST Inc.	Project Biologist, Field Supervisor
Karen Kronner	Northwest Wildlife Consultants Inc.	Reviewer and assisted with study protocol
Laurie Ness	Northwest Wildlife Consultants Inc.	Field Biologist
Karyn Sernka	WEST Inc.	Reviewer
David Young, Jr.	WEST Inc.	Project Biologist

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION AND BACKGROUND

Zilkha Renewable Energy (the Applicant) proposes to construct and operate approximately 120 wind turbines in the Kittitas Valley northwest of Ellensburg, Washington (Figure 1). The Kittitas Valley Wind Power Project (the Project) is anticipated to provide up to 173 megawatts (MW) of capacity. It would be constructed on privately owned land, and public land administered by the Washington Department of Natural Resources (WDNR). The Applicant has contracted with CH2MHILL, Western Ecosystems Technology, Inc. (WEST), and Northwest Wildlife Consultants, Inc. to develop and implement a survey protocol for a baseline study of wildlife use of the project area. The protocol for the baseline study is similar to protocols used at the Vansycle, Klondike, Stateline, Maiden, Condon and Nine Canyon wind projects in Oregon and Washington, the Buffalo Ridge wind project in southwest Minnesota, and the Foote Creek Rim wind project in Wyoming.

This report summarizes the results of the ecological baseline studies conducted from February 2002 through early November 2002. The wildlife portion of the baseline studies consists of 1) point count and in-transit surveys for wildlife species with an emphasis on birds and big game, 2) two aerial surveys within approximately two miles of the project boundary for raptor nests in the spring of 2002 and 3) nine driving transect surveys along Highway 10, Highway 97, Bettas Road, and Hayward Road to estimate the number of wintering bald eagles in the project vicinity. Rare plant surveys and habitat mapping were also conducted and has been summarized in a separate report (Eagle Cap Consulting 2002). Information on sensitive plant and wildlife species within the vicinity of the project was requested from the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Washington Natural Heritage Program (WNHP). The expected impacts of the project on wildlife are discussed. The recent synthesis of baseline and operational monitoring studies at wind developments by Erickson *et al.* (2002), as well as other relevant information was utilized for predicting avian impacts from the Project.

PROJECT DESCRIPTION

The proposed Project would consist of the installation, operation, and eventual decommissioning of approximately 120 wind turbines and supporting facilities. The project is anticipated to produce up to approximately 173 MW of electricity. The power would be sold to one or more regional utilities for transmission to regional consumers. The wind turbines proposed for the Project will have a capacity of 1.5 MW each and will be connected to adjacent turbines by a 34.5-kilovolt (kV) underground collector system. The turbines will be mounted on 50-75 m tubular towers, for a total height of approximately 100 m to the tip of the blade. The concrete tower foundations would be approximately 5-15 m square, and extend 6-15 m deep. Wind turbines would be grouped in turbine “strings” of about 4 to 32 turbines generally near the crest of the ridges. Turbines will be spaced approximately 90 to 150 m (300 to 500 ft) from the next or 1.5-2 times the diameter of the turbine rotor.

The electrical output of each turbine string would be connected to the project substation by a combination of overhead and underground 34.5-kV transmission lines. The substation would be connected to the BPA and/or PSE transmission lines that are located adjacent to the substation site. The project would be monitored and controlled from an operations and maintenance (O&M) building located adjacent to the substation (Figure 1). Existing roads would be improved, and some new graveled roads constructed to provide access to the wind turbine locations during construction and for O&M. Wind speeds will be monitored using 9 permanent metrological (met) towers.

Total acres of impacted habitat will be relatively small. Approximately 77.2 acres will be permanently disturbed (occupied by roads, turbines and other infrastructure) and approximately 301.7 acres temporarily disturbed during construction. Approximately 12 miles of new roads and driveway will be constructed, and approximately 10.4 miles of existing roads graveled and widened to 20-30 ft.

STUDY AREA DESCRIPTION

The Project is located in Kittitas County, Washington, approximately 14 kilometers (km) southeast of the town of Cle Elum, and 20 km northwest of the town of Ellensburg. The Yakima River flows in a southeasterly direction to the south of the Project. US Highway 97 runs north-south through the middle of the project area, and State Highway 10 and Interstate 90 parallel the Yakima River to the south. The project is located in the following sections: Township 19N, Range 17E, sections 1-3, 7, 9-16, 21-23, and 27, and Township 20N, Range 17E, section 34 (Figure 1).

The Project is located at the western edge of the Columbia Basin physiographic province at the eastern base of the Cascade Mountain range (Franklin and Dyrness 1988). The Columbia Basin province is surrounded on all sides by mountain ranges and highlands, and covers a large portion of eastern Washington, and extends south into Oregon.

The Project extends over an approximately six by nine kilometer (3.7 by 5.6 mile) block of land, which consists primarily of long north-south trending ridges. Between the ridges are ephemeral drainages of Dry Creek and associated tributaries that flow into the Yakima River to the south. Slopes within the project area generally range from 5^{B} to 20^{B}, but can reach 40^{B} in the canyons. Elevations in the project area ranges from approximately 670 m (2200 ft) above mean sea level along Highway 97, to approximately 960 m (3150 ft) near the northern most turbine string (see Figure 1).

A detailed survey for rare plants and habitat was conducted in April – August 2002. Additional results and discussions of vegetation of the project are included in Eagle Cap and CH2MHILL (2002). The project area is near the western edge of the big sagebrush/bluebunch wheatgrass zone as defined by Franklin and Dyrness (1988). In addition to big sagebrush (*Artemisia tridentata*), a number of other shrub species may be present in the zone including: rabbitbrushes

(*Chrysothamnus* spp. and *Ericameria* spp.), threetip sagebrush (*Artemisia tripartita*), and spiny hopsage (*Grayia spinosa*). The bluebunch wheatgrass is supplemented by variable amounts of grasses and forbs such as needle-and-thread grass (*Hesperostipa comata*), Thurber's needlegrass (*Achnatherum thurberianum*), Cusick's bludegrass (*Poa cusickii*), bottlebrush (*Elymus elymoides*), Sandberg's bluegrass (*Poa secunda*), cheatgrass (*Bromus tectorum)*, and flatspine stickseed (Lappula occidentalis).

Within the project area, many of the plant communities have been impacted and modified due to numerous factors, such as cattle grazing, introduction of exotic plant species, ground disturbance from development activities, past fires, transmission lines, roads and highways, and housing/farms. Much of the riparian areas are degraded from heavy cattle use, and riparian vegetation has been removed.

The majority of lands within the project area are privately owned, although several parcels are owned and administered by the State of Washington Department of Natural Resources (DNR). Livestock production (cattle grazing) is the primary land use, although some rural homesite development has also taken place. The area is also used, on a much more limited basis, for recreational activities such as hunting. A high-voltage transmission line corridor crosses on a roughly east-west line through the middle of the project area. This corridor contains four steel-tower 230 kV electrical transmission lines. Additionally, there is a wood-pole 230kV transmission line that roughly parallels the four-line corridor, and a steel-tower 345 kV line running through the northern portion of the project area.

AGENCY/LOCAL AUDUBON CONSULTATION

Consultation with local, regional and central office personnel of WDFW was initiated in early 2002 for the proposed project. A study protocol was provided to WDFW and the Kittitas Audubon Society in February 2002. Representatives of the Applicant, project consultants, and WDFW met in Yakima on February 27, 2002 to discuss the project and protocol. Representatives of the Applicant and project consultants also met with Kittitas Audubon Society on February 26, 2002 to introduce the proposed project and again after the spring surveys were completed to discuss the results of those surveys. Information on sensitive plant and wildlife species within the vicinity of the project was requested and received from the U.S. Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW), and the Washington Natural Heritage Program (WNHP).

METHODS

Diurnal Fixed-point and In-Transit Avian Use Surveys

The goal of the avian use surveys was to estimate the temporal and spatial use of the study area by birds. The avian use surveys combined observations collected at eleven fixed-point circular plots in the study area with in-transit observations of birds made while driving to and from the study area. All wildlife species of concern and unusual species observed were recorded while the observers were in the study area traveling between observation points and while conducting other field activities. Two experienced wildlife and avian biologists, Jay Jeffrey of WEST Inc., and Laurie Ness of Northwest Wildlife Consultants Inc., conducted the avian surveys.

Fixed-point Surveys
Each plot consists of an 800-m radius circle centered on an observation point location (Figure 2). Landmarks were located to aid in identifying the 800 m boundary of each observation point. Observations of birds beyond the 800 m radius were recorded, but may be analyzed separately from observations made within the plot, if warranted.

All detections of birds, mammals, reptiles, and amphibians in and near plots during the 20-minute plot surveys were recorded. Visual and binocular scanning of the entire plot viewshed and beyond were continuously performed throughout the survey period. A unique observation number was assigned to each sighting. The following data were recorded for each plot survey: date, start and end time of observation period, plot number, species or best possible identification, number of individuals, sex and age class when known, distance from plot center when first observed, closest distance, altitude above ground (first, low and high), flight direction, behavior(s), habitat(s), whether observed during one or more of the three instantaneous counts, and in which of the two ten minute periods it was observed. Flight paths were mapped for raptors and species of concern and given corresponding observation numbers. The map indicates whether the bird was within or outside the survey radius based on reference points at known distances from the plot center. Flight paths were digitized using ARCVIEW 3.2. Climate information, such as temperature, wind speed, wind direction, precipitation and cloud cover were also recorded for each point count survey.

Behavior categories recognized included perched (PE), soaring (SO), flapping (FL), flushed (FH), circle soaring (CS), hunting (HU), gliding (GL), and other (OT). Habitats were recorded as grassland-steppe (GS), coniferous forest (CF), riparian (RI), shrub-steppe (SS), deciduous forest (DS), Rock (RO), and other (OT). Initial flight patterns and habitats were identified with ”1” in the data sheet and subsequent patterns and habitats (if any) recorded as an "x" or check mark. Any comments or unusual observations were recorded in the comment section of the data form.

Incidental/In-transit Observations
All wildlife species of concern and uncommon species observed while field observers were traveling between plots were recorded on incidental/in-transit data sheets. Other incidental observations made during other surveys or visits to the sites were also recorded. These observations were recorded in a similar fashion to those recorded during the plot studies. The observation number, date, time, species, number, sex/age class, height above ground, and habitat were recorded. Observations of species of concern and uncommon species were recorded in additional detail, mapped on a USGS quadrangle map by observation number, and digitized using ARCVIEW 3.2.

Observation Schedule

Surveys were conducted weekly at intervals designed to include approximately all daylight hours. During a set of surveys, each selected plot was visited once. A pre-established schedule was developed prior to field work to ensure that each station was surveyed about the same number of times each period of the day, during each season, and to most efficiently utilize personnel time. The schedule was altered in response to adverse weather conditions or farming operations, which required delays and/or rescheduling of observations.

Statistical Analysis

Avian Use

Species lists were generated by season including all observations of birds detected regardless of their distance from the observer. The number of birds seen during each point count survey was standardized to a unit area and unit time surveyed. The standardized unit time was 20 minutes and the standardized unit area was 2.01 km^2 (800 m radius viewshed for each station). For example, if four raptors were seen during the 20 minutes at a point with a viewing area of 2.01 km^2, these data may be standardized to 4/2.01 = 1.98 raptors/km^2 in a 20-minute survey. For the standardized avian use estimates, only observations of birds detected within 800 m of the observer were used. Estimates of avian use (expressed in terms of number of birds/plot/20-minute survey) were used to compare differences in avian use between 1) avian groups and 2) seasons.

Avian Diversity and Richness

The total number of unique species was calculated by season. The mean number of species observed per survey (i.e., per station per 20-minute survey) was tabulated to illustrate and compare differences in mean number of species per survey between seasons.

Avian Flight Height/Behavior

The first flight height recorded was used to estimate percentages of birds flying below, within and above the rotor swept area (RSA). The zone of collision risk was estimated at 25-100 m above ground level (AGL) which is the combination of proposed tower heights with 50 m diameter rotors.

Avian Exposure Index

A relative index to collision exposure (R) was calculated for bird species observed during the fixed-point surveys using the following formula:

$$R = A*P_f*P_t$$

Where A = mean relative use for species *i* (observations within 800 m of observer) averaged across all surveys, P_f = proportion of all observations of species *i* where activity was recorded as flying (an index to the approximate percentage of time species *i* spends flying during the daylight period), and P_t = proportion of all flight height observations of species *i* within the rotor-swept area (RSA). This index does not account for differences in behavior other than flight characteristics (i.e., flight heights and percent of birds observed flying).

Avian Flight Patterns and Behavior
Maps of flight paths of raptors and other species of concern were generated and reported to illustrate patterns in flight paths and behaviors.

Data Compilation and Storage
A Microsoft® ACCESS database was developed to store, organize and retrieve field observation data. Data from field forms were keyed into electronic data files using a pre-defined format to facilitate subsequent QA/QC and data analysis. All field data forms, field notebooks, and electronic data files were retained for reference.

Quality Assurance/Quality Control (QA/QC)
QA/QC measures were implemented at all stages of the study, field surveys, data entry, and during data analysis and report writing. At the end of each survey day, each observer was responsible for inspecting his or her data forms for completeness, accuracy, and legibility. Periodically data forms were reviewed to ensure completeness and legibility; any problems detected were corrected. Any changes made to the data forms were initialed and dated by the individual making the change.

A sample of records from the electronic files was compared to the raw data forms and any errors found were corrected. Any irregular codes detected, or any data suspected as questionable, was discussed with the observer and study team leader. All changes made to the raw data were documented for future reference. Any errors or suspect data identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps made.

Raptor Nest Surveys

Raptor nest surveys were conducted within approximately two miles of the proposed turbine locations (Figure 2). The search area encompassed approximately 70 square miles which is the Project area plus the two-mile radius buffer, referred to as the raptor nest study area (RNA). The survey was conducted via a helicopter by searching suitable habitat for nests, such as stands of trees, shrubs, rocky areas, cliffs, and powerlines. If a nest was observed the helicopter was moved to a position where nest occupancy and species could be determined. Efforts were made to minimize disturbance to breeding raptors, including keeping the helicopter a maximum distance from the nest to identify species. Those distances varied depending upon nest location and wind conditions. No nesting raptors were flushed from their nests during the aerial surveys.

Two surveys of the RNA were conducted. The purpose of the initial survey, conducted between May 5 and 8, 2002 was to document the location of all raptor nest structures and to determine nest occupancy. A total of approximately 908 linear miles was covered from the air during the initial visit.

A second survey was conducted on June 5, 2002 to determine productivity of nests occupied during the initial survey. Inactive nests found during the initial survey were also revisited to determine if late nesting species (e.g. Swainson's hawks) occupied nests that were empty during the initial visit. Approximately 54 linear air miles were covered during the second visit.

Wintering Bald Eagle Surveys

Driving transects to evaluate the numbers of wintering bald eagles and their movements in the project area were initiated in mid-February, 2002. Surveys involved driving and counting bald eagles along four different routes (see below and Figure 3). Surveyors drove a pre-determined survey route at weekly intervals. A total of 9 surveys were conducted between February 15 and April 11, 2002. The one-way distance for all survey routes combined is approximately 35 miles. Most routes were surveyed twice on any given survey day (e.g., starting in the east to west direction, and returning on the west-east direction).

Route 1: From the junction of Highway 97 and Highway 10 along 97 North to the intersection with Bettas Road. Also includes approximately 2.5 miles of Smithson road. Total distance (one-way) is approximately 11 miles.

Route 2: North on Highway 97 from Bettas Road to Northern Bettas Road Junction including all of Bettas Road and south on Hayward Road. Total distance (one-way) is approximately 10 miles.

Route 3: Junction of Hayward Road and Highway 10, west on Highway 10 to Junction with Hart Road. Total distance (one-way) is approximately 7.4 miles.

Route 4: Junction of Highway 97 and Highway 10 west on Highway 10 to Hayward Road. Total distance (one-way) is approximately 6.7 miles.

Depending on the traffic and safe pull-off availability, the surveyor looked for eagles within the viewshed from the road. During periodic stops, the surveyor scanned areas of large cottonwoods and conifer trees with binoculars to look for perched eagles. A spotting scope was used if closer views were required to confirm identifications or if a potential roost tree grove was identified in the distance. Between stops, the observer drove at a slow speed of approximately 25 mph (40 kph), where appropriate. Surveys were conducted in the morning and evening hours, alternating each week. If bald eagles or other species of interest (e.g., raptors, elk) were sighted, they were assigned an observation number and mapped on USGS 7.5' quadrangle maps. Habitat, activity, and time of day were also recorded for each observation. Flight paths of bald eagles were mapped for as long as the bird was visible. Perch sites and evening roost sites were recorded on the topo maps. The direction of the route followed (forward or reverse), total time spent and distance driven was recorded for each survey route.

RESULTS

Field work (all survey types) on the Project occurred from February 15 through November 1, 2002. A total of 97 avian species were identified during the bald eagle surveys, point counts, in-transit travel, and incidentally while conducting other field tasks at the Project (Table 1).

Fixed-Point Avian Use Surveys

Fixed-point surveys were conducted weekly from March 21 through November 1, 2002 at the Project. A total of 279 20-minute point count surveys were conducted on the Project (Table 2).

Avian Diversity
A total of 90 species were observed during the fixed-point surveys at the Project site. The mean number of species observed per survey (20-minute point count) was 3.63 (Figure 3). The mean number of species was highest in the spring and summer, and lowest during the fall (Figures 3 and 4). The passerine diversity was high for the Project, likely due to the high diversity of habitats in the project area.

Avian Use by Species
A total of 3,600 individual bird detections within 1,210 separate groups were recorded from during the fixed-point surveys (Table 3). Cumulatively, four passerines, American pipits, American robins, horned larks, and western meadowlarks, comprised approximately 47% of the observations. All other species comprised less than 5% of the observations individually.

Mean avian-use estimates (number of birds/20-minute survey using detections within 800 m of each point) were calculated by species and season, and grouped by bird size due to differences in the detectability of small and large birds (Table 4). During the **spring**, large birds with the highest use were common raven (0.72), black-billed magpie (0.30), red-tailed hawk (0.26), American kestrel (0.22), and Canada goose (0.15). Small bird species with the highest spring use were American pipit (6.10), yellow-rumped warbler (1.11), horned lark (0.95), western meadowlark (0.91), and American robin (0.72) (Table 4). During the **summer**, large bird species with the highest use were American kestrel (0.45), red-tailed hawk (0.37), turkey vulture (0.17), common nighthawk (0.15), and common raven (0.11). Small bird species with the highest summer use were horned lark (1.61), western meadowlark (1.47), vesper sparrow (0.86), Brewer's blackbird (0.57), and barn swallow (0.35) (Table 4). During the **fall**, large birds with the highest use (Table 4) were common raven (0.47), red-tailed hawk (0.32), black-billed magpie (0.23), northern harrier (0.17), and rough-legged hawk (0.8). Small bird species with the highest fall use were American robin (3.08), horned lark (2.15), cedar waxwing (1.11), mountain bluebird (0.59), and American pipit (0.58) (Table 4).

text continued on page 17

Table 1. List of avian species observed during fixed-point, in-transit and bald eagle surveys on the Kittitas Valley Project site.

Species/Group	Scientific Name	Species/Group	Scientific Name	Species/Group	Scientific Name
blue-winged teal	*Anas discors*	black-headed grosbeak	*Pheucticus melanocephalus*	Townsend's solitaire	*Myadestes townsendi*
Canada goose	*Branta canadensis*	Brewer's blackbird	*Euphagus cyanocephalus*	Townsend's warbler	*Dendroica townsendi*
greater white-fronted goose	*Anser Albifrons*	Brewer's sparrow	*Spizella breweri*	Vaux's swift	*Chaetura vauxi*
Mallard	*Anas platyrhynchos*	brown-headed cowbird	*Molothrus ater*	vesper sparrow	*Pooecetes gramineus*
great blue heron	*Ardea herodias*	Bullock's oriole	*Icterus bullockii*	violet-green swallow	*Tachycineta thalassina*
herring gull	*Larus argentatus*	Cassin's finch	*Carpodacus purpureus*	warbling vireo	*Vireo gilvus*
common snipe	*Gallinago Gallinago*	cedar waxwing	*Bombycilla cedrorum*	western kingbird	*Tyrannus verticalis*
greater yellowlegs	*Tringa melanoleuca*	chipping sparrow	*Spizella passerina*	western meadowlark	*Sturnella neglecta*
Killdeer	*Charadrius vociferus*	cliff swallow	*Petrochelidon pyrrhonota*	western tanager	*Piranga ludoviciana*
long-billed curlew	*Numenius americanus*	dark-eyed junco	*Junco hyemalis*	western wood-pewee	*Contopus virens*
spotted sandpiper	*Actitis macularia*	eastern kingbird	*Tyrannus tyrannus*	white-crowned nuthatch	*Sitta carolinenis*
Wilson's phalarope	*Phalaropus tricolor*	European starling	*Sturnus vulgaris*	white-crowned sparrow	*Zonotrichia leucophrys*
American kestrel	*Falco sparverius*	golden-crowned kinglet	*Regulus satrapa*	yellow-headed blackbird	*Xanthocephalus xanthocephalus*
bald eagle	*Haliaeetus leucocephalus*	golden-crowned sparrow	*Zonotrichia atricapilla*	yellow-rumped warbler	*Dendroica coronata*
Cooper's hawk	*Accipiter cooperii*	gray-crowned rosy finch	*Leucosticte arctoa*	common nighthawk	*Chordeiles minor*
Golden eagle	*Aquila chrysaetos*	horned lark	*Eremophila alpestris*	downy woodpecker	*Picoides pubescens*
great-horned owl	*Bubo virginianus*	house finch	*Carpodacus mexicanus*	Lewis's woodpecker	*Melanerpes lewis*
Gyrfalcon	*Falco rusticolus*	lazuli bunting	*Passerina amoena*	northern flicker	*Colaptes auratus*
Merlin	*Falco columbarius*	Lincoln's sparrow	*Melospiza lincolnii*	Rufous hummingbird	*Selasphorus rufus*
northern goshawk	*Accipiter gentilis*	loggerhead shrike	*Lanius ludovicianus*	blue grouse	*Dendragapus obscurus*
northern harrier	*Circus cyaneus*	Macgillivray's warbler	*Oporornis tolmiei*	California quail	*Callipepla californica*
Osprey	*Pandion haliaetus*	mountain bluebird	*Sialia currucoides*	gray partridge	*Perdix perdix*
Prairie falcon	*Falco mexicanus*	mountain chickadee	*Poecile gambeli*	ruffed grouse	*Bonasa umbellus*
red-tailed hawk	*Buteo jamaicensis*	northern shrike	*Lanius excubitor*	mourning dove	*Zenaida macroura*
rough-legged hawk	*Buteo lagopus*	orange-crowned warbler	*Vermivora celata*		
sharp-shinned hawk	*Accipter striatus*	pine grosbeak	*Pinicola enucleator*		
Turkey vulture	*Cathartes aura*	purple finch	*Carpodacus purpureus*		
black-billed magpie	*Pica pica*	red crossbill	*Loxia curvirostra*	unidentified duck	
common raven	*Corvus corax*	red-breasted nuthatch	*Sitta canadensis*	unidentified accipiter	
Steller's jay	*Cyanocitta stelleri*	red-winged blackbird	*Agelaius phoeniceus*	unidentified buteo	
American goldfinch	*Carduelis tristis*	ruby-crowned kinglet	*Regulus calendula*	unidentified eagle	
American green-winged teal	*Anas crecca*	sage thrasher	*Oreoscoptes montanus*	unidentified falcon	
American pipit	*Anthus rubescens*	savannah sparrow	*Passerculus sandwichensis*	unidentified finch	
American redstart	*Setophaga ruticilla*	Say's phoebe	*Sayornis saya*	unidentified flycatcher	
American robin	*Turdus migratorius*	song sparrow	*Melospiza melodia*	unidentified passerine	
barn swallow	*Hirundo rustica*	spotted towhee	*Pipilo maculatus*	unidentified swallow	
black-capped chickadee	*Poecile atricapillus*			unidentified bluebird	

Table 2. Mean use, mean # species/survey, total number of species, and total number of fixed-point surveys conducted by season and overall for the Project site.

Season	Number of Visits	Mean Use[a]	# Species/ Survey[b]	# Species	# Surveys Conducted
Spring	8	15.14	3.84	56	85
Summer	9	9.16	4.39	56	98
Fall	9	12.20	2.70	48	96
Overall	26	12.05	3.63	90	279

[a] # observations per 20-minute survey
[b] % of 20-minute surveys species/group is recorded

Table 3. Avian species observed while conducting fixed-point surveys (March 21, 2002 – November 1, 2002) on the Project Site. [a]

Species/Group	Spring # obs.	Spring # groups	Summer # obs.	Summer # groups	Fall # obs.	Fall # groups	Grand Total # obs.	Grand Total # groups
Waterfowl								
blue-winged teal	0	0	3	1	0	0	3	1
Canada goose	141	4	1	1	0	0	142	5
Mallard	24	4	5	2	0	0	29	6
unidentified duck	0	0	0	0	7	1	7	1
Subtotal	165	8	9	4	7	1	181	13
Waterbird								
herring gull	2	1	0	0	0	0	2	1
Shorebirds								
common snipe	1	1	0	0	0	0	1	1
greater yellowlegs	1	1	0	0	0	0	1	1
Killdeer	5	4	6	3	4	2	15	9
long-billed curlew	1	1	0	0	0	0	1	1
Wilson's phalarope	0	0	1	1	0	0	1	1
Subtotal	8	7	7	4	4	2	19	13
Corvids								
black-billed magpie	26	12	8	7	23	18	57	37
common raven	65	35	11	10	46	25	122	70
Steller’s jay	2	2	2	1	8	6	12	9
Subtotal	93	49	21	18	77	49	191	116
Upland Gamebirds								
blue grouse	3	3	0	0	4	1	7	4
California quail	7	2	2	1	4	2	13	5
ruffed grouse	0	0	1	1	0	0	1	1
Subtotal	10	5	3	2	8	3	21	10
Doves								
mourning dove	1	1	4	3	3	3	8	7

[a] Includes all observations, including those recorded at distances greater than 800 m from the observer.

Table 3 (*continued*).

Species/Group	Spring # obs.	Spring # groups	Summer # obs.	Summer # groups	Fall # obs.	Fall # groups	Grand Total # obs.	Grand Total # groups
Raptors								
Accipiter								
Cooper's hawk	4	4	0	0	3	3	7	7
northern goshawk	0	0	0	0	2	2	2	2
sharp-shinned hawk	5	5	1	1	4	4	10	10
unidentified accipiter	1	1	0	0	1	1	2	2
Subtotal	10	10	1	1	10	10	21	21
Buteos								
red-tailed hawk	23	22	41	38	32	32	96	92
rough-legged hawk	9	9	0	0	7	7	16	16
unidentified buteo	1	1	1	1	1	1	3	3
Subtotal	33	32	42	39	40	40	115	111
Eagles								
bald eagle	7	7	0	0	0	0	7	7
golden eagle	4	4	2	2	1	1	7	7
unidentified eagle	1	1	1	1	0	0	2	2
Subtotal	12	12	3	3	1	1	16	16
Falcons								
American kestrel	21	20	44	43	6	5	71	68
merlin	2	2	0	0	0	0	2	2
prairie falcon	5	5	0	0	0	0	5	5
unidentified falcon	1	1	0	0	0	0	1	1
Subtotal	29	28	44	43	6	5	79	76
Other Raptors								
great-horned owl	0	0	0	0	1	1	1	1
northern harrier	1	1	0	0	17	17	18	18
osprey	1	1	0	0	0	0	1	1
turkey vulture	7	7	18	18	1	1	26	26
Subtotal	9	9	18	18	19	19	46	46
Raptor Subtotal	93	91	108	104	76	75	277	270
Passerines								
American goldfinch	0	0	0	0	16	5	16	5
American pipit	537	2	0	0	57	1	594	3
American redstart	0	0	1	1	0	0	1	1
American robin	63	11	25	15	305	15	393	41
barn swallow	0	0	35	5	5	2	40	7
black-capped chickadee	1	1	1	1	11	4	13	6
black-headed grosbeak	0	0	1	1	0	0	1	1
Brewer's blackbird	41	6	55	13	0	0	96	19
Brewer's sparrow	0	0	2	1	2	1	4	2

[a] Includes all observations, including those recorded at distances greater than 800 m from the observer.

Table 3 (*continued*).

Species/Group	Spring # obs.	Spring # groups	Summer # obs.	Summer # groups	Fall # obs.	Fall # groups	Grand Total # obs.	Grand Total # groups
Passerines (*continued*)								
brown-headed cowbird	0	0	18	7	0	0	18	7
Bullock's oriole	0	0	2	2	0	0	2	2
Cassin's finch	0	0	0	0	1	1	1	1
cedar waxwing	0	0	5	3	110	1	115	4
chipping sparrow	4	1	33	18	10	2	47	21
cliff swallow	4	1	30	6	0	0	34	7
dark-eyed junco	2	2	0	0	36	4	38	6
eastern kingbird	0	0	5	4	0	0	5	4
European starling	53	5	29	3	26	2	108	10
golden-crowned kinglet	4	1	0	0	0	0	4	1
golden-crowned sparrow	0	0	0	0	1	1	1	1
gray-crowned rosy finch	0	0	0	0	5	1	5	1
horned lark	84	35	158	72	207	53	449	160
house finch	6	3	1	1	5	2	12	6
lazuli bunting	0	0	6	5	0	0	6	5
Lincoln's sparrow	0	0	0	0	2	1	2	1
Macgillivray's warbler	0	0	1	1	0	0	1	1
mountain bluebird	13	6	15	8	55	11	83	25
mountain chickadee	7	3	0	0	4	1	11	4
northern shrike	0	0	0	0	2	2	2	2
orange-crowned warbler	4	2	1	1	0	0	5	3
pine grosbeak	0	0	1	1	0	0	1	1
purple finch	7	1	0	0	0	0	7	1
red crossbill	0	0	5	1	0	0	5	1
red-breasted nuthatch	0	0	0	0	1	1	1	1
red-winged blackbird	15	1	0	0	0	0	15	1
ruby-crowned kinglet	4	2	0	0	1	1	5	3
sage thrasher	0	0	1	1	0	0	1	1
savannah sparrow	1	1	0	0	53	9	54	10
Say's phoebe	1	1	2	2	0	0	3	3
song sparrow	0	0	3	3	0	0	3	3
spotted towhee	17	15	30	27	7	3	54	45
Townsend's solitaire	2	2	0	0	2	2	4	4
Townsend's warbler	0	0	1	1	0	0	1	1
unidentified bluebird	0	0	12	2	0	0	12	2
unidentified finch	0	0	7	1	8	1	15	2
unidentified flycatcher	0	0	1	1	0	0	1	1
unidentified passerine	6	2	4	2	12	1	22	5
unidentified swallow	1	1	0	0	0	0	1	1
Vaux's swift	0	0	2	1	0	0	2	1

[a] Includes all observations, including those recorded at distances greater than 800 m from the observer.

Table 3 (*continued*).

Species/Group	Summer # obs.	Summer # groups	Fall # obs.	Fall # groups	Spring # obs.	Spring # groups	Grand Total # obs.	Grand Total # groups
Passerines (*continued*)								
vesper sparrow	35	29	85	60	4	2	124	91
violet-green swallow	4	2	0	0	0	0	4	2
warbling vireo	0	0	5	4	0	0	5	4
western kingbird	1	1	4	3	0	0	5	4
western meadowlark	80	64	144	82	24	18	248	164
western tanager	0	0	2	2	0	0	2	2
western wood-pewee	0	0	4	4	0	0	4	4
white-crowned sparrow	2	1	0	0	32	5	34	6
yellow-headed blackbird	1	1	0	0	0	0	1	1
yellow-rumped warbler	98	14	1	1	17	7	116	22
Subtotal	1098	217	738	367	1021	160	2857	744
Other								
common nighthawk	0	0	15	8	0	0	15	8
downy woodpecker	1	1	0	0	0	0	1	1
Lewis's woodpecker	0	0	1	1	1	1	2	2
northern flicker	7	6	3	3	12	12	22	21
rufous hummingbird	2	2	2	2	0	0	4	4
Subtotal	10	9	21	14	13	13	44	36
Grand Total	1480	388	911	516	1209	306	3600	1210

[a] Includes all observations, including those recorded at distances greater than 800 m from the observer.

Table 4. Avian species observed within 800 m of the observer and estimated mean use (#/20-minute survey) on the Project site (March 21, 2002 - November 1, 2002).

Large Birds					
Spring		Summer		Fall	
Species/Group	Use	Species/Group	Use	Species/Group	Use
common raven	0.72	American kestrel	0.45	common raven	0.47
black-billed magpie	0.30	red-tailed hawk	0.37	red-tailed hawk	0.32
red-tailed hawk	0.26	turkey vulture	0.17	black-billed magpie	0.23
American kestrel	0.22	common nighthawk	0.15	northern harrier	0.17
Canada goose	0.15	common raven	0.11	rough-legged hawk	0.08
rough-legged hawk	0.13	black-billed magpie	0.08	American kestrel	0.06
mallard	0.10	killdeer	0.06	killdeer	0.04
California quail	0.08	mallard	0.02	sharp-shinned hawk	0.04
turkey vulture	0.08	golden eagle	0.02	California quail	0.04
bald eagle	0.06	California quail	0.02	blue grouse	0.04
killdeer	0.06	Canada goose	0.01	northern goshawk	0.02
prairie falcon	0.06	Wilson's phalarope	0.01	Cooper's hawk	0.01
sharp-shinned hawk	0.06	sharp-shinned hawk	0.01	great-horned owl	0.01
golden eagle	0.05	unidentified buteo	0.01	golden eagle	0.01
Cooper's hawk	0.05	ruffed grouse	0.01	turkey vulture	0.01
blue grouse	0.03			Cooper's hawk	0.05
herring gull	0.02			blue grouse	0.03
merlin	0.02			herring gull	0.02
common snipe	0.01			merlin	0.02
greater yellowlegs	0.01			common snipe	0.01
long-billed curlew	0.01			greater yellowlegs	0.01
northern harrier	0.01			long-billed curlew	0.01
osprey	0.01			northern harrier	0.01
unidentified accipiter	0.01			osprey	0.01
				unidentified accipiter	0.01

Table 4 (*continued*).

Small Birds					
Spring		**Summer**		**Fall**	
Species/Group	Use	Species/Group	Use	Species/Group	Use
American pipit	6.10	horned lark	1.61	American robin	3.08
yellow-rumped warbler	1.11	western meadowlark	1.47	horned lark	2.15
horned lark	0.95	vesper sparrow	0.86	cedar waxwing	1.11
western meadowlark	0.91	Brewer's blackbird	0.57	mountain bluebird	0.59
American robin	0.72	barn swallow	0.35	American pipit	0.58
European starling	0.60	chipping sparrow	0.35	savannah sparrow	0.54
Brewer's blackbird	0.47	spotted towhee	0.31	dark-eyed junco	0.36
vesper sparrow	0.40	cliff swallow	0.30	white-crowned sparrow	0.32
spotted towhee	0.19	European starling	0.29	European starling	0.26
red-winged blackbird	0.17	American robin	0.26	western meadowlark	0.24
mountain bluebird	0.15	brown-headed cowbird	0.18	yellow-rumped warbler	0.17
mountain chickadee	0.08	mountain bluebird	0.15	American goldfinch	0.16
purple finch	0.08	unidentified bluebird	0.13	unidentified passerine	0.12
northern flicker	0.08	unidentified finch	0.07	northern flicker	0.12
house finch	0.07	lazuli bunting	0.06	black-capped chickadee	0.11
unidentified passerine	0.07	cedar waxwing	0.05	chipping sparrow	0.10
chipping sparrow	0.05	eastern kingbird	0.05	Steller’s jay	0.08
cliff swallow	0.05	red crossbill	0.05	unidentified finch	0.08
golden-crowned kinglet	0.05	warbling vireo	0.05	spotted towhee	0.07
orange-crowned warbler	0.05	unidentified passerine	0.04	barn swallow	0.05
ruby-crowned kinglet	0.05	western kingbird	0.04	gray-crowned rosy finch	0.05
violet-green swallow	0.05	western wood-pewee	0.04	house finch	0.05
dark-eyed junco	0.03	mourning dove	0.04	mountain chickadee	0.04
Steller’s jay	0.02	song sparrow	0.03	vesper sparrow	0.04
Townsend's solitaire	0.02	northern flicker	0.03	mourning dove	0.03
white-crowned sparrow	0.02	Bullock's oriole	0.02	Brewer's sparrow	0.02
rufous hummingbird	0.02	Steller’s jay	0.02	Lincoln's sparrow	0.02
black-capped chickadee	0.01	Brewer's sparrow	0.02	northern shrike	0.02
Say's phoebe	0.01	Say's phoebe	0.02	Townsend's solitaire	0.02
savannah sparrow	0.01	Vaux's swift	0.02	Cassin's finch	0.01
unidentified swallow	0.01	western tanager	0.02	golden-crowned sparrow	0.01
western kingbird	0.01	rufous hummingbird	0.02	red-breasted nuthatch	0.01
yellow-headed blackbird	0.01	Lewis's woodpecker	0.01	ruby-crowned kinglet	0.01
downy woodpecker	0.01	American redstart	0.01	Lewis's woodpecker	0.01
mourning dove	0.01	black-capped chickadee	0.01		
		black-headed grosbeak	0.01		
		house finch	0.01		
		Macgillivray's warbler	0.01		
		orange-crowned warbler	0.01		
		pine grosbeak	0.01		
		sage thrasher	0.01		
		Townsend's warbler	0.01		
		unidentified flycatcher	0.01		
		yellow-rumped warbler	0.01		

text continued from page 8

Frequency of Occurrence by Species
Frequency of occurrence measures how often a species is observed during 20-minute point count surveys (% of surveys) and is calculated as the percent of surveys in which a particular species was observed (Table 5). During the **spring**, common raven (31.7%), red-tailed hawk (22.9%), American kestrel (18.2%), black-billed magpie (14.1%) and rough-legged hawk (10.1%) were observed during more than ten percent of the surveys. Small bird species observed during more than ten percent of the surveys were western meadowlark (55.7%), horned lark (34.1%), vesper sparrow (28.4%), spotted towhee (15.9%), yellow-rumped warbler (15.9%), and American robin (12.5%).

During the **summer**, American kestrel had the highest frequency of occurrence (40.5%) for large birds, followed by red-tailed hawk (30.7%), turkey vulture (16.2%), common raven (8.3%) and black-billed magpie (7.1%). Small bird species observed during more than ten percent of the surveys were western meadowlark (64.4%), horned lark (53.0%), vesper sparrow (49.9%), spotted towhee (25.5%), chipping sparrow (15.4%), American robin (14.3%) and Brewer's blackbird (11.3%).

During the **fall**, red-tailed hawk (25.0%), common raven (21.6%), northern harrier (16.5%) and black-billed magpie (16.2%) were observed during more than ten percent of the surveys. Small bird species observed during more than ten percent of the surveys were horned lark (39.5%), western meadowlark (18.2%), mountain bluebird (12.2%), American robin (12.1%) and northern flicker (11.1%).

Avian Use by Seasons and Groups
Higher overall avian use occurred in the spring (15.14) and fall (12.20) compared to the summer use (9.16) (Table 6, Figures 5 and 6). The apparent higher use in spring was primarily due to observations of relatively large flocks of birds (i.e., 520 American pipit, 141 Canada geese).

Passerines
Passerines were the most abundant avian group observed during all seasons (Table 6). Passerines showed higher abundance in spring (12.48) and fall (10.40) compared to summer (7.55), for spring this was primarily due to one large flock of American pipits (Figure 5 and 6). Passerines made up approximately 82% or more of the avian use in all seasons. Passerines were observed during 97.0% of the surveys in the summer, 73.6% in the fall and 80.0% in the spring (Figure 7).

Raptors
Raptor use was second highest to passerines in the summer (1.03) and third to passerines and corvids, in the fall (0.73) and spring (1.01) (Figures 5 and 8). Raptor use was similar in all seasons with American kestrels, red-tailed hawks and northern harriers the most abundant species. In all seasons, raptors made up less than twelve percent of the avian use, and were observed in 59.1% of the summer surveys, 42.6% in the fall and 62.8% of the spring surveys (Figure 7). The high red-tailed hawk use is, in part, due to the proximity of two active nests near two of the observation stations (nests located within ~¼ mile of the station).

Corvids
The majority of corvid use occurred in the spring and fall, and consisted of several groups of common ravens (Figures 5, 7 and 8).

Waterfowl
The majority of waterfowl use occurred in the spring, and consisted primarily of several groups of Canada geese.

Spatial Use of the Project Area
No large differences are apparent other than the higher use at station B from the large flock of American pipits observed (Figure 9). Mean use for the three stations to the west of the project area (A, B and K) is higher, but again this is mainly due to the large flock of American pipits (Figure 10). Passerine use by station shows the same pattern as all birds (Figures 9 and 10).

Raptor use by station ranged from 0.5 to 1.5, indicating relatively similar spatial use of the project area (Figure 11). Overall raptor use for the three stations to the west was slightly less than the use for the east stations (Figure 10). Raptor use for the east stations was very similar to the west stations in the spring and summer, with higher use in the fall. Higher buteo and northern harrier use for the east stations appears to drive this difference (Figure 12).

Flight paths of raptors and other species of interest and perched raptor locations observed during fixed-point and in-transit surveys were summarized to look for spatial patterns of use (Figures 13-19). The two most common raptor species, red-tailed hawk and American kestrel, differed in how they used the project area. High red-tailed hawk use in the eastern portion of the study area appears to be associated with the two active nests in that area. Red-tailed hawks were observed typically flying parallel and off the west edge of the ridges. American kestrels were observed throughout the study area with no obvious patterns or concentrations of use.

Flight Height Characteristics
At least 20 groups of flying birds were observed for seven species during the fixed-point surveys. Of these species, American robin (79.2%), red-tailed hawk (52.1%), common raven (48.4%) and American kestrel (42.9%) were most often observed within the RSA. Common passerines including horned lark (8.1%) and western meadowlark (4.3%) were not often observed within the RSA (Table 7).

Overall, 27.9% of the birds observed were recorded within the defined RSA, 64.9% were below the RSA and 7.1% were flying above the RSA (Table 8). As a group, raptors had the third highest percentage of observations within the RSA (40.9%) behind other birds and shorebirds. Raptor subgroups observed above this mean percent within the RSA included buteos (50.0%), accipiters (41.2%) and small falcons (41.4%; mostly American kestrel). Eagles were relatively evenly split between the three categories. Waterfowl and waterbirds were not typically observed within the RSA. Doves, passerines, upland gamebirds and waterbirds were typically observed below the RSA, while waterfowl were typically observed above the RSA.

text continued on page 26

Table 5. Avian species observed within 800 m of observer and estimated frequency of occurrence for large and small birds on the Project Site (March 21, 2002 – July 11, 2002).

Large Birds					
Spring		**Summer**		**Fall**	
Species/Group	% freq.	Species/Group	% freq.	Species/Group	% freq.
common raven	31.7	American kestrel	40.5	red-tailed hawk	25.0
red-tailed hawk	22.9	red-tailed hawk	30.7	common raven	21.6
American kestrel	18.2	turkey vulture	16.2	northern harrier	16.5
black-billed magpie	14.1	common raven	8.3	black-billed magpie	16.2
rough-legged hawk	10.1	black-billed magpie	7.1	rough-legged hawk	6.8
turkey vulture	8.0	common nighthawk	6.1	American kestrel	4.0
prairie falcon	5.7	killdeer	2.0	sharp-shinned hawk	4.0
golden eagle	5.0	Canada goose	1.1	killdeer	2.0
killdeer	4.5	mallard	1.0	northern goshawk	2.0
bald eagle	4.5	Wilson's phalarope	1.0	California quail	2.0
Cooper's hawk	4.5	golden eagle	1.0	Cooper's hawk	1.0
sharp-shinned hawk	4.5	sharp-shinned hawk	1.0	great-horned owl	1.0
blue grouse	3.4	unidentified buteo	1.0	golden eagle	1.0
Canada goose	2.3	California quail	1.0	turkey vulture	1.0
mallard	2.3	ruffed grouse	1.0	blue grouse	1.0
merlin	2.3				
California quail	2.3				
herring gull	1.1				
common snipe	1.1				
greater yellowlegs	1.1				
long-billed curlew	1.1				
northern harrier	1.1				
osprey	1.1				
unidentified accipiter	1.1				

Table 5 (*continued*).

Small Birds					
Summer		**Fall**		**Spring**	
Species/Group	% Freq	Species/Group	% Freq	Species/Group	% Freq
western meadowlark	55.7	western meadowlark	64.4	horned lark	39.5
horned lark	34.1	horned lark	53.0	western meadowlark	18.2
vesper sparrow	28.4	vesper sparrow	49.9	mountain bluebird	12.2
spotted towhee	15.9	spotted towhee	25.5	American robin	12.1
yellow-rumped warbler	15.9	chipping sparrow	15.4	northern flicker	11.1
American robin	12.5	American robin	14.3	savannah sparrow	8.1
Brewer's blackbird	6.8	Brewer's blackbird	11.3	yellow-rumped	7.1
mountain bluebird	6.8	mountain bluebird	7.2	Steller's jay	6.1
northern flicker	6.8	brown-headed cowbird	7.1	American goldfinch	5.1
European starling	4.5	barn swallow	5.1	white-crowned	5.1
house finch	3.4	cliff swallow	5.1	dark-eyed junco	4.0
mountain chickadee	3.4	lazuli bunting	5.1	mourning dove	3.4
dark-eyed junco	2.7	eastern kingbird	4.0	black-capped	3.0
Steller's jay	2.3	warbling vireo	4.0	barn swallow	2.0
orange-crowned	2.3	cedar waxwing	3.0	chipping sparrow	2.0
ruby-crowned kinglet	2.3	song sparrow	3.0	European starling	2.0
Townsend's solitaire	2.3	western kingbird	3.0	house finch	2.0
unidentified passerine	2.3	western wood-pewee	3.0	northern shrike	2.0
violet-green swallow	2.3	northern flicker	3.0	spotted towhee	2.0
rufous hummingbird	2.3	mourning dove	3.0	Townsend's solitaire	2.0
American pipit	1.1	Bullock's oriole	2.1	vesper sparrow	2.0
black-capped chickadee	1.1	unidentified bluebird	2.1	American pipit	1.0
chipping sparrow	1.1	European starling	2.0	Brewer's sparrow	1.0
Cliff swallow	1.1	Say's phoebe	2.0	Cassin's finch	1.0
golden-crowned kinglet	1.1	unidentified passerine	2.0	cedar waxwing	1.0
purple finch	1.1	rufous hummingbird	2.0	gray-crowned rosy	1.0
red-winged blackbird	1.1	Lewis's woodpecker	1.1	golden-crowned	1.0
Say's phoebe	1.1	Steller's jay	1.0	Lincoln's sparrow	1.0
savannah sparrow	1.1	American redstart	1.0	mountain chickadee	1.0
unidentified swallow	1.1	black-capped chickadee	1.0	red-breasted nuthatch	1.0
white-crowned sparrow	1.1	black-headed grosbeak	1.0	ruby-crowned kinglet	1.0
western kingbird	1.1	Brewer's sparrow	1.0	unidentified finch	1.0
yellow-headed	1.1	house finch	1.0	unidentified	1.0
downy woodpecker	1.1	Macgillivray's warbler	1.0	Lewis's woodpecker	1.0
mourning dove	1.1	orange-crowned warbler	1.0		
		pine grosbeak	1.0		
		red crossbill	1.0		
		sage thrasher	1.0		
		Townsend's warbler	1.0		
		unidentified finch	1.0		
		unidentified flycatcher	1.0		
		Vaux's swift	1.0		
		western tanager	1.0		
		yellow-rumped warbler	1.0		

Table 6. Mean use, percent composition and percent frequency of occurrence for avian groups by season for the Kittitas Valley Project site.

Species/Group	Mean Use (#/20 minute survey)			Group Composition (%)			% Frequency		
	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall
Waterfowl	0.25	0.03	0.00	1.7	0.3	0.0	4.5	2.1	0.0
Waterbirds	0.02	0.00	0.00	0.2	0.0	0.0	1.1	0.0	0.0
Shorebirds	0.09	0.07	0.04	0.6	0.8	0.3	6.8	2.0	2.0
Accipiters	0.11	0.01	0.07	0.8	0.1	0.6	10.2	1.0	6.1
Buteos	0.39	0.38	0.40	2.6	4.1	3.3	28.7	31.7	28.0
Northern Harriers	0.01	0.00	0.17	0.1	0.0	1.4	1.1	0.0	16.5
Eagles	0.11	0.02	0.01	0.7	0.2	0.1	8.4	1.0	1.0
Large Falcons	0.06	0.00	0.00	0.4	0.0	0.0	5.7	0.0	0.0
Small Falcons	0.24	0.45	0.06	1.6	4.9	0.5	19.3	40.5	4.0
Other – Raptor	0.09	0.17	0.02	0.6	1.9	0.2	8.0	16.2	2.0
Raptors Subtotal	1.01	1.03	0.73	6.7	11.2	6.0	62.8	59.1	47.6
Corvids	1.04	0.21	0.78	6.9	2.2	6.4	38.5	16.4	39.8
Passerines	12.48	7.55	10.40	82.5	82.3	85.3	80.0	97.0	73.6
Other Birds	0.11	0.21	0.13	0.8	2.3	1.1	10.2	11.2	12.1
Gamebirds	0.11	0.03	0.08	0.8	0.3	0.7	5.7	1.0	3.0
Doves/Pigeons	0.01	0.04	0.03	0.1	0.4	0.3	1.1	3.0	3.4
Subtotal	15.14	9.16	12.20						

Table 7. Flight height characteristics by species observed during fixed-point surveys.

Species/Group	# Groups Flying	# Birds Flying	% Birds Flying	Collision Risk Height (25-100 m AGL)		
				Below	Within	Above
gray-crowned rosy finch	1	5	100.0	0.0	100.0	0.0
long-billed curlew	1	1	100.0	0.0	100.0	0.0
unidentified swallow	1	1	100.0	0.0	100.0	0.0
unidentified accipiter	1	1	50.0	0.0	100.0	0.0
Townsend's solitaire	1	1	25.0	0.0	100.0	0.0
cedar waxwing	2	112	97.4	1.8	98.2	0.0
common nighthawk	7	14	93.3	0.0	85.7	14.3
American robin	23	322	81.9	14.3	79.2	6.5
violet-green swallow	2	4	100.0	25.0	75.0	0.0
killdeer	2	4	26.7	25.0	75.0	0.0
unidentified buteo	3	3	100.0	0.0	66.7	33.3
barn swallow	6	34	85.0	41.2	58.8	0.0
American goldfinch	3	14	87.5	42.9	57.1	0.0
red-tailed hawk	69	73	76.0	28.8	52.1	19.2
Lewis's woodpecker	2	2	100.0	50.0	50.0	0.0
northern goshawk	2	2	100.0	0.0	50.0	50.0
unidentified eagle	2	2	100.0	0.0	50.0	50.0
Cooper's hawk	4	4	57.1	50.0	50.0	0.0
northern flicker	4	4	18.2	50.0	50.0	0.0
common raven	51	91	74.6	40.7	48.4	11.0
American kestrel	53	56	78.9	51.8	42.9	5.4
golden eagle	5	5	71.4	0.0	40.0	60.0
bald eagle	6	6	85.7	50.0	33.3	16.7
sharp-shinned hawk	10	10	100.0	40.0	30.0	30.0
rough-legged hawk	10	10	62.5	70.0	30.0	0.0
northern harrier	17	17	94.4	70.6	29.4	0.0
mourning dove	7	8	100.0	75.0	25.0	0.0
prairie falcon	4	4	80.0	75.0	25.0	0.0
mountain bluebird	16	56	67.5	75.0	25.0	0.0
cliff swallow	6	31	91.2	77.4	22.6	0.0
turkey vulture	24	24	92.3	41.7	20.8	37.5
Steller’s jay	6	8	66.7	87.5	12.5	0.0
American pipit	3	594	100.0	90.4	9.6	0.0
horned lark	59	258	57.5	91.9	8.1	0.0
Brewer's blackbird	14	65	67.7	93.8	6.2	0.0
unidentified passerine	4	17	77.3	94.1	5.9	0.0
western meadowlark	16	23	9.3	95.7	4.3	0.0
black-billed magpie	21	31	54.4	96.8	3.2	0.0
European starling	6	81	75.0	98.8	1.2	0.0
American redstart	1	1	100.0	100.0	0.0	0.0
black-headed grosbeak	1	1	100.0	100.0	0.0	0.0
blue-winged teal	1	3	100.0	100.0	0.0	0.0
greater yellowlegs	1	1	100.0	100.0	0.0	0.0

Table 7 (*continued*).

Species/Group	# Groups Flying	# Birds Flying	% Birds Flying	Collision Risk Height (25-100 m AGL)		
				Below	Within	Above
herring gull	1	2	100.0	100.0	0.0	0.0
merlin	2	2	100.0	50.0	0.0	50.0
purple finch	1	7	100.0	100.0	0.0	0.0
red-breasted nuthatch	1	1	100.0	100.0	0.0	0.0
red-winged blackbird	1	15	100.0	100.0	0.0	0.0
rufous hummingbird	4	4	100.0	100.0	0.0	0.0
unidentified bluebird	2	12	100.0	100.0	0.0	0.0
unidentified falcon	1	1	100.0	100.0	0.0	0.0
unidentified finch	2	15	100.0	100.0	0.0	0.0
unidentified flycatcher	1	1	100.0	100.0	0.0	0.0
Vaux's swift	1	2	100.0	100.0	0.0	0.0
yellow-headed blackbird	1	1	100.0	100.0	0.0	0.0
yellow-rumped warbler	10	100	86.2	100.0	0.0	0.0
Canada goose	1	100	70.4	0.0	0.0	100.0
blue grouse	1	4	57.1	100.0	0.0	0.0
dark-eyed junco	2	25	65.8	100.0	0.0	0.0
mountain chickadee	2	6	54.5	100.0	0.0	0.0
savannah sparrow	5	29	53.7	100.0	0.0	0.0
house finch	3	6	50.0	100.0	0.0	0.0
black-capped chickadee	1	6	46.2	100.0	0.0	0.0
chipping sparrow	3	19	40.4	100.0	0.0	0.0
Say's phoebe	1	1	33.3	100.0	0.0	0.0
eastern kingbird	1	1	20.0	100.0	0.0	0.0
western kingbird	1	1	20.0	100.0	0.0	0.0
white-crowned sparrow	1	4	11.8	100.0	0.0	0.0
mallard	1	3	10.3	100.0	0.0	0.0
vesper sparrow	6	7	5.6	100.0	0.0	0.0
brown-headed cowbird	1	1	5.6	100.0	0.0	0.0
spotted towhee	3	3	5.6	100.0	0.0	0.0
Brewer's sparrow	0	0	0.0	N/A	N/A	N/A
Bullock's oriole	0	0	0.0	N/A	N/A	N/A
California quail	0	0	0.0	N/A	N/A	N/A
Cassin's finch	0	0	0.0	N/A	N/A	N/A
common snipe	0	0	0.0	N/A	N/A	N/A
downy woodpecker	0	0	0.0	N/A	N/A	N/A
golden-crowned kinglet	0	0	0.0	N/A	N/A	N/A
golden-crowned sparrow	0	0	0.0	N/A	N/A	N/A
great-horned owl	0	0	0.0	N/A	N/A	N/A
lazuli bunting	0	0	0.0	N/A	N/A	N/A
Lincoln's sparrow	0	0	0.0	N/A	N/A	N/A
Macgillivray's warbler	0	0	0.0	N/A	N/A	N/A
northern shrike	0	0	0.0	N/A	N/A	N/A
orange-crowned warbler	0	0	0.0	N/A	N/A	N/A
osprey	0	0	0.0	N/A	N/A	N/A
pine grosbeak	0	0	0.0	N/A	N/A	N/A
red crossbill	0	0	0.0	N/A	N/A	N/A
ruby-crowned kinglet	0	0	0.0	N/A	N/A	N/A
ruffed grouse	0	0	0.0	N/A	N/A	N/A

Table 7 (*continued*).

Species/Group	# Groups Flying	# Birds Flying	% Birds Flying	Collision Risk Height (25-100 m AGL)		
				Below	Within	Above
sage thrasher	0	0	0.0	N/A	N/A	N/A
song sparrow	0	0	0.0	N/A	N/A	N/A
Townsend's warbler	0	0	0.0	N/A	N/A	N/A
unidentified duck	0	0	0.0	N/A	N/A	N/A
warbling vireo	0	0	0.0	N/A	N/A	N/A
western tanager	0	0	0.0	N/A	N/A	N/A
western wood-pewee	0	0	0.0	N/A	N/A	N/A
Wilson's phalarope	0	0	0.0	N/A	N/A	N/A
Subtotal	539	2383	66.2	64.9	27.9	7.1

Table 8. Flight height characteristics by avian group during fixed-point surveys.

Group	# Groups Flying	# Birds Flying	% Birds Flying	Collision Risk Height (25-100 m AGL)		
				Below	Within	Above
Waterbirds	1	2	100.0	100.0	0.0	0.0
Waterfowl	3	106	58.6	5.7	0.0	94.3
Shorebirds	4	6	31.6	33.3	66.7	0.0
Accipiters	17	17	81.0	35.3	41.2	23.5
Buteos	82	86	74.8	32.6	50.0	17.4
Northern Harriers	17	17	94.4	70.6	29.4	0.0
Eagles	13	13	81.3	23.1	38.5	38.5
Small Falcons	55	58	79.5	51.7	41.4	6.9
Large Falcons	4	4	80.0	75.0	25.0	0.0
Unid. Falcons	1	1	100.0	100.0	0.0	0.0
Other Raptors	24	24	85.7	41.7	20.8	37.5
All Raptors	213	220	79.4	42.3	40.9	16.8
Corvids	78	130	68.1	56.9	35.4	7.7
Upland Gamebirds	1	4	19.0	100.0	0.0	0.0
Doves	7	8	100.0	75.0	25.0	0.0
Passerines	215	1883	65.9	71.9	27.0	1.1
Other	17	24	54.5	29.2	62.5	8.3
Subtotal	539	2383	66.2	64.9	27.9	7.1

text continued from page 18

Exposure Indices
Relative exposure indices (use multiplied by proportion of observations where bird flew within the rotor swept area) were calculated by species (Table 9). This index is only based on flight height observations and relative abundance and does not account for other possible factors such as foraging behavior. Small bird species with the three highest exposure indexes were American robin, cedar waxwing and American pipit. Due to high use estimates, horned lark had the highest exposure index at the Stateline and Foote Creek Rim wind plants, and has been the most commonly observed fatality. The large bird species with the highest exposure index was common raven, followed by red-tailed hawk, and American kestrel. Mortality studies at other wind projects have indicated that although ravens are often observed at wind projects within the zone of risk, they appear to be less susceptible to collision with wind turbines than other similar size birds (e.g., raptors, waterfowl).

text continued on page 30

Table 9. Mean exposure indices calculated by species observed during fixed-point surveys at the Project site.

Species/Group	Overall Mean Use	% Flying	% Flying within RSA	Exposure Index
American robin	1.377	81.9	79.2	0.893
cedar waxwing	0.402	97.4	98.2	0.385
American pipit	2.077	100.0	9.6	0.199
common raven	0.421	74.6	48.4	0.152
red-tailed hawk	0.319	76.0	52.1	0.126
American kestrel	0.242	78.9	42.9	0.082
horned lark	1.595	57.5	8.1	0.075
barn swallow	0.140	85.0	58.8	0.070
mountain bluebird	0.301	67.5	25.0	0.051
common nighthawk	0.052	93.3	85.7	0.042
American goldfinch	0.056	87.5	57.1	0.028
cliff swallow	0.119	91.2	22.6	0.024
gray-crowned rosy finch	0.017	100.0	100.0	0.017
northern harrier	0.061	94.4	29.4	0.017
turkey vulture	0.087	92.3	20.8	0.017
Brewer's blackbird	0.342	67.7	6.2	0.014
rough-legged hawk	0.068	62.5	30.0	0.013
killdeer	0.052	26.7	75.0	0.010
sharp-shinned hawk	0.035	100.0	30.0	0.010
violet-green swallow	0.014	100.0	75.0	0.010
golden eagle	0.026	71.4	40.0	0.007
mourning dove	0.029	100.0	25.0	0.007
northern flicker	0.077	18.2	50.0	0.007
bald eagle	0.017	85.7	33.3	0.005
Cooper's hawk	0.017	57.1	50.0	0.005
Lewis's woodpecker	0.007	100.0	50.0	0.004
black-billed magpie	0.201	54.4	3.2	0.004
western meadowlark	0.873	9.3	4.3	0.004
European starling	0.378	75.0	1.2	0.003
unidentified passerine	0.077	77.3	5.9	0.003
Steller’s jay	0.042	66.7	12.5	0.003
prairie falcon	0.017	80.0	25.0	0.003
Townsend's solitaire	0.014	25.0	100.0	0.003
northern goshawk	0.007	100.0	50.0	0.003
long-billed curlew	0.003	100.0	100.0	0.003
unidentified swallow	0.003	100.0	100.0	0.003
unidentified buteo	0.003	100.0	66.7	0.002
unidentified accipiter	0.003	50.0	100.0	0.002
blue-winged teal	N/A	100.0	0.0	0.000
unidentified duck	N/A	0.0	N/A	0.000
unidentified eagle	N/A	100.0	50.0	0.000
unidentified falcon	N/A	100.0	0.0	0.000
vesper sparrow	0.435	5.6	0.0	0.000
yellow-rumped warbler	0.406	86.2	0.0	0.000
spotted towhee	0.190	5.6	0.0	0.000

Table 9 (*continued*).

Species/Group	Overall Mean Use	% Flying	% Flying within RSA	Exposure Index
savannah sparrow	0.189	53.7	0.0	0.000
chipping sparrow	0.169	40.4	0.0	0.000
Dark-eyed junco	0.134	65.8	0.0	0.000
white-crowned sparrow	0.119	11.8	0.0	0.000
brown-headed cowbird	0.063	5.6	0.0	0.000
red-winged blackbird	0.052	100.0	0.0	0.000
unidentified finch	0.052	100.0	0.0	0.000
Canada goose	0.049	70.4	0.0	0.000
California quail	0.045	0.0	N/A	0.000
black-capped chickadee	0.045	46.2	0.0	0.000
unidentified bluebird	0.045	100.0	0.0	0.000
house finch	0.042	50.0	0.0	0.000
mallard	0.038	10.3	0.0	0.000
mountain chickadee	0.038	54.5	0.0	0.000
purple finch	0.024	100.0	0.0	0.000
blue grouse	0.024	57.1	0.0	0.000
lazuli bunting	0.021	0.0	N/A	0.000
orange-crowned warbler	0.017	0.0	N/A	0.000
red crossbill	0.017	0.0	N/A	0.000
ruby-crowned kinglet	0.017	0.0	N/A	0.000
warbling vireo	0.017	0.0	N/A	0.000
eastern kingbird	0.017	20.0	0.0	0.000
western kingbird	0.017	20.0	0.0	0.000
Brewer's sparrow	0.014	0.0	N/A	0.000
golden-crowned kinglet	0.014	0.0	N/A	0.000
western wood-pewee	0.014	0.0	N/A	0.000
rufous hummingbird	0.014	100.0	0.0	0.000
song sparrow	0.010	0.0	N/A	0.000
Say's phoebe	0.010	33.3	0.0	0.000
Bullock's oriole	0.007	0.0	N/A	0.000
Lincoln's sparrow	0.007	0.0	N/A	0.000
northern shrike	0.007	0.0	N/A	0.000
western tanager	0.007	0.0	N/A	0.000
Vaux's swift	0.007	100.0	0.0	0.000
herring gull	0.007	100.0	0.0	0.000
merlin	0.007	100.0	0.0	0.000
Cassin's finch	0.003	0.0	N/A	0.000
Macgillivray's warbler	0.003	0.0	N/A	0.000
Townsend's warbler	0.003	0.0	N/A	0.000

Table 9 (*continued*).

Species/Group	Overall Mean Use	% Flying	% Flying within RSA	Exposure Index
Wilson's phalarope	0.003	0.0	N/A	0.000
common snipe	0.003	0.0	N/A	0.000
downy woodpecker	0.003	0.0	N/A	0.000
golden-crowned sparrow	0.003	0.0	N/A	0.000
great-horned owl	0.003	0.0	N/A	0.000
osprey	0.003	0.0	N/A	0.000
pine grosbeak	0.003	0.0	N/A	0.000
ruffed grouse	0.003	0.0	N/A	0.000
sage thrasher	0.003	0.0	N/A	0.000
American redstart	0.003	100.0	0.0	0.000
black-headed grosbeak	0.003	100.0	0.0	0.000
greater yellowlegs	0.003	100.0	0.0	0.000
red-breasted nuthatch	0.003	100.0	0.0	0.000
unidentified flycatcher	0.003	100.0	0.0	0.000
yellow-headed blackbird	0.003	100.0	0.0	0.000

text continued from page 26

In-transit Survey Data and Non-avian Observations

Avian Observations During In-transit Surveys
Observations of state or federally listed species, raptors, and other species of interest observed while in-transit between surveys points were recorded (Table 10). The most abundant avian species recorded (# of observations) were turkey vulture (34), followed by American kestrel (30), and red-tailed hawk (30). Six species observed during in-transit surveys were not detected during the fixed-point surveys including gray partridge, greater white-fronted goose, white-breasted nuthatch, spotted sandpiper, green-winged teal, and great blue heron (Table 10).

Mammals
Mule deer (*Odocoileus hemionus*) were commonly observed throughout the project area (Table 11). Observations of 10-20 individuals were commonly observed in the spring, with 3-7 individuals observed throughout the summer. Observations in the fall were typically small groups of does. Elk (*Cervis elaphus*) were observed in some large groups (15-25) individuals near the northern points (A, E, F and G) during the spring surveys, with few observations made in the summer and fall periods. American pika (*Ochotona princeps*) has been heard regularly on the large talus slope near station A. Coyotes and coyote sign were occasionally observed within the project site.

Reptiles and Amphibians
Reptiles observed during the field studies included rubber boa (*Charina bottae*), Great Basin gopher snake (*Pituophis catenifer deserticola*), Northern Pacific rattlesnake (*Crotalus viridis oreganus*), and short-horned lizard (*Phrynosoma douglassii*). One amphibian chorus was heard during the spring at a distance of over 300 meters, and is likely one of the true frog species (e.g., Cascade frog, *Rana cascadae*). Spotted frogs (*Rana pretiosa*) and red-legged frogs (*Rana aurora*) have auditory calls that typically don't carry over 30 meters, and the northern leopard frog (*Rana pipiens*) is not known to occur in Kittitas county.

Table 10. Summary of observations of state or federal-listed species, raptors, and other species observed during in-transit surveys that were not observed during the fixed-point surveys.

Species	# Obs.	# Groups
turkey vulture	34	11
American kestrel	30	27
red-tailed hawk	30	24
gray partridge	15	1
greater white-fronted goose	10	1
golden eagle	6	6
Cooper's hawk	4	4
rough-legged hawk	3	3
Brewer's sparrow	2	1
sharp-shinned hawk	2	2
northern harrier	2	2
prairie falcon	2	2
unidentified accipiter	1	1
white-breasted nuthatch	1	1
spotted sandpiper	1	1
American green-winged teal	1	1
osprey	1	1
great blue heron	1	1
Avian Subtotal	146	90

Table 11. Summary of observations and mean use of big game species observed during the fixed-point surveys.

Species	Station	# Obs.	# Groups	Mean Use[a]
Mule deer	A	37	4	1.48
	B	50	7	2.08
	C	44	7	1.69
	D	0	0	0.00
	E	7	1	0.27
	F	4	1	0.15
	G	38	5	1.46
	H	15	2	0.58
	I	0	0	0.00
	J	33	4	1.32
	K	121	10	5.04
Subtotal		349	41	1.28
Elk	A	0	0	0.00
	B	66	4	2.75
	C	0	0	0.00
	D	0	0	0.00
	E	0	0	0.00
	F	8	1	0.31
	G	6	2	0.23
	H	0	0	0.00
	I	0	0	0.00
	J	0	0	0.00
	K	7	1	0.29
Subtotal		87	8	0.33
Grand Total		436	49	1.61

[a] # observations/20-minute survey

Raptor Nest Survey

A total of approximately 70 square miles was covered by helicopter during the raptor nest surveys. A total of six red-tailed hawk nests and nine inactive raptor nests were found (Table 12). Five of the six red-tailed hawk nests produced a total of 9 young for an average of 1.5 young per nest. One previously active red-tailed hawk nest was not found during the second visit. The nest may have been blown out of the tree during a high wind event. Of the 15 nests found during surveys, six were in mature cottonwoods, six were in coniferous trees, one was in a shrub, one was on a cliff, and one was located on a powerline pole. Much of the survey area was dominated by coniferous forest. Due to the presence of thick foliage and interlocking crowns of coniferous forests, detection of raptor nests in these areas was difficult from the helicopter.

Active raptor nest density was 0.085 nest/mi^2. This index of raptor nest density falls below the range of other wind projects that have been studied, however, detection of nests was difficult throughout much of the area due to the presence of large stands of coniferous forest. For example, the nest density in a 10-mile buffer surrounding the Foote Creek Rim wind project in Wyoming is 0.19 nest/mi^2 (Johnson *et al.* 2000b). Nest density within a 2-mile buffer around the Stateline wind project in Oregon and Washington is 0.20 nest/mi^2 (URS and WEST 2001).

Table 12. A summary of raptor nests found at the Project site.

Species	# Young	Date Nest Was Found	Nest Status	Revisit Nest Status	Nest Substrate
red-tailed hawk	2	5/6/2002	Young Present	Young present	Cottonwood
red-tailed hawk	1	5/6/2002	Young Present	Young present	Cottonwood
red-tailed hawk	2	5/6/2002	Bird Incubating	Young present	Conifer
red-tailed hawk	0	5/6/2002	Young Present	Not Found[a]	Conifer
red-tailed hawk	3	5/7/2002	Bird Incubating	Young present	Conifer
red-tailed hawk	1	5/8/2002	Young Present	Young present	Powerline
Unknown		5/8/2002	Inactive	Inactive	Cliff
Unknown		5/6/2002	Inactive	Not Found[1]	Conifer
Unknown		5/6/2002	Inactive	Inactive	Cottonwood
Unknown		5/6/2002	Inactive	Inactive	Conifer
Unknown		5/6/2002	Inactive	Inactive	Cottonwood
Unknown		5/6/2002	Inactive	Inactive	Conifer
Unknown		5/6/2002	Inactive	Inactive	Cottonwood
Unknown		5/6/2002	Inactive	Inactive	Cottonwood
Unknown		5/7/2002	Inactive	Inactive	Shrub
Unknown		5/7/2002	Inactive	Inactive	Conifer

[a] The nest may have been blown out of the tree by the wind.

Wintering Bald Eagle Surveys

Nine surveys were conducted along the four winter bald eagle survey routes established for the Project between February 15 and April 11, 2002. Counts of bald eagles (repeat counts are not included) observed during each surveys were tallied by route (Table 13). The maximum number of bald eagles observed during one survey day was 12 (March 12, 2002), with one of the twelve observations an unidentified eagle (either golden or bald eagle). On average, 5.6 bald eagles were observed per survey (including the unidentified eagle). Approximately 58 percent of the observations were adults, 30 percent were subadults (1-3 years of age), 10 percent were juveniles (<1 year old), and 1 observation unidentified as to age class (Table 13).

Route 4, the southernmost route (Figure 3), had the highest bald eagle use (0.33/survey mile, [0.12, 0.61][1]), followed by Route 3 (0.20/survey mile, [0.10, 0.48]), Route 1 (0.15/survey mile, [0.06, 0.29]) and Route 2 (0.04/survey mile, [0.04, 0.09]). The mean observed at routes 4 and 3 were significantly higher than the mean for Route 2 ($p<0.10$). No night roost sites were identified in the upland areas. One potential night roost was identified along the river, although no large groups (> 3) of eagles were ever observed at one location, including this roost.

Several of the eagle observations on Route 3 were near cattle pasture/calving area along Smithson Road (Figure 9). The survey route nearest the proposed development is Route 2, which had the lowest bald eagle use. Three unique observations (an additional likely repeat observation of an adult is mapped as well) were recorded along this route. One adult bald eagle was observed flying just south of the intersection of Hayward and Bettas Road (February 15) approximately 200 m above ground level. One adult eagle was observed perched in a conifer tree to the west of Highway 97 (February 18), 1.3 miles north of Bettas Road. Another adult eagle was observed perched in a lone tree one mile north of the intersection of Highway 10 and Highway 97 near the crest of the ridge above the Yakima River (April 3). The eagle apparently had been feeding on a dead cow, which was observed in close proximity to the tree.

Other Avian Observations
Other raptors observed during the survey included red-tailed hawks and one gyrfalcon observed on Route 3 on March 27, 2002. In addition, one loggerhead shrike and 2 unidentified shrikes (northern or loggerhead) were observed along Route 2. Eight elk were observed along Route 3 on March 21, 2002.

[1] lower and upper limit of a 95% confidence interval

Table 13. Results of bald eagle surveys in the vicinity of the Project site.

	Number of Eagle Observations								
	Route					Age Classification			
Date	**1**	**2**	**3**	**4**	**Total**	**AD[a]**	**SA[b]**	**JUV[c]**	**UNK[d]**
02/15/2002	0	1	6	0	7	3	3	1	0
02/18/2002	2	1	1	2	6	3	2	1	0
02/26/2002	4	0	0	3	7	5	2	0	0
03/04/2002	5	0	3	0	8	5	3	0	0
03/12/2002	2	0	3	7	12	8	3	0	1
03/21/2002	1	0	0	5	6	3	1	2	0
03/27/2002	0	0	0	2	2	0	1	1	0
04/03/2002	0	1	0	1	2	2	0	0	0
04/11/2002	0	0	0	0	0	0	0	0	0
Total	14	3	13	20	50	29	15	5	1
#/survey	1.56	0.33	1.44	2.22	5.56				
#/mile/survey	0.15	0.04	0.20	0.33					
95% CI (LL[g])	0.06	0.02	0.10	0.12					
95% CI (UL[h])	0.29	0.09	0.48	0.61					

[a] Adults (>3 years old)
[b] Subadults (1-3 years old)
[c] Juveniles (<1 year old)
[d] Unknown
[e] Lower limit of a 95% confidence interval
[f] Upper limit of a 95% confidence interval

Sensitive, Threatened, and Endangered Species

A list of state and federally protected species that potentially occur within the project area was generated to assess the potential for impacts to these species (Table 14). Species were identified based on the WDFW Species of Concern list, which includes state listed endangered, threatened, sensitive and candidate species; and the USFWS, Central Washington Ecological Services office list of Endangered, Threatened, Proposed, Candidate and Species of Concern for Kittitas County.

Information about occurrence of these species in the project area is based largely on the following resources:

- Habitat mapping and predicted distribution from Washington State Gap Analysis Program (GAP) project,
- WDFW Priority Habitats and Species (PHS) records for the project area and a buffer or approximately 5 miles,
- Breeding Bird Atlas of Washington State, Location Data and Predicted Distributions (Smith *et al.* 1997)
- Baseline field studies being conducted on site (this report), and
- Other published literature where available.

Of the special status species potentially occurring in the project, five were observed on site during surveys (Table 15). In addition, five State Monitor status species were observed. Fatality references in the table are based on Erickson *et al.* (2001) and Erickson *et al.* (2002).

text continued on page 44

Table 14. A list of state and federally protected species potentially occurring within the Project area.

Species	State Status	Federal Status	Occurrence	Documentation
<u>Birds</u>				
Northern goshawk (*Accipiter gentilis*)	C	SC	Documented breeder north and west of project; numerous PHS records from mountains north and west of project [T19N, R16E, Secs 21, 24, 28; T20N, R17E, Secs 6, 11, 14, 15]; coniferous and aspen forests	PHS 1989-1996
Golden eagle (*Aquila chrysaetos*)	C	-	Documented on site (6 observations in spring/ summer); No nest found	Erickson *et al.* 2002
Bald eagle (*Haliaeetus leucocephalus*)	T	T	Documented winter resident	Erickson *et al.* 2002
Merlin (*Falco columbarius*)	C	-	Possible breeder; one old PHS record from project area [T19N, R17E, Sec 8]	PHS 1981
Peregrine falcon (*Falco peregrinus*)	S	SC	Unlikely; most records in western WA; possible transient or migrant	Smith *et al.* 1997
Ferruginous hawk (*Buteo regalis*)	T	SC	Unlikely; most records in eastern WA in steppe zones; possible rare transient or migrant	Smith *et al.* 1997
Harlequin duck (*Histrionicus histrionicus*)	-	SC	Unlikely, occurs in fast flowing mountain rivers and streams; recorded in Kittitas Co. west of project	Smith *et al.* 1997
Spotted owl (*Strix occidentalis*)	E	T	Documented site centers north and west of project; PHS - T20N, R17E; T20N, R16E; T20N, R18E	PHS no date
Flammulated owl (*Otus flammeolus*)	C	-	Possible in forests nearby; unlikely in steppe habitats; recorded in Kittitas Co.	recorded in Kittitas Co.
Burrowing owl (*Athene cunicularia*)	-	SC	Unlikely due to species distribution in WA; possible in extreme eastern Kittitas Co.	Smith *et al.* 1997
Black tern (*Chlidonias niger*)	-	SC	Unlikely due to species distribution in WA; no records from Kittitas Co.	Smith *et al.* 1997
Pileated woodpecker (*Dryocopus pileatus*)	C	-	Possible in forests nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997
Black-backed woodpecker (*Picoides arcticus*)	C	-	Possible in forests/burns nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997
White-headed woodpecker (*Picoides albolarvatus*)	C	-	Possible in forests nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997
Lewis' woodpecker (*Melanerpes lewis*)	C	-	Possible in forests nearby, unlikely on-site; recorded in Kittitas Co.	Smith *et al.* 1997

Table 14 (*continued*).

Species	State Status	Federal Status	Occurrence	Documentation
Birds (*continued*)				
Vaux's swift (*Chaetura vauxi*)	C	-	Possible breeder; varied habitats below alpine habitats and excluding extensive steppe; recorded in Kittitas Co.	Smith *et al.* 1997
Olive-sided flycatcher (*Contopus borealis*)	-	SC	Possible breeder in forested habitats; recorded in Kittitas Co.	Smith *et al.* 1997
Willow flycatcher (*Empidonax traillii*)	-	SC	Possible breeder; moist forested areas, riparian habitats; recorded in Kittitas Co.	Smith *et al.* 1997
Sage thrasher (*Oreoscoptes montanus*)	C	-	Possible breeder; sagebrush shrublands; records from southern and eastern Kittitas Co.	Smith *et al.* 1997
Loggerhead shrike (*Lanius ludovicianus*)	C	SC	Possible breeder; shrub steppe, shrublands, agriculture, mixed habitats; recorded in Kittitas Co.	Smith *et al.* 1997
Sage sparrow (*Amphispiza belli*)	C	-	Possible breeder; sagebrush shrublands; records from southern and eastern Kittitas Co.	Smith *et al.* 1997
Mammals				
Gray wolf (*Canis lupus*)	E	E	Unlikely; unknown status in Washington but suitable habitat in North Kittitas Co., nearest PHS records from 1992 and 1993 from L.T. Murray State Wildlife Recreation Area southwest of I-90 [T19N, R16E, Sec 16, 34]	WDFW web page; WA GAP Analysis Project[a]; PHS 1992-1993
Grizzly bear (*Ursus arctos*)	E	T	Unlikely; unknown status in Washington but suitable habitat in North Kittitas Co., one PHS record north of project [T20N, R17E, Sec 15]	WA GAP Analysis Project; PHS 1993
Wolverine (*Gulo gulo*)	C	SC	Unlikely; generally associated with northern coniferous forest; suitable habitat in western Kittitas Co.; PHS record from northeast of project [T20N, R18E, Sec 29]	WA GAP Analysis Project; PHS 1991
Fisher (*Martes pennanti*)	E	SC	Unlikely resident; associated with mature coniferous forests; suitable habitat in western Kittitas Co.	WA GAP Analysis Project
Western gray squirrel (*Sciurus griseus*)	T	SC	Unlikely resident; suitable habitat in northeast Kittitas Co.; PHS records from south of I-90 in L.T. Murray State Wildlife Recreation Area [T19N, R16E, Sec 35]	WA GAP Analysis Project; PHS 1997, 2000

Table 14 (*continued*).

Species	State Status	Federal Status	Occurrence	Documentation
Mammals (*continued*)				
White-tailed jackrabbit (*Lepus townsendii*)	C	-	Possible resident; grassland/ shrub habitats; recorded in northeast Kittitas Co.	WA GAP Analysis Project
Black-tailed jackrabbit (*Lepus californicus*)	C	-	Possible resident; grassland/shrub habitats; records from southeast Kittitas Co.	WA GAP Analysis Project
Townsend's big-eared bat (*Coryhorhinus townsendii*)	C	SC	Unlikely resident; varied habitats but tends to prefer forested and riparian areas, hibernates in caves; no records from Kittitas Co.	WA GAP Analysis Project
Long-legged myotis (*Myotis evotis*)	-	SC	Unlikely due to habitat; coniferous and mixed forests, riparian areas; roosts caves, crevices, buildings, mines; potential habitat in western and northern Kittitas Co.	WA GAP Analysis Project
Long-eared myotis (*Myotis volans*)	-	SC	Unlikely due to habitat; primarily forested habitats and edges, juniper woodland, mixed conifers, riparian areas; roosts snags, crevices, bridges, buildings, mines; potential habitat in western and northern Kittitas Co.	WA GAP Analysis Project
Fringed myotis (*Myotis thysanodes*)	-	SC	Possible; varied habitats, forested or riparian habitats, shrublands; roosts buildings, trees; hibernates in mines and caves; potential habitat throughout eastern two-thirds of Kittitas Co.	WA GAP Analysis Project
Small-footed myotis (*Myotis ciliolabrum*)	-	SC	Possible; varied arid grasslands/ shrublands, mixed forests; roosts in crevices, cliffs; hibernates in caves, mines; records from eastern Kittias Co.	WA GAP Analysis Project
Yuma myotis (*Myotis yumanensis*)	-	SC	Possible resident; closely associated with water in varied habitats; no records from Kittitas Co.	WA GAP Analysis Project
Merriam's shrew (*Sorex merriami*)	C	-	Possible resident; sagebrush shrub and mesic grass/shrub habitats; records from southeast Kittitas Co.	WA GAP Analysis Project

Table 14 (*continued*).

Species	State Status	Federal Status	Occurrence	Documentation
Reptiles and Amphibians (*continued*)				
Striped whipsnake (*Masticophis taeniatus*)	C	-	Possible resident; occurs in grasslands, sagebrush, dry rocky canyons; records from eastern Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Sharptail snake (*Contia tenuis)*	C	-	Likely resident; found in stable talus slopes, damp/moist habitats; forest edges; records from Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Larch mountain salamander (*Plethodon larselli*)	S	SC	Unlikely resident; found in lava talus slopes; recorded in western Kittitas Co.	WA GAP Analysis Project
Western toad (*Bufo boreas*)	C	SC	Possible resident; occurs in spring pools, ponds, lake shallows, slow moving streams and uplands nearby; documented in Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Columbia spotted frog (*Rana luteiventris*)	C	SC	Likely resident; occurs in wetlands, marshy edges of ponds/lakes; documented throughout Kittitas Co.; two PHS records north of project T20N, R17E, Sec 22	WA GAP Analysis Project; Nussbaum *et al.* 1983; PHS 1992-1993
Cascades frog (*Rana cascadae*)	-	SC	Unlikely due to habitat; occurs in wet mountain meadows with ponds and potholes; records in western and northern Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983;
Red-legged frog (*Rana aurora*)	-	SC	Unlikely due to species range; moist forests, streams, and ponds; recorded in western Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983
Tailed frog (*Ascaphus truei*)	-	SC	Unlikely due to habitat; fast flowing permanent streams in forested areas; records in western and northern Kittitas Co.	WA GAP Analysis Project; Nussbaum *et al.* 1983;
Fish				
Chinook salmon (*Oncorhynchus tshawytscha*)	C	T	Yakima River and major tributaries; PHS record from Swauk Creek T20N, R17E and Yakima River T20N R16E	PHS 1997
Steelhead (*Oncorhynchus mykiss*)	C	T	Yakima River and major tributaries; PHS record from Swauk Creek T20N, R17E and Yakima River T20N R16E	PHS 1997
Bull trout (*Salvelinus confluentus*)	C	T	Yakima River and major tributaries; PHS records from Teanaway River and Yakima River T20N R16E	PHS 1997

Species	State Status	Federal Status	Occurrence	Documentation
Fish (*continued*)				
Westslope cutthroat (*Oncorhynchus clarki lewisi*)	-	SC	Yakima River and major tributaries	no records located
Interior Redband trout (*Oncorhynchus mykiss gairdneri*)	-	SC	Yakima River and major tributaries	no records located
Mountain sucker (*Catostomus platyrhynchus*)	C	-	Yakima River and major tributaries; PHS record from Teanaway River north west of project [T20N, R16E, Sec 25]	PHS 1994
Pacific lamprey (*Lampetra tridentate*)	-	SC	Yakima River and major tributaries	no records located

E=Endangered, T=Threatened, C=Candidate, S = Sensitive, SC=Species of Concern

[a] GAP Analysis Program (GAP). The Washington State Gap Analysis Project is based on a two primary data sources: vegetation types (actual vegetation, vegetation zone, and ecoregion) and species distribution. The two data sources are combined to map the predicted distribution of vertebrate species. More information about the Washington Gap Analysis Project can be found on the WDFW web page: www.wa.gov/wdfw/wlm/gap/dataprod.htm

Table 15. A summary of State and Federal sensitive species and State Monitor species observed during 2002 wildlife surveys at the Project site.

Species	Description
bald eagle	***State and Federally Threatened*** – Average of 5.6 bald eagles per winter driving survey, with a maximum survey day count of 12 (3/11/02). Winter use relatively high compared to other wind projects, but mostly along Yakima river. No bald eagle fatalities documented at any U.S. wind project.
golden eagle	***State Candidate*** –Six observations during fixed-point surveys, six during in-transit surveys. Much lower use at KVP (0.02-0.05 per 20-minute survey) compared to Foote Creek Rim (WY) (0.2 – 0.3 per 20-minute survey) and Altamont Pass (CA) (0.2-0.3 per 20-minute survey). One golden eagle was killed during two years of monitoring at the Foote Creek Rim Phase I and II facility.
merlin	***State Candidate*** – Two observations during spring and summer surveys. Occasional merlin observations have been recorded at several wind projects. No fatalities have been reported at U.S. wind projects.
Lewis's woodpecker	***State Candidate*** – One observation. Observed as a fatality at Vansycle in 1999.
loggerhead shrike	***State Candidate and Federal Species of Concern*** – Not observed during spring and summer avian use surveys. One observation during winter bald eagle surveys as well as two unidentified shrike observations. One fatality observed each at Altamont Pass and Tehachapi Pass (CA).
long-billed curlew	***State Monitor***[b] – One observation. Also observed occasionally at Stateline. No fatalities documented at any U.S. wind projects.
turkey vulture	***State Monitor*** – Twenty-five observations during fixed-point surveys, 31 during in-transit surveys. A few fatalities observed at U.S. wind projects, but apparently not very susceptible to collision due to foraging/scavenging behavior.
prairie falcon	***State Monitor*** – Five observations during the spring. Observed occasionally at most wind projects. One fatality documented at Foote Creek Rim (WY), two at Altamont Pass (CA), one at Montezuma Hills and one at Tehachapi Pass (CA).
gyrfalcon	***State Monitor*** – One observation during winter bald eagle surveys. No fatalities documented at U.S. wind projects.
osprey	***State Monitor*** – One observation during fixed-point surveys, one in-transit. No fatalities documented at U.S. wind projects.

text continued from page 37

POTENTIAL IMPACTS

Birds

Risk of Turbine Collision

Raptors

Based on the level of raptor use within the Project, raptor mortality is expected to be slightly higher compared to other wind projects with similar turbine types. American kestrels and red-tailed hawks account for much of the raptor use at the site, and are expected to be the species with the highest mortality. The potential exists for other raptor species to collide with turbines, including northern harrier, rough-legged hawk, bald eagle, and turkey vulture. However, the mortality risk associated with these species is expected to be lower than the risk for American kestrel and red-tailed hawk. Turkey vultures appear less susceptible to collision that most other raptors (Orloff and Flannery 1992). Very few northern harrier fatalities and no rough-legged hawk or bald eagle fatalities have been observed at wind projects to date. Golden eagle use of the site is low relative to other wind sites and the mortality risk for golden eagles is also expected to be very low.

As a group, raptor use ranged from 0.73 per 20-minute survey in the fall to 1.03 in the summer, with an overall average of approximately 0.9. For comparison, raptor use at three wind projects studied with the same methods[2] was lower. Raptor use at the Vansycle wind project was approximately 0.36 raptors per 20-minute survey; at the Buffalo Ridge wind project raptor use was approximately 0.49 raptors per 20-minute survey; and at the Foote Creek Rim wind project raptor use was approximately 0.73 raptors per 20-minute survey. Overall raptor use as well as habitat is most similar to the Foote Creek Rim, Wyoming wind project.

Raptor mortality at other newer generation wind projects has been very low. The estimate of raptor mortality at the Foote Creek Rim wind project in Wyoming is the highest observed and is 0.03 raptors per turbine per year based on a three-year study of 69 turbines (Young *et al.* 2002). No raptor mortality was observed at the Vansycle wind project in Oregon during a one-year study; and 1 raptor was recorded over a four-year study at the Buffalo Ridge wind project (Erickson *et al.* 2001).

---

[2] Fixed-point surveys were conducted following the same methods at all three wind projects but had variable survey duration. The calculated use at these wind projects was standardized to 20-minute duration surveys under the assumption that raptor observations were uniform across time for each survey period.

Considering these mortality results as well as raptor use estimates at these wind projects, it is estimated that potential raptor mortality at the proposed project would be approximately 25% greater than that of the Foote Creek Rim Wind project (or approximately 0.038 raptors per turbine per year). Using these raptor mortality rates, a range of approximately 0 to 4 raptor fatalities per year at the Project may be expected if 120 turbines are constructed. It should be noted that the fatality estimates may vary from the expected range based on many factors, including the number of occupied raptor nests near the wind project after construction, turbine size and other site specific and/or weather variables. It should also be noted that the majority of raptor fatalities are expected to be American kestrels and red-tailed hawks, two very common raptor species. No significant population level impacts to raptor species is anticipated.

<u>Passerines</u>

Passerines have been the most abundant avian fatality at other wind projects studied (see Johnson *et al.* 2000a, Johnson *et al.* 2002, Young *et al.* 2002, Erickson *et al.* 2000, Erickson *et al.* 2001), often comprising more than 80% of the avian fatalities. Both migrant and resident passerine fatalities have been observed. Given that passerines make up the vast majority of the avian observations on-site, it is expected passerines will make up the largest proportion of fatalities. Species most common to the study area will likely be most at risk, including western meadowlark, vesper sparrow and horned lark. Horned larks have been the most commonly observed fatality at several wind projects, including Vansycle and Foote Creek Rim (Erickson *et al.* 2000, Young *et al.* 2002). A few large flocks of birds such as American pipits were observed, but given their infrequent use, mortality would be expected to be low. Nocturnal migrating species may also be affected, but it is not expected that they would be found in large numbers based on data collected at other wind plants [i.e., no large mortality events documented (Erickson *et al.* 2001)]. Estimates of the percentage of bird fatalities that are migrants have ranged from approximately 30% at the Wisconsin wind plant to 60% at Buffalo Ridge, Minnesota (Erickson et al. 2001). Estimates of total bird mortality at other wind plants have ranged from approximately 0.6 birds per turbine per year at the Vansycle wind plant in Oregon to 2.8 birds per turbine per year at the Buffalo Ridge wind plant in Minnesota (Erickson *et al.* 2001). Provided 120 turbines are constructed at the proposed project, approximately 50-300 birds may be killed at the wind plant annually. The number of these that would be expected to be migrants would vary from approximately 30-180 birds. Actual levels of mortality that could result from the project may vary from these predictions. No significant population level impacts to passerine species is anticipated.

Carcass search studies at the Foote Creek Rim Wind Plant, Wyoming, have found avian casualties associated with guyed met towers. Based on searches of five permanent met towers at Foote Creek Rim over a three-year period, it was estimated that these towers resulted in approximately 8.1 avian casualties per tower per year (Young *et al.* 2002). The vast majority of these avian casualties were passerines. The nine permanent met towers proposed for the project would be expected to result in collision deaths for passerines at the site, although the use of bird flight diverter's on guy wires should reduce the risk of collision.

Waterfowl

Some waterfowl mortality has been documented at other wind plants (Erickson *et al.* 2001). However, studies at Foote Creek Rim, Vansycle, and Buffalo Ridge have not documented mortality of Canada geese, one the most common waterfowl species observed flying over the Project study area. Because of the low use of the site by waterfowl, little mortality would be expected from the project.

Other Groups/Species

Other avian groups (e.g., upland game birds, doves, shorebirds) occur in relatively low numbers within the study area and mortality would be expected to be low. Other species only observed during migration may be at risk; however, mortality would be expected to be low given the low use estimates by these species and groups.

Displacement

Most studies of displacement effects have been conducted in Europe, and most of the impacts have involved wetland habitats and groups of birds not common on this Project, including waterfowl, shorebirds and waders (Larsen and Madsen 2000, Pederson and Poulsen 1991, Vauk 1990, Winkelman 1989, Winkelman 1990, Winkelman 1992). Most disturbance has involved feeding, resting, and migrating birds in these groups (Crockford 1992). European studies of disturbance to breeding birds suggest negligible impacts and disturbance effects were documented during only one study (Pedersen and Poulsen 1991). For most avian groups or species or at other European wind plants, no displacement effects on breeding birds were observed (Karlsson 1983, Phillips 1994, Winkelman 1989, Winkelman 1990).

Avian displacement associated with wind power development has not received as much attention in the U.S. At a large wind plant on Buffalo Ridge, Minnesota, abundance of shorebirds, waterfowl, upland gamebirds, woodpeckers, and several groups of passerines was found to be significantly lower at survey plots with turbines than at plots without turbines. There were fewer differences in avian use as a function of distance from turbine, however, suggesting that the area of reduced use was limited primarily to those areas within 100 m of the turbines (Johnson *et al.* 2000a). A sizeable portion of these displacement effects are likely due to the direct loss of habitat near the turbine for the turbine pad and associated roads. These results are similar to those of Osborn *et al.* (1998) who reported that birds at Buffalo Ridge avoided flying in areas with turbines. Also at Buffalo Ridge, Leddy *et al.* (1999) found that densities of male songbirds were significantly lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. Grasslands without turbines as well as portions of grasslands located at least 180 m from turbines had bird densities four times greater than grasslands located near turbines. Reduced avian use near turbines was attributed to avoidance of turbine noise and maintenance activities and reduced habitat effectiveness due to the presence of access roads and large gravel pads surrounding turbines (Leddy 1996, Johnson *et al.* 2000a).

Construction and operation of the Foote Creek Rim wind plant did not appear to cause reduced use of the wind plant and adjacent areas by most avian groups, including raptors, corvids, or passerines (Johnson *et al.* 2000b). Some reduced use of the areas near turbines was apparent for a local population of mountain plovers. A pair of golden eagles successfully nested 0.5 miles from the wind plant after one phase was operational and another phase was under construction.

Avoidance of windplants by raptors has not been reported at any U.S. windplants, and anecdotal evidence indicates that raptor use of the Altamont Pass, California wind resource area (WRA) may have increased since installation of wind turbines (American Wind Energy Association 1995). Although displacement of birds by wind plants is not desirable, especially where important habitats may be limited, if other suitable habitats are available, one potential benefit of avian avoidance of turbines is the reduced potential for collision mortality to occur (Crockford 1992).

Based on the available information, it is probable that some displacement effects may occur to the grassland/shrub-steppe avian species occupying the study area. The extent of these effects and their significance is unknown and hard to predict but could range from none to several hundred feet, resulting in a low level of impacts.

Operation of the proposed project would not affect raptor nests unless there were displacement effects that caused raptors to not return to the nests close to the project site. Impacts would be considered very low, given the low density observed in close proximity to the turbines, and the species involved (red-tailed hawk).

Big Game

The project area is within a transition zone between the dry grassland/shrub steppe basin towards the Columbia River and the wetter coniferous forest of the east slope of the Cascade Mountains. Portions of the proposed wind plant are within habitats designated by WDFW as winter range for mule deer and elk, although the human development that has already occurred in the project area has likely reduced the quality of the winter range. In addition, portions of the wind plant are near elk calving areas and elk migration routes. Wintering elk forage on native grass species such as Sandberg's bluegrass, which greens up with fall and winter rains, while mule deer likely utilize more shrub species in the project area. Wind-blown slopes and ridges remain snow-free most of the year. West and south-facing slopes green up earlier and provide accessible nutritious forage during the harsh winter months. Elk travel through the area between seasons and calving occurs at Lookout Mountain during the spring.

Although this area has been designated as elk and deer winter range, significant amounts of human activity has already occurred within the project area. Highway 97, which accommodates an average of 2,200 vehicles a day, runs through the project area, with turbine strings on both sides of the road. Bettas and Hayward roads each serve approximately 20 vehicles per day. Several of the turbine strings and associated roads will follow existing roads which are currently used to access private property in the project area.

The WDFW has expressed some concern over the potential effects of wind project development on wintering big game. Winter is a crucial period of time for the survival of many big game species. Deer, for example, cannot maintain body condition during the winter because of reduced forage availability combined with the increased costs of thermogenesis (Reeve and Lindzey 1991). In other words, as deer expend more energy than they take in, body condition gradually declines throughout the winter (Short 1981). Unnecessary energy expenditures may increase the rate at which body condition declines, and the energy balance determining whether a deer will survive the winter is thought to be relatively narrow, especially for fawns (Wood 1998). Overwinter fawn survival may decrease in response to human activity or other disturbances (Stephenson *et al.* 1996). Roads and energy development may also fragment otherwise continuous patches of suitable habitat, effectively decreasing the amount of winter range available for big game. Fragmentation of habitat may also limit the ability of big game populations to move throughout the winter range as conditions change, causing big game to utilize less suitable habitat (Brown 1992).

Two published studies of big game winter use may be relevant to the development of wind turbines and wintering deer and elk (Rost and Bailey 1979, Van Dyke and Klein 1996). Van Dyke and Klein (1996) documented elk movements through the use of radio telemetry before, during and after the installation of a single oil well within an area used year round by elk. Drilling activities during their study ceased by November 15, however, maintenance activities continued throughout the year. Elk showed no shifts in home range between the pre and post drilling periods, however, elk shifted core use areas out of view from the drill pad during the drilling and post drilling periods. Elk also increased the intensity of use in core areas after drilling and slightly reduced the total amount of range used. It was not clear if the avoidance of the well site during the post drilling period was related to maintenance activities or to the use of a new road by hunters and recreationalists. The authors concluded that if drilling activities occupy a relatively small amount of elk home ranges, that elk are able to compensate by shifting areas of use within home ranges.

While several authors have documented elk avoiding roads within forested environments during the summer, the effects of roads and associated human activity on wintering elk and mule deer have not been well documented. Rost and Bailey (1979) found that wintering mule deer and elk avoided areas within 200 m of roads in eastern portions of their Colorado study area, where presumably greater amounts of winter habitat were present. Road avoidance was greater where roads were more traveled. Only mule deer showed a clear avoidance of roads in the western portion of their study area, where winter range was assumed to be more limiting. Mule deer also showed greater avoidance of roads in shrub habitats versus more forested areas. The authors concluded that impacts of roads depended on the availability of suitable winter range away from roads, as well as the amount of traffic associated with roads.

There is little information regarding wind project effects on big game. At the Foote Creek Rim wind project in Wyoming, pronghorn observed during raptor use surveys were recorded year round (Johnson *et al.* 2000b). The mean number of pronghorn observed at the six survey points was 1.07 prior to construction of the wind plant and 1.59 and 1.14/survey the two years immediately following construction, indicating no reduction in use of the immediate area. Mule deer and elk also occurred at Foote Creek Rim, but their numbers were so low that meaningful data on wind plant avoidance could not be collected.

The elk and mule deer on site primarily occupy the grassland/shrub-steppe habitats, springs, and riparian corridors. During the construction period, it is expected that elk and mule deer will be displaced from the site due to the influx of humans and heavy construction equipment and associated disturbance. Construction related disturbance and displacement is expected to be limited to the construction period time frame. Most construction will take place during the summer months, minimizing construction disturbance to wintering big game. Following completion of the wind plant, the disturbance levels from construction equipment and humans will diminish and the primary disturbances will be associated with operations and maintenance personnel, occasionally vehicular traffic, and the presence of the turbines and other facilities.

Due to the lack of knowledge regarding the potential impacts of energy development on big game, it is difficult to predict with certainty the effects of the proposed wind project on mule deer and elk. Van Dyke and Klein (1996) showed wintering elk shifted use of core areas out of view of human related activities associated with an oil well and access road. Most turbines and roads in the project area will be located on ridges and will be visible over a fairly large area. Where wind turbines will be constructed in elk wintering areas, elk may concentrate use away from the wind development during construction. While human related activity at wind turbines during regular maintenance will be less than during the construction period, it is not known if human activity associated with regular maintenance activity will exceed tolerance thresholds for wintering elk. If tolerance thresholds during regular maintenance activities are exceeded, elk are likely to permanently utilize areas away from the wind development. Given the amount of residential development and the existing roads and disturbance within the project area (approximately half are existing roads that will be improved), and including Highway 97 which runs through the middle of the project area, disturbance levels after operation begins will not be greatly increased.

The proposed wind facility occurs approximately 3 miles southeast of mapped elk calving areas. Assuming calving areas are mapped accurately, the proposed project is not likely to impact the mapped calving area.

Bats

The potential for bats to occur is based on key habitat elements such as food sources, water, and roost sites. Potential roost structures such as trees are abundant along the riparian areas within the project area. Ponds in the project area such as those located along the Dry Creek drainage may be used as foraging and watering areas. Little is known about bat species distribution, but several species of bats could occur in the project area based on the Washington GAP project and inventories conducted on the Handford Site, Arid Lands Ecology Reserve (ALE) located in Benton County to the southeast (Table 16).

Bat research at other wind plants indicates that migratory bat species are at some risk of collision with wind turbines, mostly during the fall migration season. It is likely that some bat fatalities would occur at the proposed project site. Most bat fatalities found at wind plants have been tree-dwelling bats, with hoary and silver-haired bats being the most prevalent fatalities. Both hoary bats and silver-haired bats may use the forested habitats near the project site and may migrate through the Project.

At the Buffalo Ridge Wind Plant, Minnesota, based on a 2-year study, bat mortality was estimated to be 2.05 bats per turbine per year (Johnson *et al.*, 2000b). At the Foote Creek Rim Wind Plant, based on 2 years of study, bat mortality was estimated at 1.51 bats per turbine per year (Young *et al.*, 2001). At the Vansycle Ridge Wind Plant in Oregon, bat mortality was estimated at 0.74 bats per turbine for the first year of operation (Erickson *et al.*, 2000).

Although potential future mortality of migratory bats is difficult to predict, an estimate can be calculated based on levels of mortality documented at other wind plants. Using the estimates from other wind plants, full buildout of the proposed project could result in approximately 240 bat fatalities per year. Actual levels of mortality are unknown and could be higher or lower depending on regional migratory patterns of bats, patterns of local movements through the area, and the response of bats to turbines, individually and collectively. The significance of this impact is hard to predict since there is very little information available regarding bat populations. Studies do suggest resident bats do not appear to be significantly impacted by wind turbines (Johnson et al. 2002, Gruver 2002), since almost all mortality is observed during the fall migration period. Furthermore, hoary bat, which is expected to be the most common fatality, is one of the most widely distributed bats in North America. Preconstruction studies to predict impacts to bats may be relatively ineffective, because current state-of-the-art technology for studying bats does not appear to be highly effective for documenting migrant bat use of a site (Johnson et al. 2002).

Table 16. Bat species of potential occurrence in the Project area.

Common Name and Scientific Name	Typical Habitat	Expected Occurrence in Project Area	Occurrence Documentation
California bat *Myotis californicus*	Generally found in open habitats where it forages along tree edges, riparian areas, open water; roosts in cliffs, caves, trees	Possible; documented on ALE	WA GAP Analysis Project[a] England, 2000; Fitzner and Gray, 1991
small-footed myotis *Myotis ciliolabrum*	Varied arid grass/shrublands, ponderosa pine and mixed forests; roosts in crevices and cliffs; hibernates in caves, mines	Possibe; documented on ALE	WA GAP Analysis Project; England ,2000; West *et al.*, 1998, 1999
long-eared myotis *Myotis evotis*	Primarily forested habitats and edges, juniper woodland, mixed conifers, riparian areas; roosts snags, crevices, bridges, buildings, mines	Unlikely due to habitat; not documented on ALE	WA GAP Analysis Project; England, 2000; TNC, 1999
little brown bat *Myotis lucifugus*	Closely associated with water; riparian corridors; roosts buildings, caves, hollow trees; hibernates in caves	Possible; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999
fringed myotis *Myotis thysanodes*	Primarily forested or riparian habitats; roosts buildings, trees; hibernates in mines and caves	Possible in suitable habitat; not documented on ALE	WA GAP Analysis Project; England, 2000; TNC, 1999
long-legged myotis *Myotis volans*	Coniferous and mixed forests, riparian areas; roosts caves, crevices, buildings, mines	Possible in suitable habitat; documented on ALE	WA GAP Analysis Project; England, 2000; itzner and Gray, 1991
yuma myotis *Myotis ymanensis*	Closely associated with water; varied habitats: riparian, shrublands, forests woodlands; roosts in mines, buildings, caves, bridges	Possible; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999
hoary bat *Lasiurus cinereus*	Forested habitats, closely associated with trees; roosts in trees; migratory species	Possible in suitable habitat; probable migrant; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999
silver-haired bat *Lasionycteris noctivagans*	Forested habitats; generally coniferous forests; roosts under bark; believed to be a migratory species	Possible in suitable habitat; probable migrant; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999
western pipistrelle *Pipistrellus hesperus*	Primarily desert lowlands; desert shrublands; canyons; roosts under rocks, crevices and possibly in sagebrush	Possible; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999

Table 16 (*continued*).

Common Name and Scientific Name	Typical Habitat	Expected Occurrence in Project Area	Occurrence Documentation
big brown bat *Eptesicus fuscus*	Generally deciduous forests; buildings; roosts in buildings, trees, crevices; hibernates in caves, mines	Possible; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999
spotted bat *Euderma maculatum*	Varied habitat—pine forests to desert scrub with nearby cliffs; roosts in crevices, cliff faces	Unlikely due to rarity; not documented on ALE	WA GAP Analysis Project; England, 2000; TNC, 1999
Townsend's big-eared bat *Corynorhinus townsendii*	Varied habitats—forests to desert scrub; roosts in buildings, caves, mines, bridges; hibernates in caves	Possible in suitable habitat; not documented on ALE	WA GAP Analysis Project; England, 2000; TNC, 1999
Pallid Bat *Antrozous pallidus*	Generally occurs in arid regions, desert scrub habitats; roosts in cliff faces, caves, mines, buildings	Unlikely due to lack of suitable habitat; documented on ALE	WA GAP Analysis Project; England, 2000; West *et al.*, 1998, 1999

[a] GAP Analysis Program (GAP). The Washington State Gap Analysis Project is based on a two primary data sources: vegetation types (actual vegetation, vegetation zone, and ecoregion) and species distribution. The two data sources are combined to map the predicted distribution of vertebrate species. More information about the Washington Gap Analysis Project can be found on the WDFW web page: www.wa.gov/wdfw/wlm/gap/dataprod.htm

Other Mammals

Other mammals that likely exist within the project site include, badger, coyote, pocket gopher, bobcat, American pika, and other small mammals such as rabbits, voles and mice. Construction of the wind project may affect these mammals on site through loss of habitat and direct mortality of individuals occurring in construction zones. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. Road and facility construction will result in loss of foraging and breeding habitat for small mammals. Ground-dwelling mammals will lose the use of the permanently impacted areas; however, they are expected to repopulate the temporarily impacted areas. Some small mammal fatalities can be expected from vehicle activity. Impacts are expected to be very low and not significant.

Reptiles and Amphibians

Construction of the wind project may affect reptiles and amphibians on site through loss of habitat and direct mortality of individuals occurring in construction zones. The level of mortality associated with construction would be based on the abundance of the species on site. Some mortality may be expected as common reptiles such as short-horned lizards and yellow-bellied racers often retreat to underground burrows for cover or during periods of winter dormancy. Excavation for turbine pads, roads, or other wind project facilities could kill individuals in underground burrows. While above ground, yellow-bellied racers and other snakes are generally mobile enough to escape construction equipment, however, short-horned lizards do not move fast over long distances and rely heavily on camouflage for predator avoidance. Some individual lizard fatalities can be expected from vehicle activity. Impacts are expected to be very low and not significant.

Fish

Facilities for the project are located more than ¼ mile from the Yakima River, and the small tributaries such as Dry Creek apparently do not support fish habitat (PHS data). No impacts to fish are likely to occur as a result of the project.

Threatened and Endangered Species Impacts

The project area occurs within the potential range of 21 bird, 14 mammal, eight reptile and amphibian and six fish species which are of interest based on designations made under the State of Washington or Federal Endangered Species Act, or which are species of concern because of declining numbers (Table 13). Several of these species are unlikely to occur within the project area due to limited habitat or occurrence on the periphery of the known species distributions. These species are not likely to occur within the project area and the Project should have no effect on them.

Birds
Bald eagle and northern spotted owl are the only bird species listed under the Endangered Species Act that may potentially occur within the project area. Bald eagle is documented wintering, but not breeding within the project area. While bald eagle fatalities have not been documented at other wind sites, bald eagle winter use is higher surrounding the project area than at other wind sites. Few bald eagles were observed within the project area during surveys, rather most bald eagles were observed along the Yakima River and in areas where cattle are pastured. Although the risk is low, the potential exists for bald eagle fatalities at the proposed wind project.

Northern spotted owl site centers and associated territory buffers are mapped by the WDFW approximately ½ mile to the north of the project area. Spotted owls occur almost exclusively within forested environments. The project area is located within the transition zone between forest and grassland. No nesting habitat is present within the project area. Although possible, it is unlikely that spotted owls will hunt within or disperse through the project area. The project is not expected to impact the northern spotted owl.

Northern goshawks are documented as breeding within the National Forest a few miles from the Project. Although the project area does not contain suitable nesting habitat for northern goshawks, the species may occasionally occur within the project area while hunting or migrating. This is expected to be a very rare occurrence, as no goshawks were observed during surveys within the project area. The proposed project is not expected to affect northern goshawks.

One historic record of a breeding merlin is present within the project area, and two merlins were observed during avian use surveys. No merlin fatalities have been documented at other wind plants and considering the low use of the project area by merlins, the proposed project is not expected to impact merlins in the area.

Mammals
The project occurs within the potential range of several species of federally and state protected mammals, which are unlikely to occur within the project area due to habitat constraints and/or uncertain population status in Washington. These species include gray wolf, grizzly bear, wolverine, fisher, western gray squirrel, Townsend's big-eared bat, long-legged myotis, and long-eared myotis. These species are not expected to occur within the project area and no impacts to these species are likely to occur.

Both the white-tailed and black-tailed jackrabbits have been documented within Kittitas County, and suitable habitat for these species is present in the project area. Assuming these species are present in the project area, the potential exists for individuals to be killed by vehicles on roads, and some suitable habitat for these species will be lost to turbine pads and road construction. Limits on vehicle speeds within the Project will minimize the potential for roadkills, and the permanent loss of suitable habitat is relatively small. Overall, impacts to these species should be minimal.

Suitable habitat for three bat species, which are listed as federal species of concern, is present within the project area: fringed myotis, small-footed myotis and Yuma myotis. However, only general descriptions of habitat requirements and potential distribution are available for the three species. Very little is known concerning the ecology of the three species, making it even more difficult to accurately predict potential impacts to these species. To date, we are unaware of any documented fatalities of these species at wind projects within the U.S.

Merriam's shrew has been documented within Kittitas County, and suitable habitat for the species occurs within the project area. Assuming the species is present within the project area, the construction of turbine pads and roads, and vehicle traffic has the potential to crush individuals within burrows or moving about above ground. Overall, total impacts to habitat are small and no significant impacts to the species are expected to occur as a result of this project.

Reptiles and Amphibians

There is very little suitable habitat for amphibians or aquatic reptiles (e.g., turtles) in the Project area. Two species of sensitive-status amphibians have been documented near the Project by the WDFW (PHS database), including tailed frog and Columbia spotted frog, however, these species are not expected to be impacted by the project.

Fish
Eight species of state and federally protected fish species occur within the Yakima River and major tributaries. However, facilities for the project are located more than ¼ mile from the Yakima River, and the small tributaries such as Dry Creek apparently do not support fish habitat (PHS data). No

impacts to state or federally protected species are likely to occur as a result of this project.

MITIGATION AND MONITORING

It is recommended that a Technical Advisory Committee (TAC) be convened to evaluate the mitigation and monitoring program and determine the need for further studies or further mitigation measures. The TAC should be composed of representatives from Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Kittitas County, local interest groups (e.g., Kittitas Audubon Society), project landowners, and the project proponent. The role of the TAC will be to coordinate appropriate mitigation measures, monitor impacts to wildlife and habitat, and address issues that arise regarding wildlife impacts during construction and operation of the wind plant. The post-construction monitoring plan should be developed in coordination with the TAC.

Mitigation

The following are potential mitigation measures for impacts to wildlife from construction and operation of the KVP Wind Farm:

- An environmental inspector should be designated by the TAC (see above) to monitor construction activity and ensure compliance with the mitigation measures.

- Sensitive habitat areas such as springs, riparian corridors, and raptor nest sites should be mapped, flagged, and identified to all contractors working on-site and should be designated as "no disturbance zones" during the construction phase. If any new nesting, denning, or otherwise sensitive wildlife sites are located during construction, these areas should also be mapped and flagged and included in the off-limit areas.

- During project construction, best management practices should be employed to reduce peripheral impacts to adjacent vegetation and habitats and to minimize the construction footprint.

- All areas disturbed during construction should be re-seeded with native plant mixes to minimize the spread of noxious weeds.

- Any hay bales used during construction should be certified as weed free.

- A site management plan should be developed in coordination with the TAC to address the following items at a minimum:
    - minimizing road construction and vehicle use where possible to reduce impacts to sensitive habitats
    - educating construction personnel to the sensitive nature of the habitat and wildlife resources
    - maintaining and enforcing reasonable driving speeds so as not to harass or accident-

ally strike wildlife
    - providing adequate on-site waste disposal
    - identifying off-limit zones
    - identifying fire management and erosion control procedures
    - identifying animal carcasses that may attract eagles and other raptors and arrange for removal

- The raptor nests on-site should be monitored for activity prior to construction of the wind plant to determine the need for construction timing and use restrictions around the nest or adjustment to the project design to avoid impacts.

- All new power and communication poles on-site should be fitted with perch guards

- Powerline conductor spacing should be set to minimize the potential for raptor electrocutions

- Guyed permanent met towers should be equipped with Bird Flight Diverters (BFD's) to minimize the potential for avian collisions with guy wires.

- If warranted due to winter weather conditions and the presence of substantial numbers of elk and mule deer in the area, construction will take not take place during critical winter periods to minimize disturbance to wintering big game.

Monitoring

A post construction monitoring study is recommended for the project to quantify impacts to avian species and to assess the adequacy of mitigation measures implemented and the need for additional measures. A monitoring plan for the project should consider the following components: 1) fatality monitoring involving standardized carcass searches, scavenger removal trials, searcher efficiency trials, and reporting of incidental fatalities by maintenance personnel and others; 2) a minimum of one breeding season raptor nest survey of the Project and a 1 mile buffer to locate and monitoring active raptor nests potentially affected by the construction and operation of the wind plant.

The protocol for the fatality monitoring study should be similar to protocols used at the Vansycle Wind Plant in northeastern Oregon (Erickson *et al.* 2000) and the Stateline Wind Plant in Washington and Oregon (FPL *et al.* 2001).

REFERENCES

American Wind Energy Association. 1995. Avian interactions with wind energy facilities: a summary. Prepared by Colson & Associates for AWEA, Washington, D.C.

Brown, C. G. 1992. Movement and migration patterns of mule deer in southeastern Idaho. Journal of Wildlife Management 56: 246-253.

Crockford, N.J. 1992. A review of the possible impacts of wind farms on birds and other wildlife. JNCC Report No. 27. Joint Nature Conservancy Committee, Peterborough, UK. 60pp.

Eagle Cap Consulting and CH2M HILL. 2002. An investigation of rare plant resources associated with the proposed Kittitas Valley wind power project (Kittitas County, Washington).

England, A.E. 2000. North American Bat Ranges. U.S. Geological Survey. Map format.

Erickson, W. P., G. D. Johnson, D. P. Young, Jr., M. D. Strickland, R. E. Good, M. Bourassa, K. Bay. 2002. Synthesis and comparison of baseline avian and bat use, raptor nesting and mortality information from proposed and existing wind developments. Technical Report prepared for Bonneville Power Administration, Portland, Oregon.

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young, Jr., K. J. Sernka and R. E. Good. 2001. Avian collisions with wind turbines: A summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee Publication. http://www.nationalwind.org/pubs/default.htm

Erickson, W. P., G. D. Johnson, M. Dale Strickland, and Karen Kronner. 2000. Avian and bat mortality associated with the Vansycle Wind Plant, Umatilla County Oregon. 1999 study year. Technical report submitted to Umatilla County Department of Resource Services and Development, Pendleton, Oregon. 22 pp.

Fitzner, R.E and R.H Gray. 1991. The status, distribution, and ecology of wildlife on the U.S. DOE Hanford Site: A historical overview of research activities. Environmental Monitoring and Assessment 18:173-202.

FPL Energy Inc., W.P. Erickson and K. Kronner. 2001. Avian and bat monitoring plan for the Washington portion of the Stateline Wind Project. Technical Report prepared for Walla Walla Regional Planning Department. May, 2001.

Franklin, Jeny F. and C.T. Dyrness. 1988. *Natural Vegetation of Oregon and Washington*. Oregon State University Press, Corvallis, Oregon.

Johnson, G.D., M.K. Perlik, W.P. Erickson, M.D. Strickland, D.A. Shepherd, and P. Sutherland, Jr. 2003. Bat interactions with wind turbines at the Buffalo Ridge, Minnesota Wind Resource Area. Electric Power Research Institute, Concord, California. In Press.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. *Wildlife Society Bulletin* 30:879-887.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd and D. A. Shepherd. 2000a. Avian monitoring studies. Buffalo Ridge, Minnesota Wind Resource Area, 1996-1999, results of a 4-year study. Technical Report prepared for Northern States Power Co., Minneapolis, MN. 212 pp.

Johnson, G.D., D.P. Young, Jr., C.E. Derby, W.P. Erickson, M.D. Strickland, and J.W. Kern. 2000b. Wildlife Monitoring Studies, SeaWest Windpower Plant, Carbon County, Wyoming, 1995-1999. Tech. Rept. prepared by WEST for SeaWest Energy Corporation and Bureau of Land Management. 195pp.

Karlsson, J. 1983. Interactions between birds and aerogenerators. Lund, Ekologihuset.

Larsen, J.K. and J. Madsen. 2000. Effects of wind turbines and other physical elements on field utilization by pink-footed geese (Anser brachyrhynchus): A landscape perspective. Landscape Ecology 15:755-764.

Leddy, K.L. 1996. Effects of wind turbines on nongame birds in Conservation Reserve Program grasslands in southwestern Minnesota. M.S. Thesis, South Dakota State Univ., Brookings. 61pp.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands. Wilson Bulletin 111:100-104.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho. 332 pp.

Orloff, S., and A. Flannery. 1992. Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas, 1989-1991. Final report to Alameda, Costra Costa, and Solano Counties and the California Energy Commission. Biosystems Analysis, Inc. Tiburon, CA.

Osborn, R.G., C.D. Dieter, K.F. Higgins, and R.E. Usgaard. 1998. Bird flight characteristics near wind turbines in Minnesota. Am. Midl. Nat. 139:29-38.

Pederson, M.B. and E. Poulsen. 1991. Impact of a 90m/2MW wind turbine on birds - avian responses to the implementation of the Tjaereborg wind turbine at the Danish Wadden Sea. Dansek Vildundersogelser, Haefte 47. Miljoministeriet & Danmarks Miljoundersogelser.

Phillips, J.F. 1994. The effects of a windfarm on the upland breeding bird communities of Bryn Titli, Mid-Wales: 1993-1994. Royal Society for the Protection of Birds, The Welsh Office, Bryn Aderyn, The Bank, Newton, Powys.

Reeve, A. F. and F. G. Lindzey. 1991. Evaluation of mule deer winter mortality in south-central Wyoming. Wyoming Cooperative Fish and Wildlife Research Unit, Laramie, WY. 147 pp.

Rost, G. R. and J. A. Bailey. 1979. Distribution of mule deer and elk in relation to roads. Journal of Wildlife Management 43(3): 634-641.

Short, H. L. 1981. Nutrition and metabolism. Pages 99-127 *in* O.C. Wallmo, editor. Mule and black-tailed deer of North America. University of Nebraska Press, Lincoln, NE.

Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding birds of Washington state, location data and predicted distributions. Seattle Audubon Society Publications in Zoology No. 1. Seattle. 538 pp.

Stephenson, T. R., M. R. Vaughan, and D. E. Andersen. 1996. Mule deer movements in response to military activity in southeast Colorado. Journal of Wildlife Management 60: 777-787.

The Nature Conservancy. 1999. Biodiversity Inventory and Analysis of the Hanford Site: Final

Report 1994-1999. The Nature Conservancy of Washington, Seattle, Washington.
Van Dyke, F. and W.C. Klein. 1996. Response of elk to installation of oil wells. Journal of Mammalogy 77(4): 1028-1041.
Vauk, G. 1990. Biological and ecological study of the effects of construction and operation of wind power sites. Jahrgang/Sonderheft, Endbericht. Norddeutsche Naturschutzakademie, Germany.
Washington GAP Analysis Project. Washington Cooperative Fish and Wildlife Research Unit (WCFWRU). 1999. University of Washington, Seattle, Washington <http://www.fish.washington.edu/naturemapping/wagap/public_html/index.html>
West, S.D., R. Gitzen, and J.L. Erickson. 1998. Hanford Vertebrate Survey: Report of Activities for the 1997 Field Season. Technical Report to The Nature Conservancy of Washington.
West, S.D., R. Gitzen, and J.L. Erickson. 1999. Hanford Vertebrate Survey: Report of Activities for the 1998 Field Season. Technical Report to The Nature Conservancy of Washington.
Winkelman, J.E. 1989. Birds at a windpark near Urk: bird collision victims and disturbance of wintering ducks, geese and swans. Rijksinstituut voor Natuurbeheer, Arnhem. RIN-Rapport 89/15.
Winkelman, J.E. 1990. Disturbance of birds by the experimental wind park near Oosterbierum (Fr.) during building and partly operative situations [1984-1989]. RIN-report 90/9, DLO-Institute for Forestry and Nature Research, Arnhem.
Winkelman, J. 1992. The impact of the SEP wind park near Oosterbierum (Fr.), the Netherlands, on birds, 4: Disturbance. RIN-report 92/5, DLO-Institute for Forestry and Nature Research, Arnhem.
Winkelman, J.E. 1994. Bird/wind turbine investigations in Europe. Pp. 43-47 in Proceedings of the National Avian-Windpower Planning Meeting. National Wind Coordinating Committee/RESOLVE. Washington, D.C.
Wood, A. 1988. Use of shelter by mule deer during winter. Prairie Naturalist 20: 15-22.
Young, D. P. Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and J. P. Eddy. 2002. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming: November 1998 - June 2000. Technical Report prepared by WEST, Inc. for Pacificorp, Inc., SeaWest Windpower, Inc. and Bureau of Land Management.

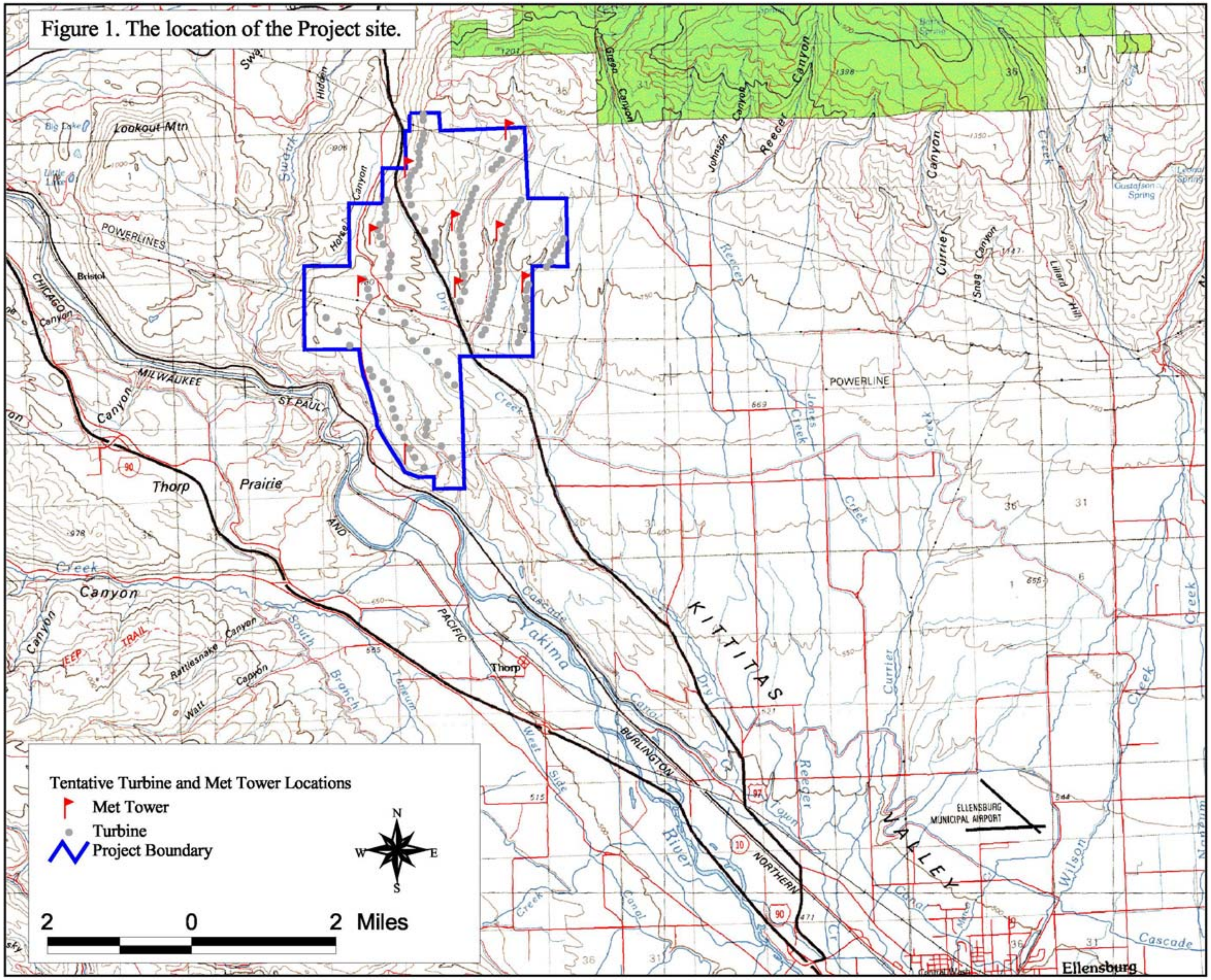


Figure 1. The location of the Project site.
Tentative Turbine and Met Tower Locations
Met Tower
Turbine
Project Boundary
2
0
2 Miles
N
S
E
W
Lookout Mtn
POWERLINES
Bristol
CHICAGO
MILWAUKEE
ST PAUL
Thorp
Prairie
Canyon
Creek
KITTITAS
VALLEY
Yakima
River
BURLINGTON
NORTHERN
PACIFIC
POWERLINE
ELLENSBURG MUNICIPAL AIRPORT
Ellensburg
Reecer
Currier
Wilson
Cascade
Dry
Johnson Canyon
Green Canyon
Rattlesnake
Watt
JEEP TRAIL
South Branch
West Side
Gustafson Spring
Lillard Hill
Snag Canyon

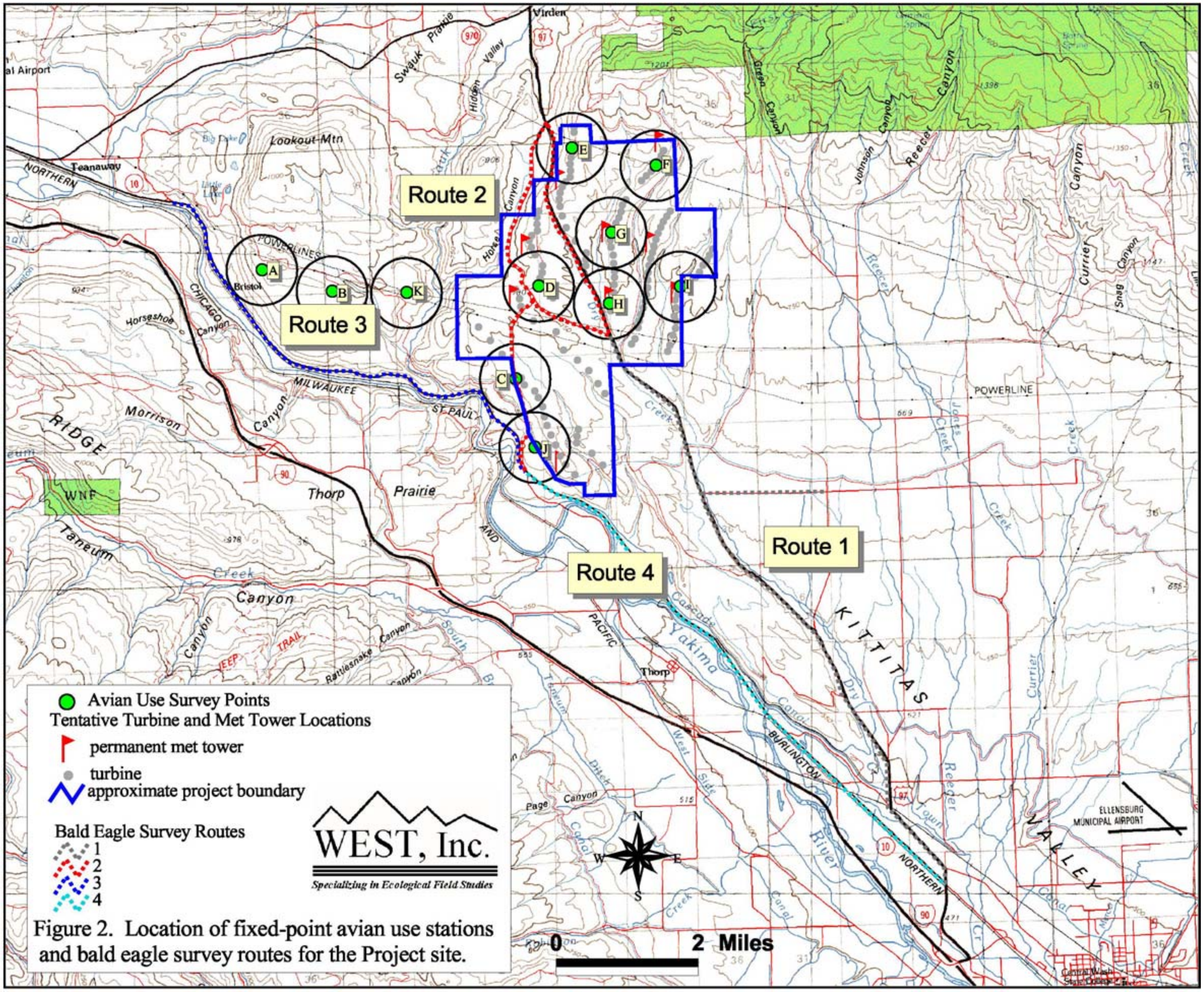


Figure 2. Location of fixed-point avian use stations and bald eagle survey routes for the Project site.

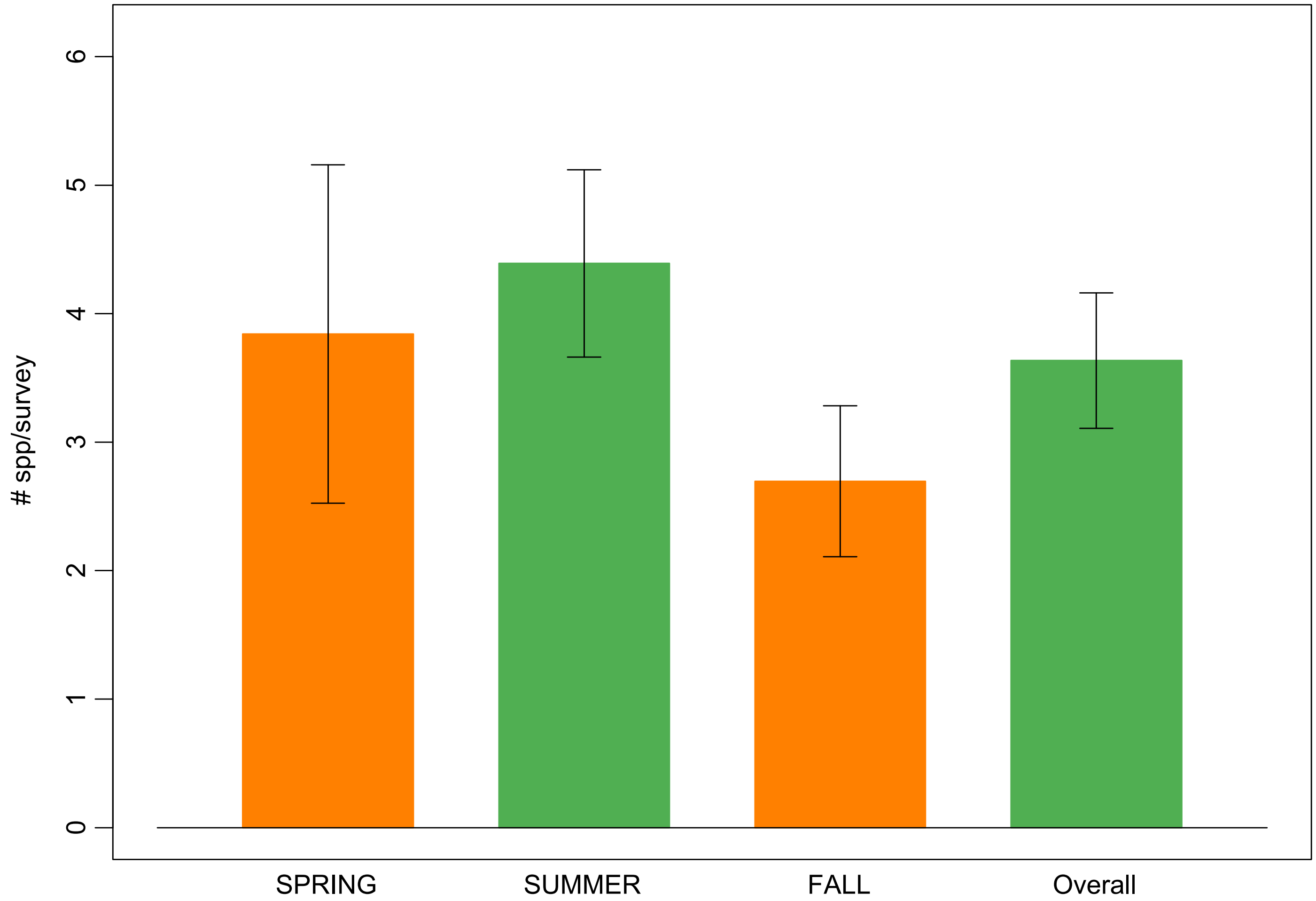


Figure 3. Mean number of species observed per survey per season.

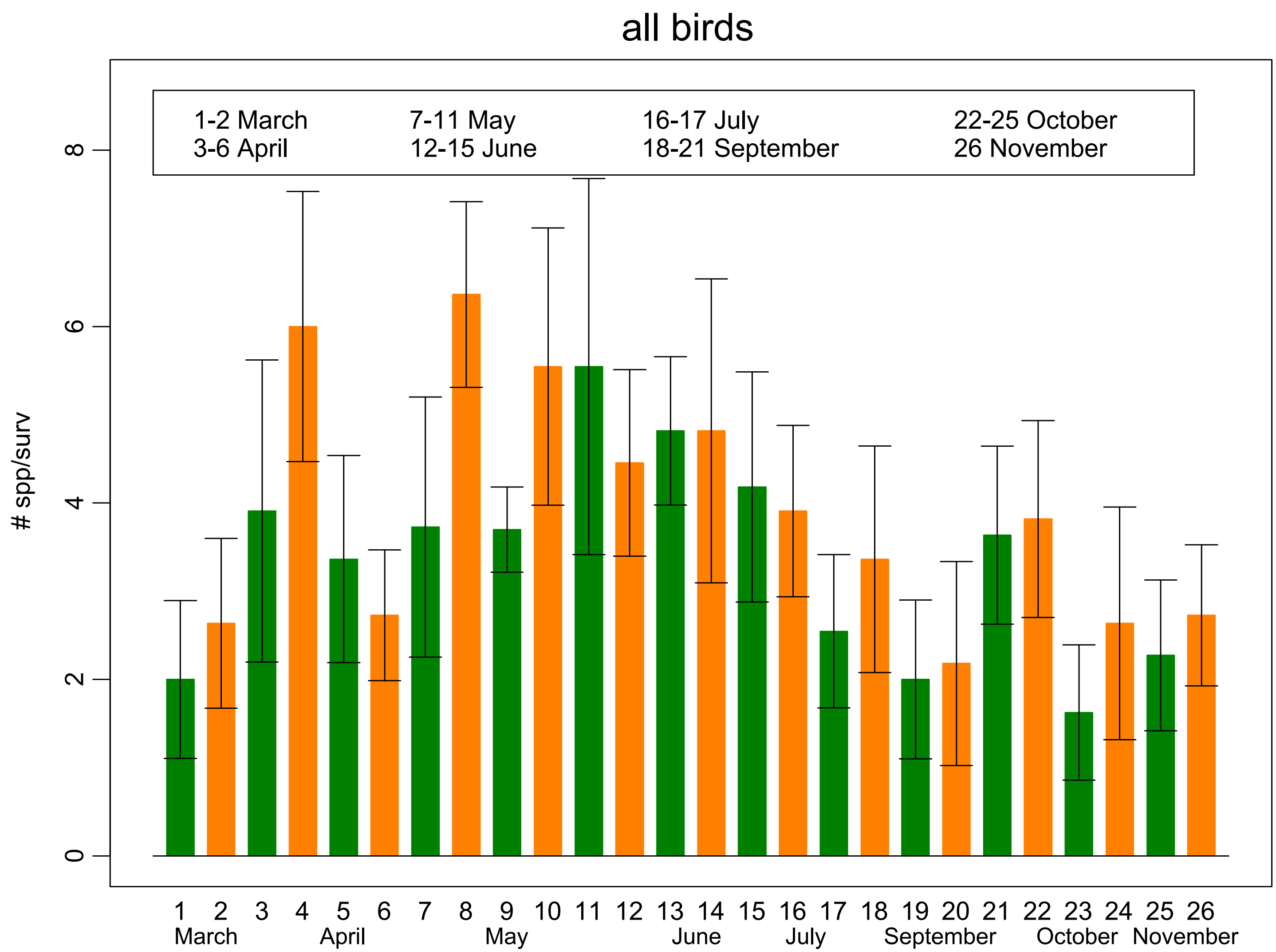


Figure 4. Mean number of species observed per survey per season.

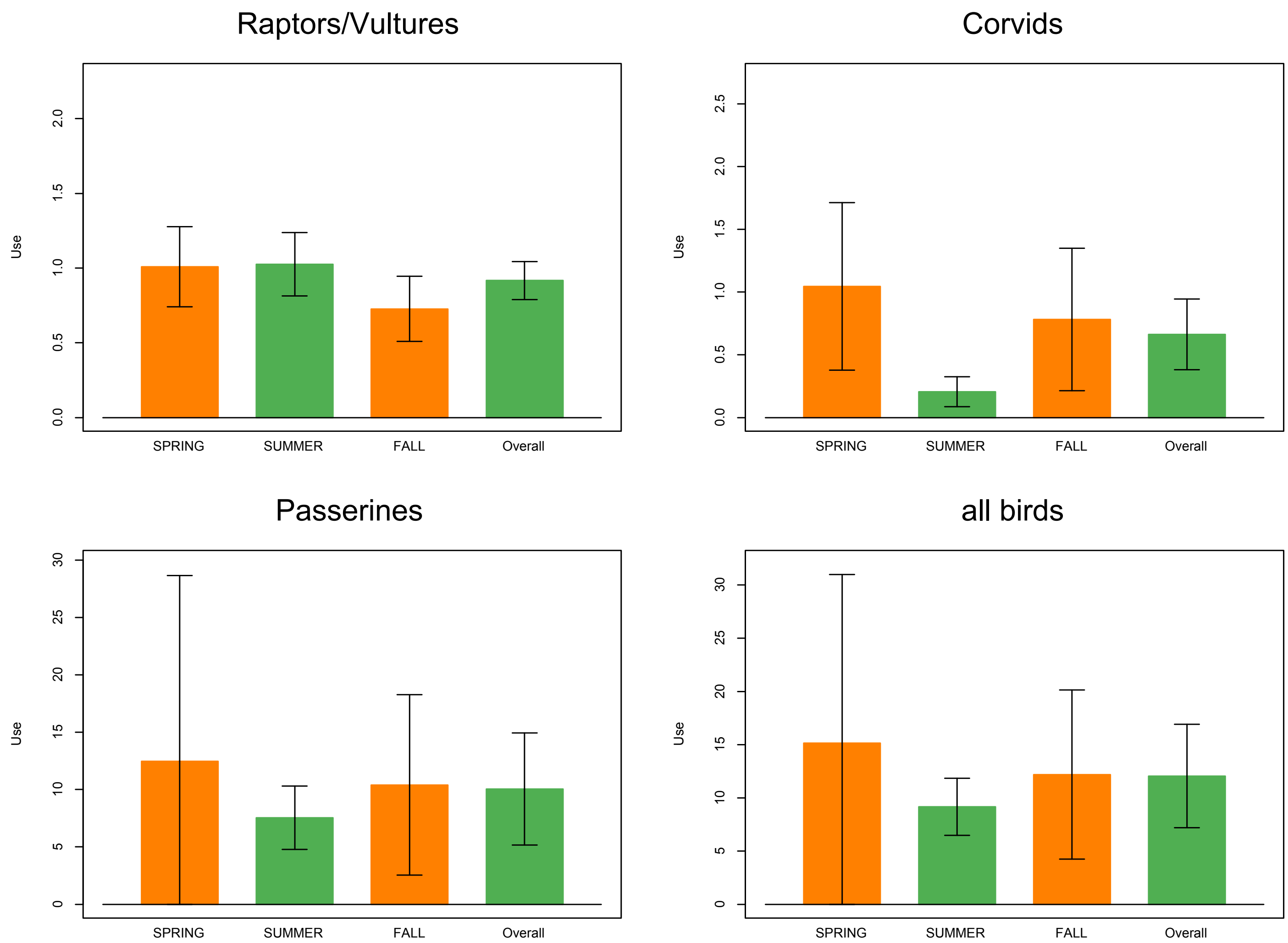


Figure 5. Avian use by major bird group.

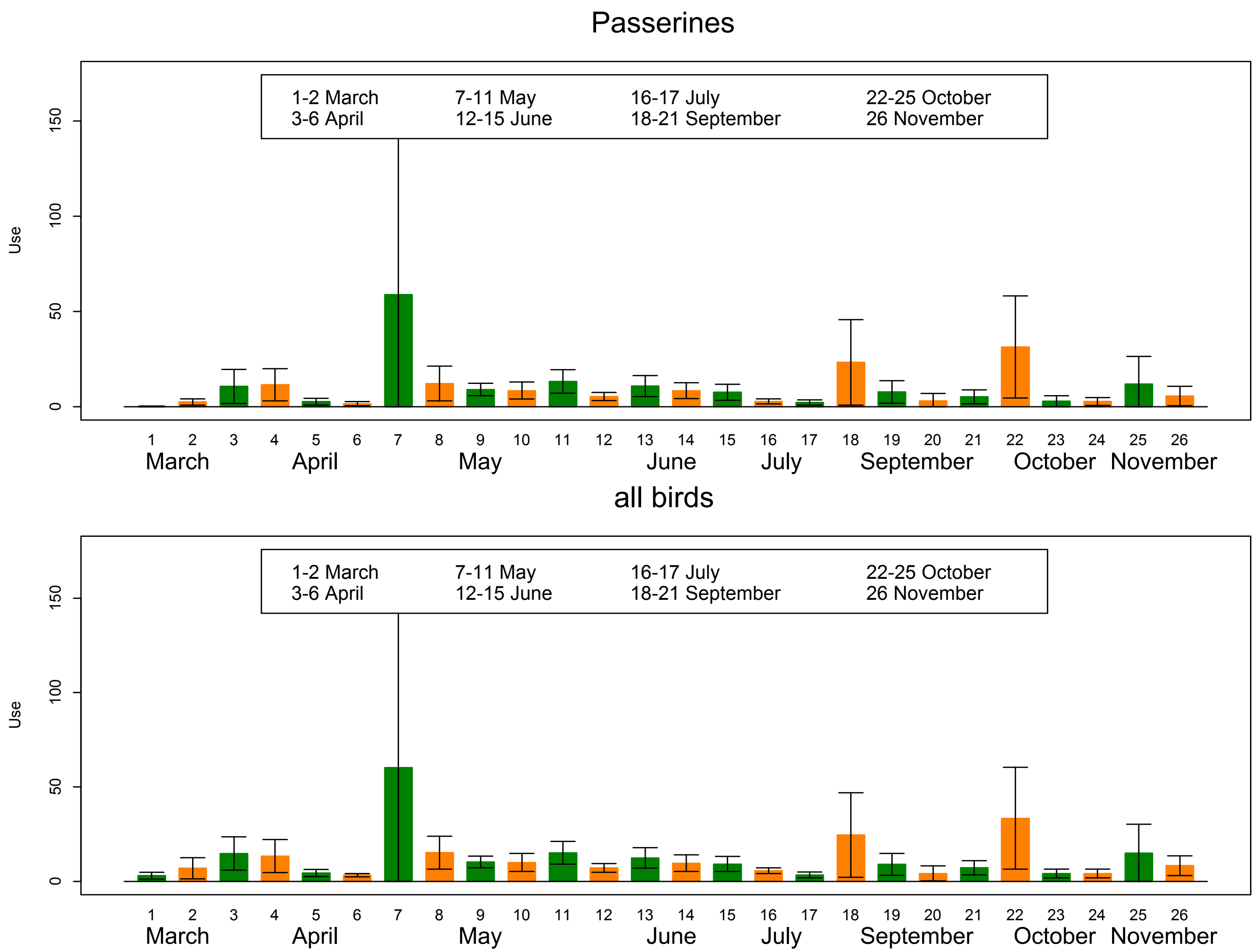


Figure 6. Mean use by visit for passerines and all birds combined.

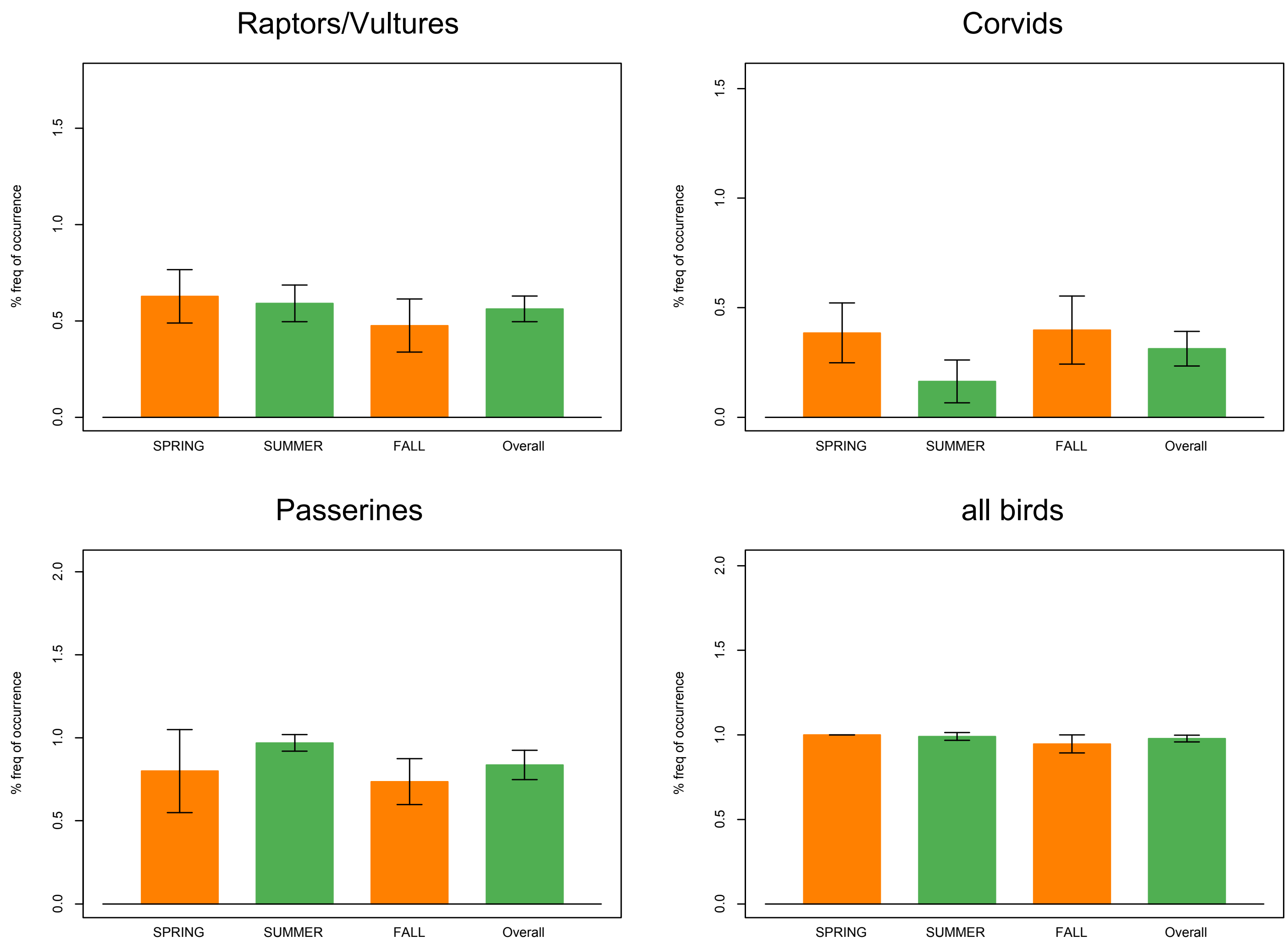


Figure 7. Frequency of use by major bird groups.

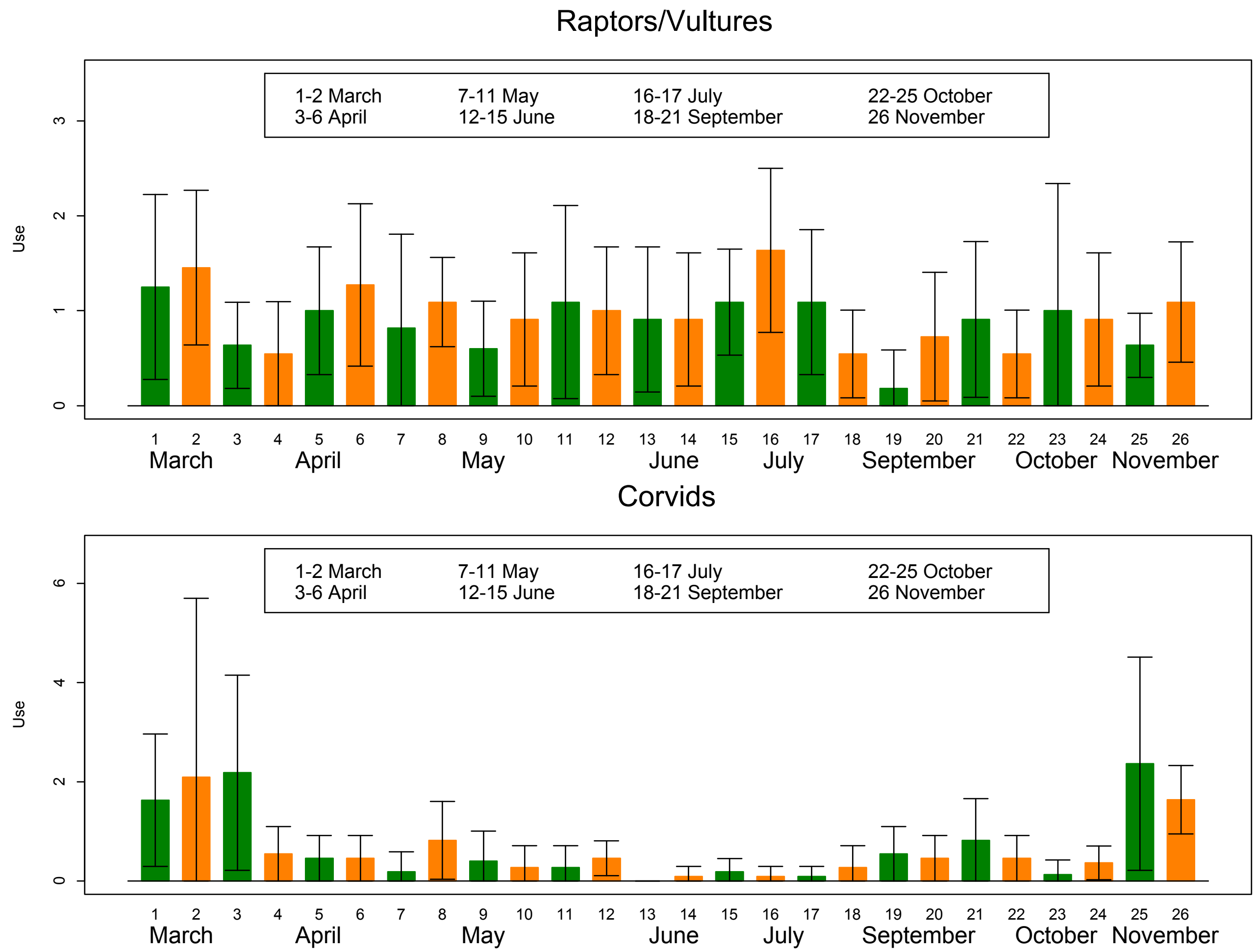


Figure 8. Mean use by visit for raptors and corvids.

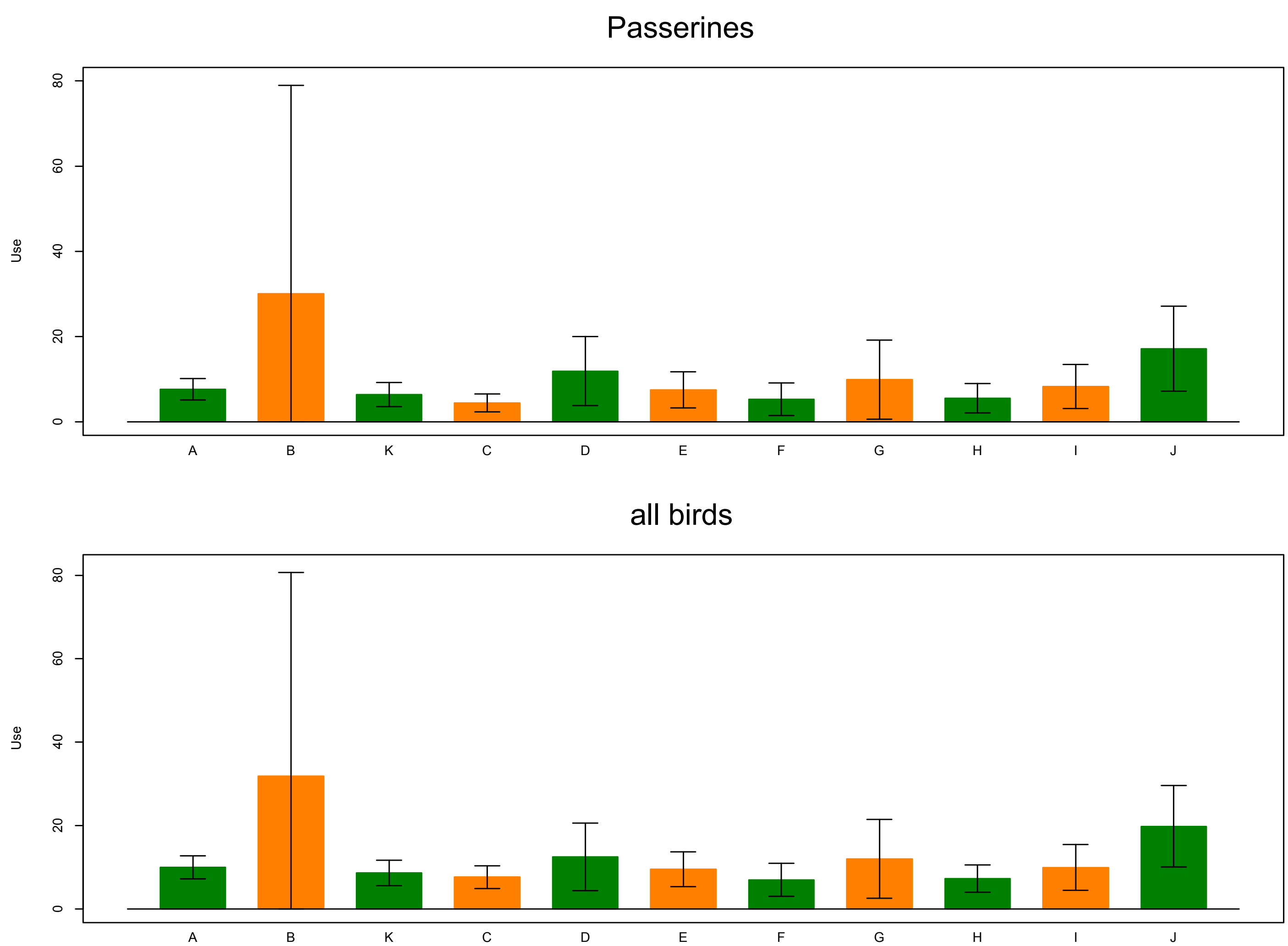


Figure 9. Mean use for passerines and all birds combined by station. Stations A, B and K are to the west of the area proposed to be developed.

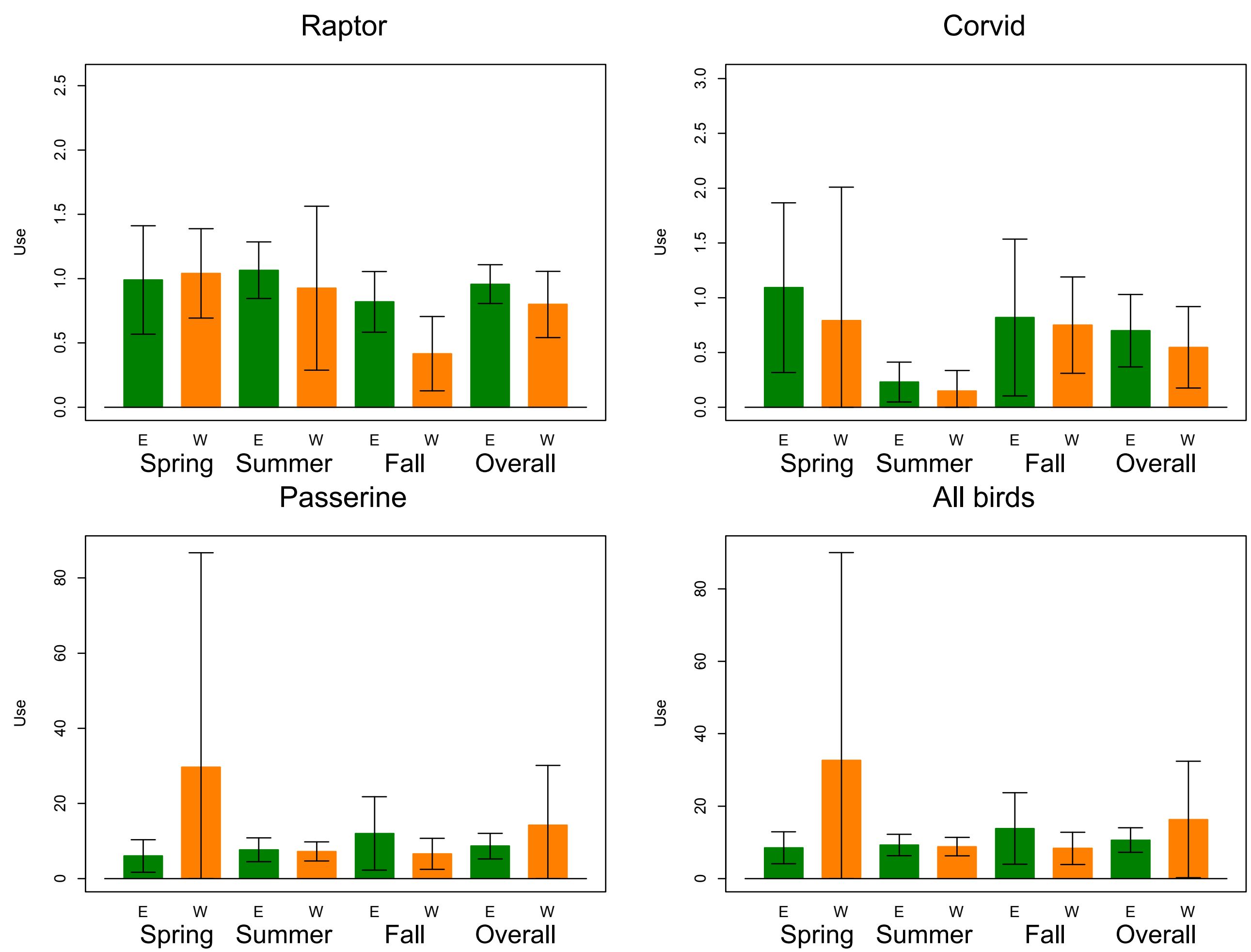


Figure 10. Mean use by major bird group by season and overall for west (W) stations (A, B, K) and the east stations. Stations A, B and K are to the west of the area proposed to be developed.

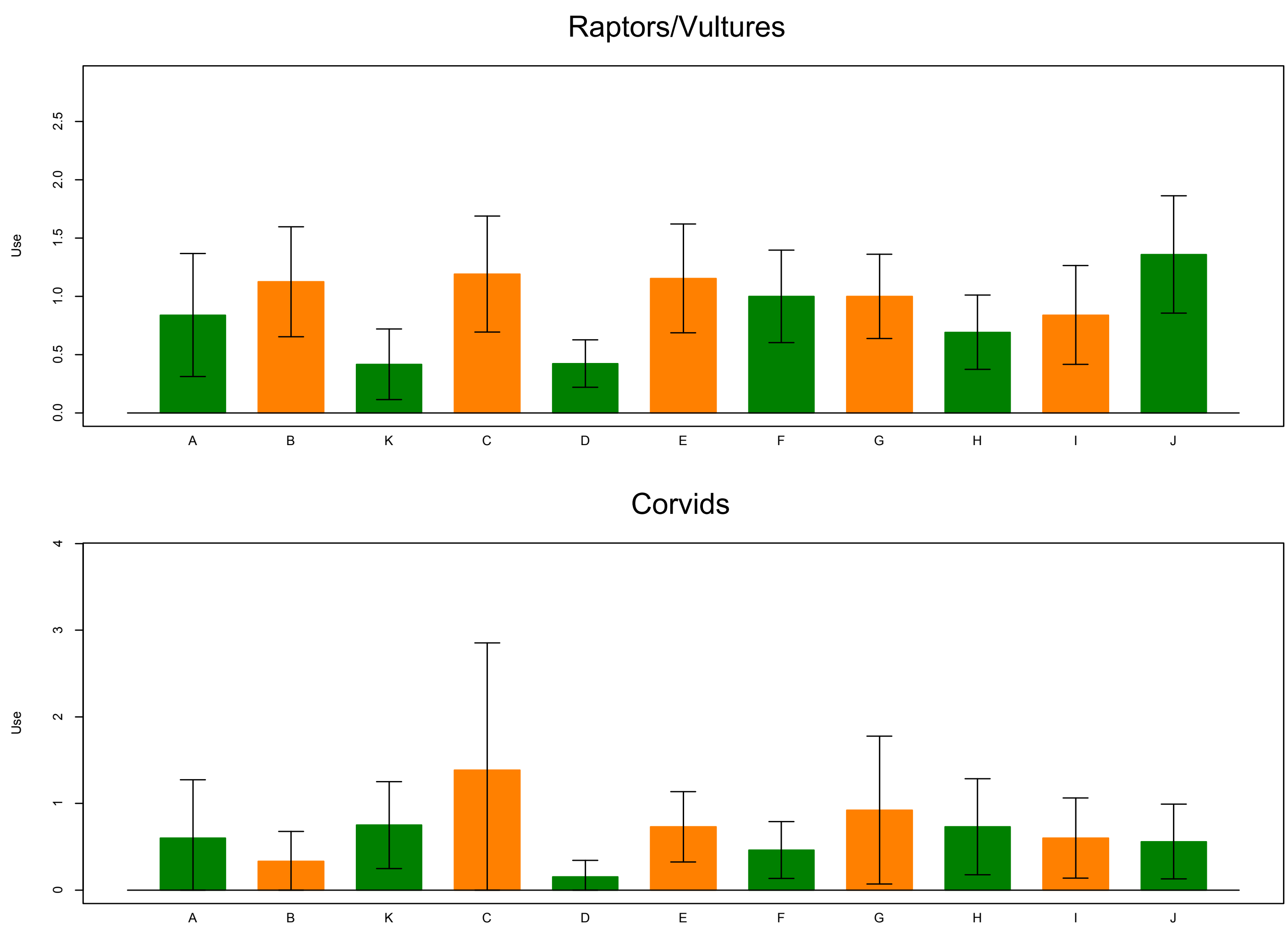


Figure 11. Mean use for raptors and corvids by station. Stations A, B and K are to the west of the area proposed to be developed.

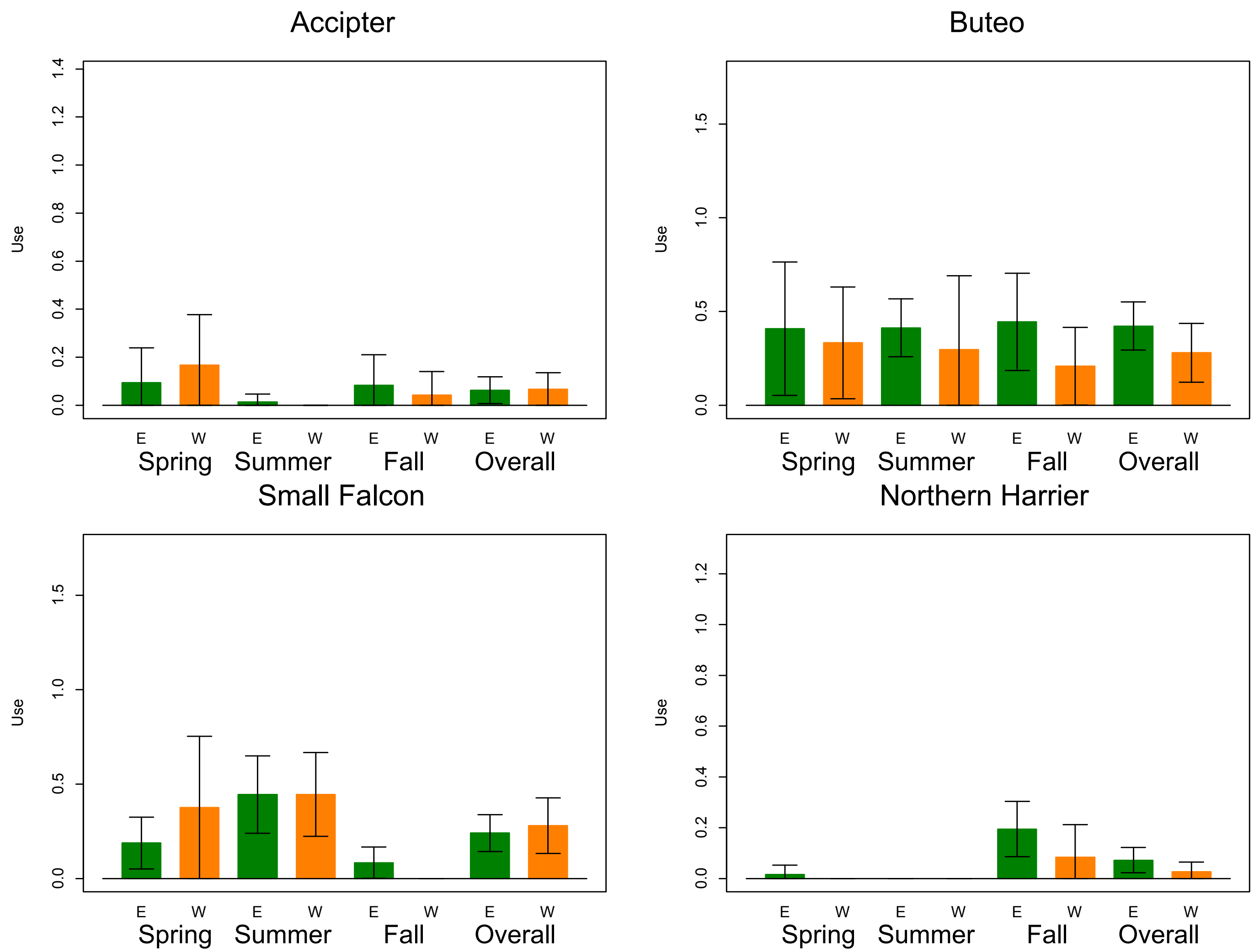


Figure 12. Mean use by major bird group by season and overall for west (W) stations (A, B, K) and the east stations. Stations A, B and K are to the west of the area proposed to be developed.

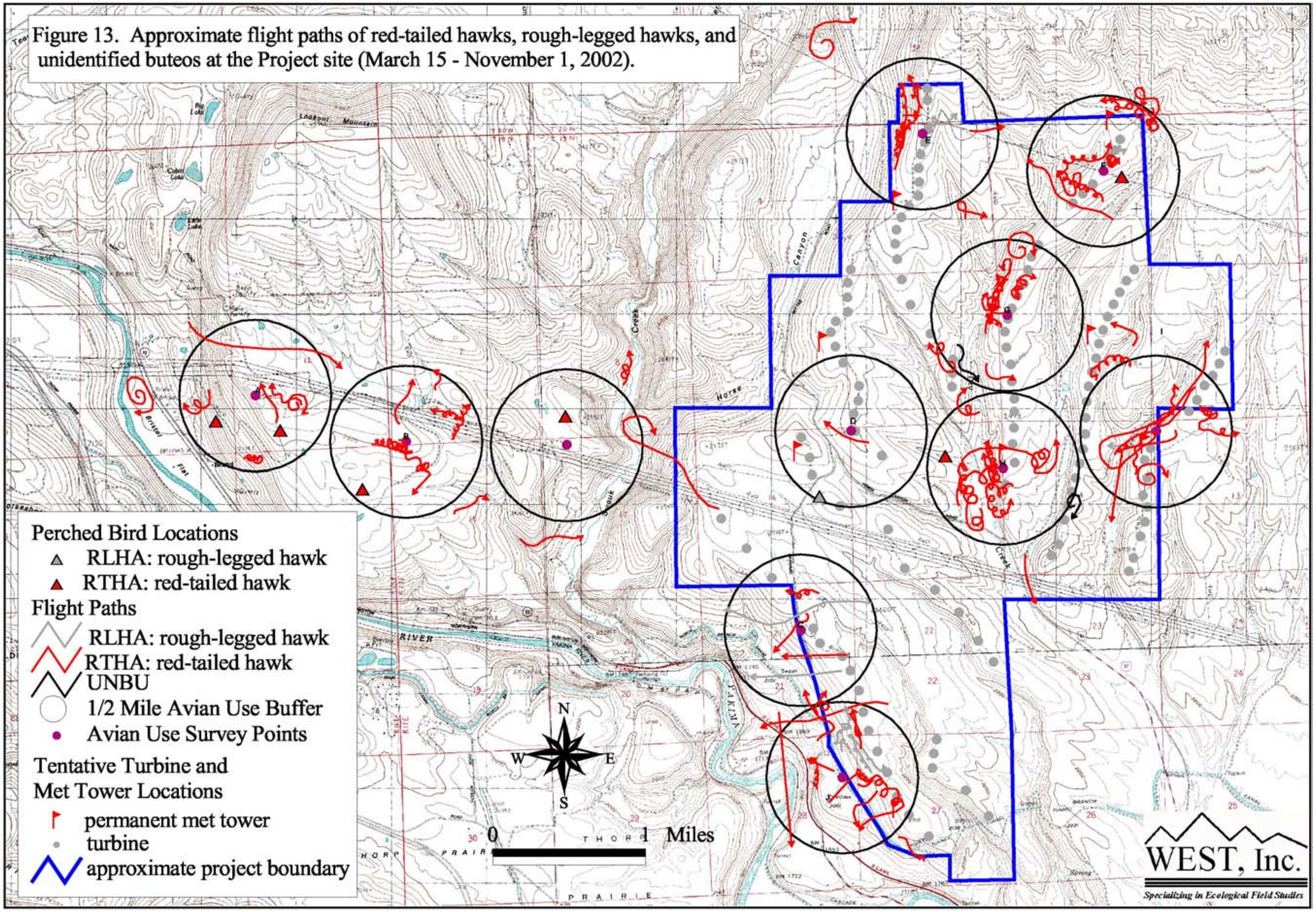


Figure 13. Approximate flight paths of red-tailed hawks, rough-legged hawks, and unidentified buteos at the Project site (March 15 - November 1, 2002).
Perched Bird Locations
RLHA: rough-legged hawk
RTHA: red-tailed hawk
Flight Paths
RLHA: rough-legged hawk
RTHA: red-tailed hawk
UNBU
1/2 Mile Avian Use Buffer
Avian Use Survey Points
Tentative Turbine and
Met Tower Locations
permanent met tower
turbine
approximate project boundary
N
S
W
E
0
1 Miles
WEST, Inc.
Specializing in Ecological Field Studies

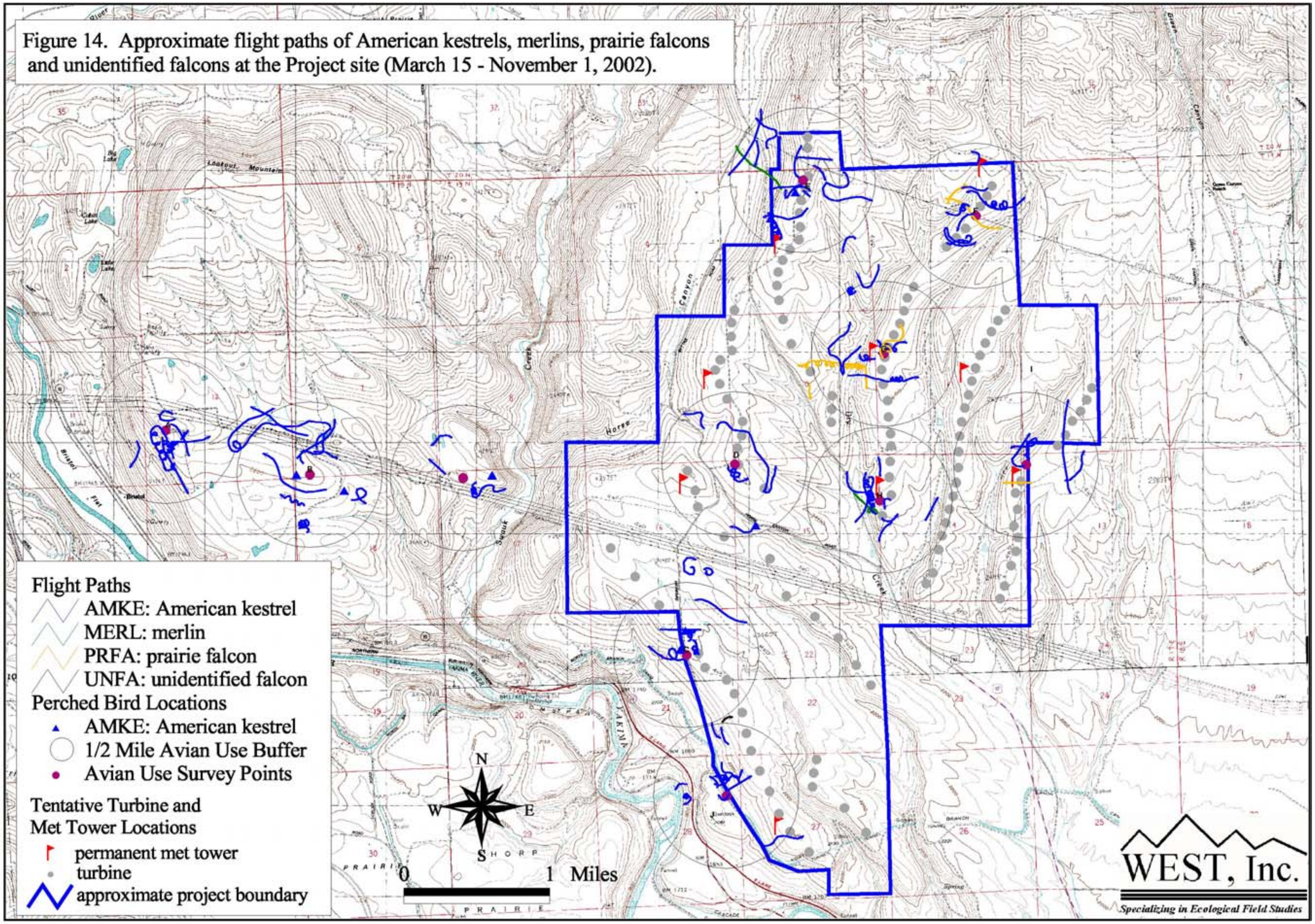


Figure 14. Approximate flight paths of American kestrels, merlins, prairie falcons and unidentified falcons at the Project site (March 15 - November 1, 2002).
Flight Paths
AMKE: American kestrel
MERL: merlin
PRFA: prairie falcon
UNFA: unidentified falcon
Perched Bird Locations
AMKE: American kestrel
1/2 Mile Avian Use Buffer
Avian Use Survey Points
Tentative Turbine and
Met Tower Locations
permanent met tower
turbine
approximate project boundary
N
W
E
S
0
1 Miles
WEST, Inc.
Specializing in Ecological Field Studies

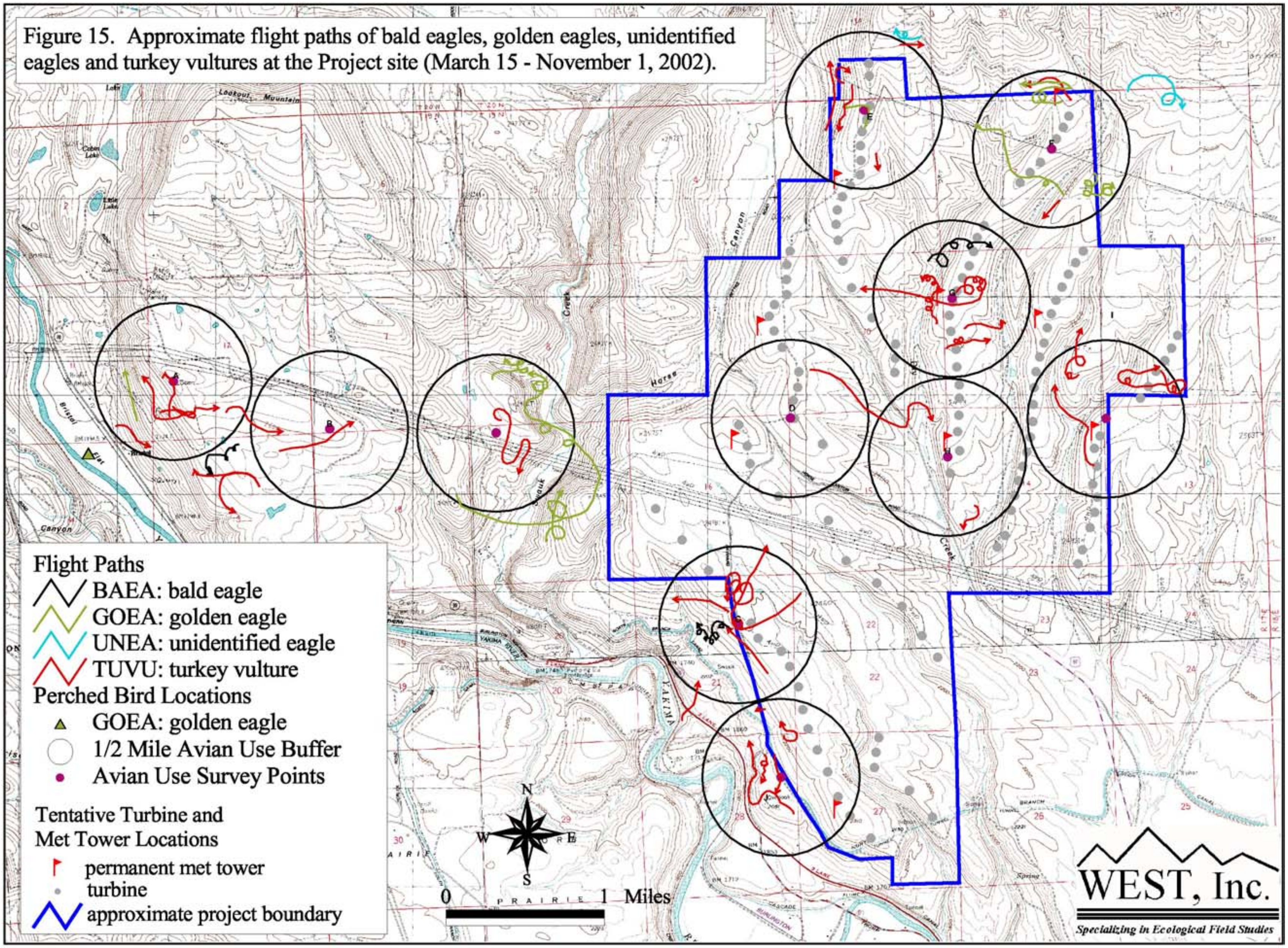


Figure 15. Approximate flight paths of bald eagles, golden eagles, unidentified eagles and turkey vultures at the Project site (March 15 - November 1, 2002).
Flight Paths
BAEA: bald eagle
GOEA: golden eagle
UNEA: unidentified eagle
TUVU: turkey vulture
Perched Bird Locations
GOEA: golden eagle
1/2 Mile Avian Use Buffer
Avian Use Survey Points
Tentative Turbine and Met Tower Locations
permanent met tower
turbine
approximate project boundary
0
1 Miles
N
S
E
W
WEST, Inc.
Specializing in Ecological Field Studies

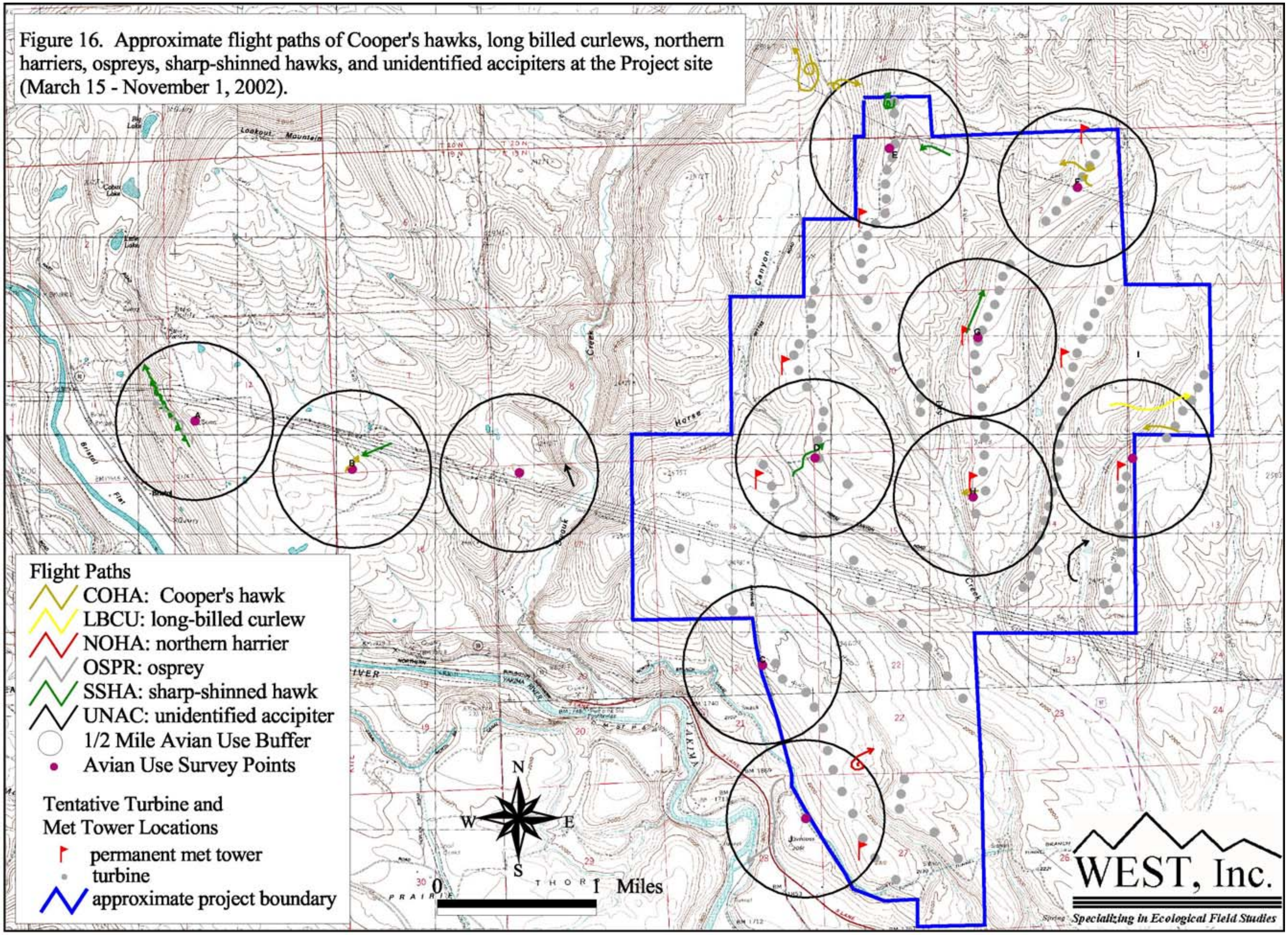


Figure 16. Approximate flight paths of Cooper's hawks, long billed curlews, northern harriers, ospreys, sharp-shinned hawks, and unidentified accipiters at the Project site (March 15 - November 1, 2002).
Flight Paths
COHA: Cooper's hawk
LBCU: long-billed curlew
NOHA: northern harrier
OSPR: osprey
SSHA: sharp-shinned hawk
UNAC: unidentified accipiter
1/2 Mile Avian Use Buffer
Avian Use Survey Points
Tentative Turbine and Met Tower Locations
permanent met tower
turbine
approximate project boundary
N
W
E
S
0
1 Miles
Horse
Canyon
Creek
Lookout Mountain
Bristol
Flat
WEST, Inc.
Specializing in Ecological Field Studies

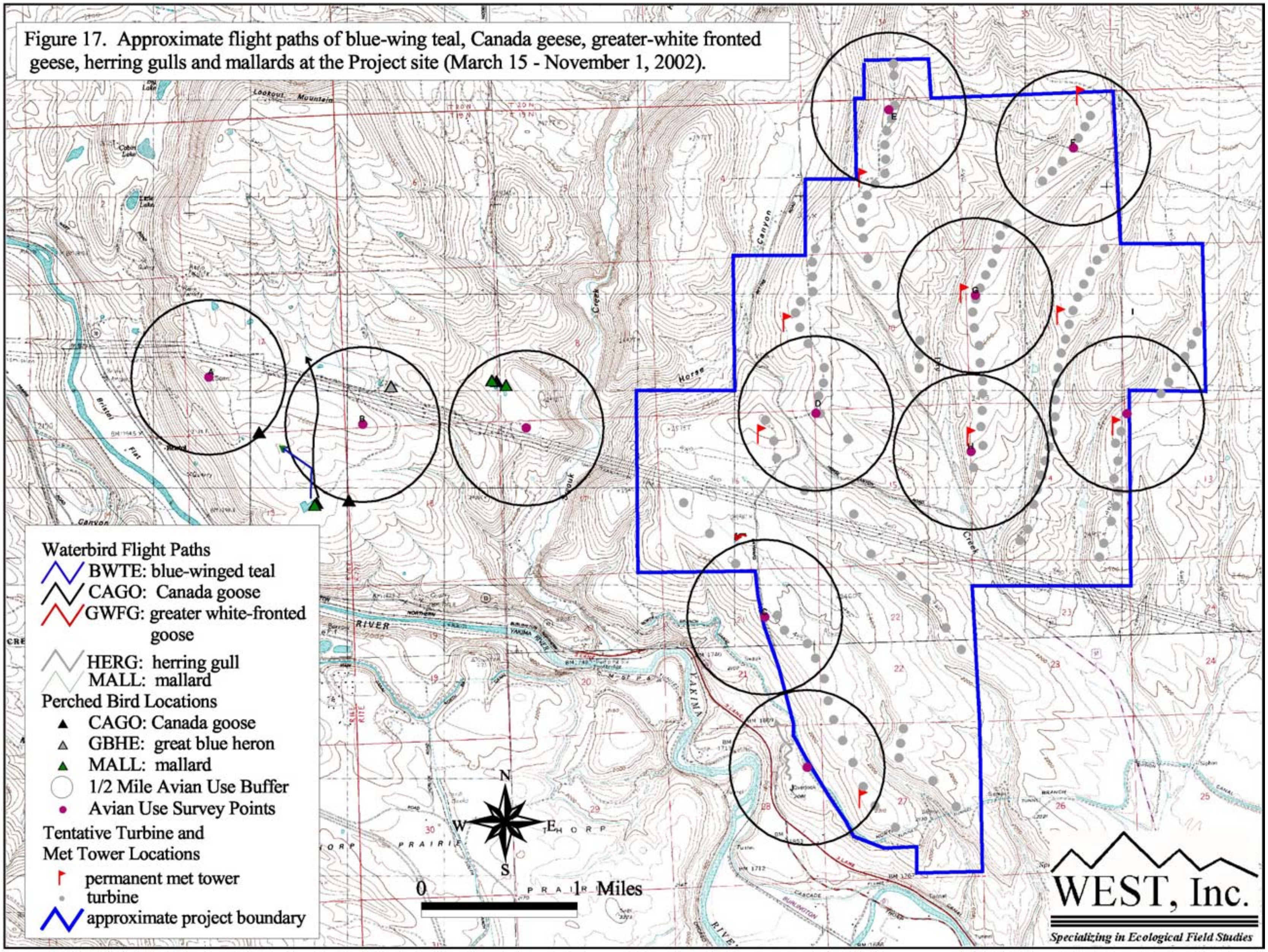


Figure 17. Approximate flight paths of blue-wing teal, Canada geese, greater-white fronted geese, herring gulls and mallards at the Project site (March 15 - November 1, 2002).

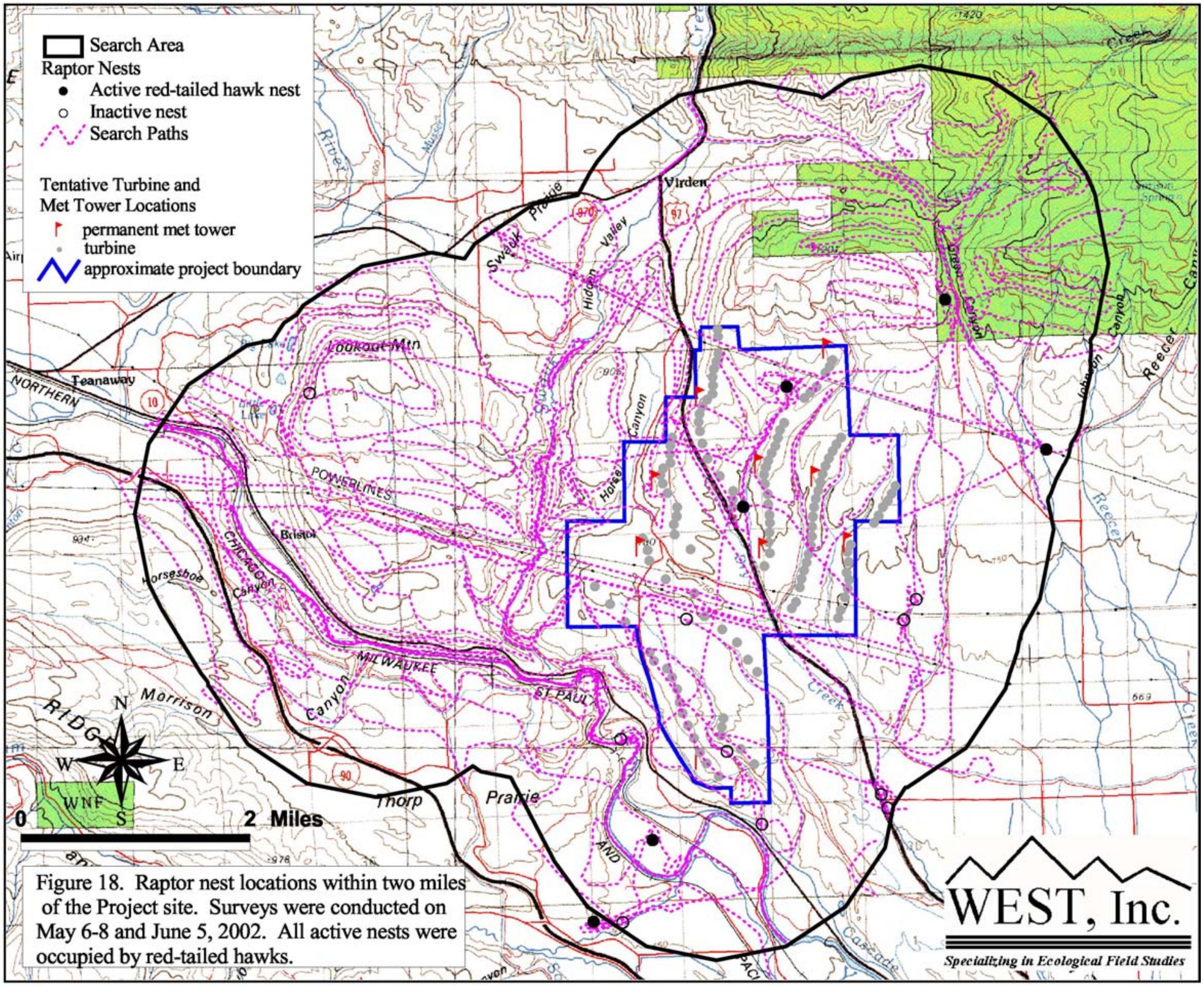


Figure 18. Raptor nest locations within two miles of the Project site. Surveys were conducted on May 6-8 and June 5, 2002. All active nests were occupied by red-tailed hawks.

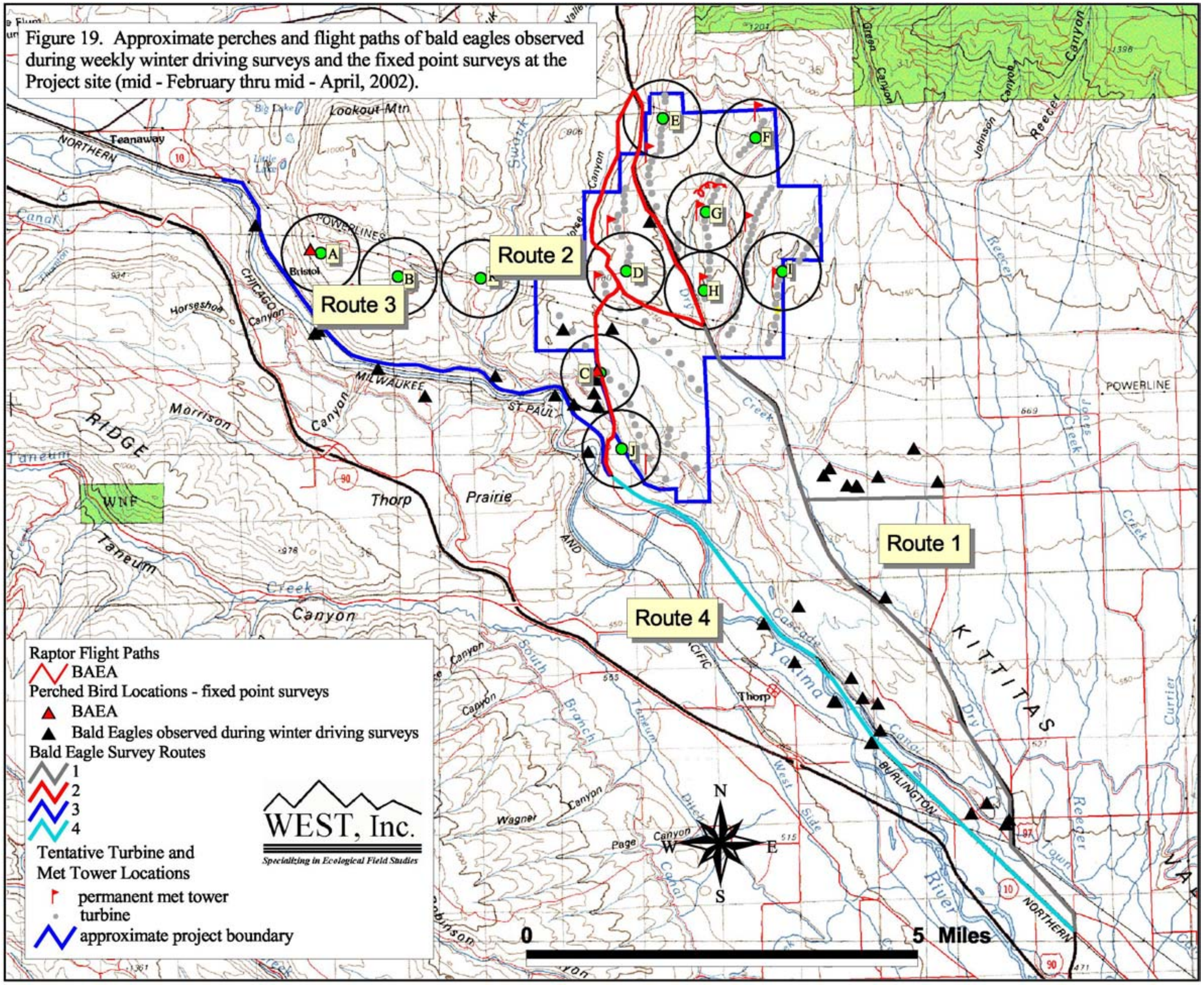


Figure 19. Approximate perches and flight paths of bald eagles observed during weekly winter driving surveys and the fixed point surveys at the Project site (mid - February thru mid - April, 2002).

DRAFT

BIOLOGICAL ASSESSMENT
ENDANGERED, THREATENED, PROPOSED & CANDIDATE SPECIES

ZILKHA RENEWABLE ENERGY
KITTITAS VALLEY WIND POWER PROJECT

Prepared for:

Zilkha Renewable Energy
210 SW Morrison Street, Suite 310
Portland, Oregon 97204

Prepared by:

David P. Young, Jr.
Wallace P. Erickson
Karyn J. Sernka

Western **E**co**S**ystems **T**echnology, Inc.
2003 Central Avenue
Cheyenne, Wyoming 82001

January 6, 2003

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The purpose of this Biological Assessment (BA) is to determine if the proposed Zilkha Renewable Energy (Zilkha), Kittitas Valley Wind Power Project will adversely affect threatened and endangered species potentially occurring in the project area. Also, the BA will determine if the project will jeopardize the continued existence of candidate species or species proposed for listing under the Endangered Species Act (ESA).

The ESA requires preparation of a BA for major construction projects proposed under Federal authority. While there is currently no federal nexus with the proposed project, future transmission interconnection may require approval by the Bonneville Power Administration (BPA). As a federal agency, BPA is required to consult with U.S. Fish and Wildlife Service (USFWS) to insure that actions proposed, permitted, or funded by BPA do not adversely affect threatened or endangered species or adversely modify designated critical habitat.

The actions being evaluated under this BA are the proposed construction, maintenance, and operation of a 250 megawatt (MW) wind power project in Kittitas County, Washington, north and west of the town of Ellensburg. Zilkha Renewable Energy (Zilkha) plans to construct, operate, and maintain between 100 and 150 wind turbines on approximately 10,000 acres of leased private land east and west of U.S. Highway 97 and north of Interstate 90 between Cle Elum and Ellensburg, Washington (Figure 1). The BA provides a summary of the available information regarding listed species in the area and a thorough effects analysis of the proposed project on the listed species.

1.1 Species Lists

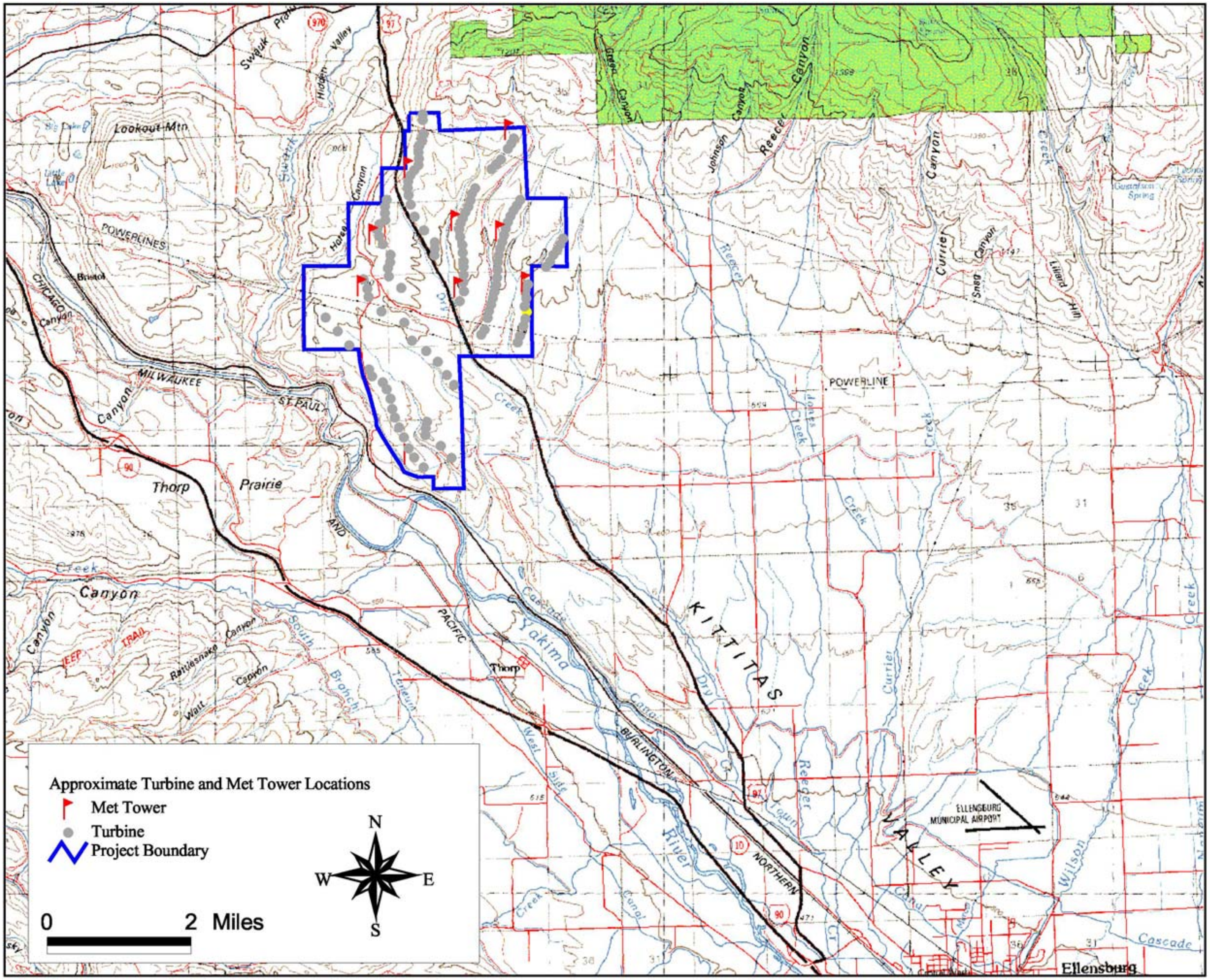
During preliminary environmental impact analysis, the USFWS provided a species list of endangered, threatened, proposed, and candidate species potentially occurring in the project area (Appendix A). The species list indicates that gray wolf (*Canis lupus*), endangered; bald eagle (*Haliaeetus leucocephalus*), threatened; bull trout (*Salvelinus confleuntus*), threatened; northern spotted owl, (*Strix occidentalis caurina*), threatened; Ute ladies'-tresses orchid (*Spiranthes diluvialis*), threatened; western sage grouse (*Centrocercus urophasianus phaios*), candidate; and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), candidate; may be present near and therefore may be affected by the proposed project. The USFWS indicated that no designated critical habitat for listed species was present near the project.

This BA addresses potential impacts from the project to these species. Prior to initiation of any construction, the species list will be confirmed and the biological assessment may be revised (or amended) if: (1) the scope of work changes significantly so as to create potential effects to listed species not previously considered; (2) new information or research reveals effects of the proposed project may impact listed species in a manner not considered in this BA; or (3) a new species is listed or critical habitat designated that may be affected by the project.

1.2 Proposed and Candidate Species

Proposed species are those for which the USFWS has formally proposed to list as threatened or endangered. Once proposed, there is typically a status review period (often 12 months) where the USFWS reviews all existing information, data, and threats to the species and makes a listing decision.

Figure 1. Proposed Zilkha Kittitas Valley wind power project location.



Species proposed for listing receive protection under the ESA in that proposed projects can not jeopardize the continued existence of these species. According to the USFWS letter, there are no species proposed for listing that may be present in the project area. Therefore, construction, maintenance, and operation of the proposed Zilkha wind power project will not jeopardize any proposed species.

The USFWS maintains a list of candidate species for listing as threatened or endangered. Candidate species are those for which the USFWS has sufficient information on their status and threats to propose them as endangered or threatened, but for which proposed listing is precluded by other higher priority species or actions (USFWS 2000a). While candidate species receive no protection under the ESA, the USFWS encourages actions that conserve these species. Based on the USFWS letter, two candidate species, western sage grouse and western yellow-billed cuckoo, may be present near the project area.

Western Sage Grouse

Western sage grouse is a subspecies of sage grouse that historically occurred from southern British Columbia south through Washington. In Washington, sage grouse historically occurred in most counties east of the Cascades but now only occur in two locations: Douglas County and extreme northern Grant County; and southeastern Kittitas County and northern Yakima County. There are other scattered records from Lincoln County and Benton County but no confirmed breeding in these locations (Smith *et al.* 1997). Sage grouse are found in areas with extensive tracts of native sagebrush steppe habitat that consists primarily of sagebrush/bunchgrass stands with medium to high sagebrush canopy cover (Hays *et al.* 1998). The project is located in a foothills setting of the Cascade Mountains and the primary habitats are shrub-steppe and grassland steppe with scattered areas of lithosol, conifer, agriculture, pasture, and riparian habitats. According to the Washington State Gap Analysis Project (GAP)[1], the project area falls outside mapped and modeled habitat for sage grouse in Washington (Smith *et al.* 1997; WCFWRU 1999). No sage grouse were observed during field surveys in the project area and they are not expected to occur in the vicinity of the project. Implementation of the proposed project will not jeopardize the continued existence of western sage grouse.

Western Yellow-Billed Cuckoo

Yellow-billed cuckoos are found throughout North America from southern Canada into central and eastern Mexico. It is commonly thought that there are two separate subspecies, eastern and western, separated generally by the Rocky Mountains. Western yellow-billed cuckoo is considered a Distinct Population Segment under USFWS policy (USFWS 2001). Yellow-billed cuckoos are migratory and spend the winter as far south as South America and generally occupy the breeding grounds from May through September. Western yellow-billed cuckoos are insectivorous and breed primarily in large riparian areas, particularly cottonwood and willow riparian habitats along large rivers (USFWS 2001). According to the Washington breeding bird atlas, yellow-billed cuckoo is believed to have been extirpated as a breeder in Washington (Smith *et al.* 1997). The project is located in a foothills setting of the Cascade Mountains and the primary habitats are shrub-steppe and grassland steppe with scattered areas of lithosol conifer, agriculture, pasture, and riparian habitats. The riparian habitat in the project area is mainly associated with Swauk and Dry Creek. As most of the development will occur on the ridge tops, little to no riparian habitat will be affected by the project. Based on current knowledge of western yellow-billed cuckoos in Washington and their habitat use, they are not expected to occur in the project area and habitat suitable for their occurrence will not be affected. No cuckoos were observed during field surveys in the project area. Implementation of the proposed project will not jeopardize the continued existence of western yellow-billed cuckoo.

[1] The Washington State Gap Analysis Project is based on a two primary data sources: vegetation types (actual vegetation, vegetation zone, and ecoregion) and species distribution. The two data sources are combined to map the predicted distribution of vertebrate species. More information about the Washington Gap Analysis Project can be found on the WDFW web page: www.wa.gov/wdfw/wlm/gap/dataprod.htm

1.3 Critical Habitat

Critical habitat for threatened or endangered species is defined by the Endangered Species Act as the specific area(s) within the geographical range of a species where physical or biological features are found that are essential to the conservation of the species and which may require special management consideration or protection. Critical habitat is specific geographic area(s) designated by the USFWS for a particular species. Under the ESA, it is unlawful to adversely modify designated critical habitat. According to the USFWS letter, there is no critical habitat as defined by the ESA for threatened or endangered species that may be affected by the project. Therefore, construction, maintenance, and operation of the proposed wind power project will not adversely modify critical habitat for endangered or threatened species.

1.4 No Effect

For most of the species identified, the project should have no effect. Resource information indicated that gray wolf, bull trout, northern spotted owl, and Ute ladies'-tresses orchid are not likely to occur or only accidentally occur in the project area and that essential habitat for some of these species is lacking within the project area.

Gray Wolf

Gray wolf is an endangered species throughout the lower 48 states, except in Minnesota where it is listed as threatened, and in Idaho and Wyoming where it is listed as non-essential, experimental. The primary threats to wolves are loss of habitat and illegal killing by humans (poaching, poisoning). Historically, gray wolves occurred throughout North America from the arctic to the southern U.S. and northern Mexico and inhabited a wide range of habitats including coniferous forests, grasslands, arctic tundra, and deserts. The availability of prey (ungulates) is one of the limiting factors for good wolf habitat (Carbyn 1987). Additionally, large wilderness tracts with little human disturbance are believed essential to maintaining healthy wolf populations. Currently, gray wolves are still fairly abundant in Canada and Alaska, and there are also native populations in northern Minnesota, Michigan, Wisconsin, and northern Montana (USFWS 2000b). Due to the reintroduction efforts of the USFWS, gray wolves also occur in Idaho, Wyoming, and southern Montana. There are no known wolf packs in Washington, however individual wolves are occasionally reported which are believed to be lone wolves from Canada or released wolf-dog hybrids (WDFW 1999). There are several historical records of wolves in the mountains west and north of the project area in the PHS database (WDFW PHS 2002), the latest of which occurred in 1993. Due to the successful wolf reintroduction effort in Central Idaho, wolves may eventually disperse in to southeastern Washington. Wolves generally hunt and live in packs that usually remain within a specific territory that may range in size from 50 to 1,000 square miles depending on prey availability and seasonal movements. Wolves may travel up to 30 miles a day while hunting and lone wolves have been known to disperse up to 500 miles (USFWS 1998a). Wolves usually prey on large ungulates such as moose, elk, bison, or deer, but will also prey on smaller animals such as rodents, beaver, domestic animals, or carrion (Tucker *et al.* 1990). Habitat throughout the northern Cascade Range and in extreme northeastern Washington is considered suitable for wolves (WCFWRU 1999). No wolves were observed during field surveys in the project area and they are not expected to occur in the project area due to the heavy human influence, lack of large tracts of suitable habitat, and uncertain population status in Washington. Implementation of the proposed project will not affect gray wolves.

Bull Trout

Bull trout historically occurred in major river drainages throughout the Pacific Northwest. They were listed as threatened for the Klamath River and the Columbia River distinct population segments in June 1998 (USFWS 1998b). The decline of bull trout is primarily due to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species. It is estimated that bull trout presently occur in 45% of the historical range (Quigley and Arbelbide 1997). Bull trout exhibit resident and migratory life-history strategies through much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary or nearby streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to saltwater (anadromous), where maturity is reached (Fraley and Shepard 1989; Goetz 1989). Bull trout have specific habitat requirements and appear to be more bottom-oriented than other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include cold water temperatures; instream cover such as large woody debris, undercut banks, boulders, and pools; clean loose substrate gravel for spawning and rearing; and unobstructed migratory corridors (Fraley and Shepard 1989; Goetz 1989; Rieman and McIntyre 1993; Watson and Hillman 1997). The nearest known bull trout inhabited stream to the project area are the Yakima and Teanaway Rivers (WDFW PHS 2002). The project is not likely to affect bull trout due to lack of suitable stream habitat in the project area and the unlikely probability that the project will affect streams and other aquatic habitats. Implementation of the project will not affect bull trout.

Northern Spotted Owl

Northern spotted owls historically occurred throughout the Pacific Northwest from central California north into southern British Columbia (USFWS 1990). The primary reason for decline of northern spotted owls is habitat loss, degradation and fragmentation due primarily to old growth timber harvest (USFWS 1990). In Washington, spotted owls are found throughout the low and moderate elevation coniferous forests of the Cascade Mountain range and the Olympic peninsula (Smith *et al.* 1997). Northern spotted owls generally require extensive tracts of coniferous forest, usually spruce/cedar/hemlock or Douglas-fir, for nesting and for juvenile dispersal. They nest almost exclusively in mature coniferous forest tracts greater than 1,200 acres in size with dense canopy cover (Gutierrez *et al.* 1995). Spotted owls are territorial and non-migratory and may occupy territories up to 22 square miles (58 km^2) (Gutierrez *et al.* 1995). Spotted owl habitat consists of four components: nesting, roosting, foraging, and dispersal (AFWO 2001). Nesting and roosting habitat consists of dense mature coniferous forest with multiple canopy layers and an abundance of large trees. Spotted owls will forage within nesting habitat but they will also utilize more open and fragmented forests for foraging depending on the characteristics of their home range (AFWO 2001). Dispersal habitat consists of forest stands with adequate tree size and canopy coverage to provide protection from other avian predators (e.g., great horned owl) while the owl travels and forages. Dispersal habitat may not provide good characteristics for nesting, roosting, or foraging. The WDFW PHS database maintains records of spotted owl site centers and management circles for the state of Washington. A site center is a spotted owl location and the management circle is the area encompassed by a 1.8 mile radius circle around the site center, which effectively plots spotted owl territories. Site centers are ranked based on the observation of the spotted owls within the circle, (e.g., a single owl, two or more owls detected, established pair, and documented reproduction). Based on the WDFW PHS database there are northern spotted owl management circles throughout the forests north of the Project. The two northernmost turbine locations (see Figure 1) are located approximately 0.5 mile (0.8 km) and 1.1 miles (1.7 km) respectively, south of spotted owl management circles in the Wenatchee National Forest. Development of the project will not directly affect these management circles. In addition, the project, which is located in open steppe habitats, will not affect any suitable spotted owl habitat and no spotted owls were observed during field surveys of the project area. The potential for the project to affect spotted owls would be based on the accidental occurrence of spotted owls in the steppe habitats of the Project. Implementation of the proposed project will not affect northern spotted owls.

Ute Ladies'-Tresses Orchid

Ute ladies' tresses orchid is a perennial orchid that occurs in wetlands. Ute ladies' tresses was listed as a threatened species in 1992 (USFWS 1992). The primary threats to the species are a general lack of knowledge about the species ecology and distribution, habitat loss or degradation, and invasion of exotic species (USFWS 1995a). Very little is known about the historic distribution of this plant. It was previously thought to only have occurred in Nevada, Utah, and Colorado. However, since the early 1990's new populations have been discovered in Wyoming, Nebraska, Montana, Idaho, and Washington. Because potential habitat for Ute ladies' tresses is fairly common through the Intermountain, Rocky Mountain west, and western plains it could possibly occur in many unknown locations throughout the region (USFWS 1995a). In Washington, Ute ladies'-tresses orchid is known to occur in north-central Washington in Okanogan and Chelan Counties (WNHP 1999). Ute ladies'-tresses have not been studied in great detail but they are believed to have similar life history traits as other orchids. Other species of *Spiranthes* live initially as saprophytic underground plants that may persist for several years before leaves emerge above ground (USFWS 1995a). Ute ladies' tresses orchids flower in late July through August and occasionally into September and October if conditions are favorable (USFWS 1992). However, it is believed that individual plants rarely flower in consecutive years or under unfavorable conditions, and populations of Ute ladies' tresses orchid are known to fluctuate from year to year, possibly depending on site conditions such as water availability, disturbance history, or encroachment by invasive weeds (USFWS 1995a). This orchid has a close affinity with floodplain areas where the water table is near the surface during the growing season providing continuous sub-irrigation and where the vegetation is relatively open and not overly dense (USFWS 1995a). Ute ladies' tresses tolerate areas with some disturbance such as flooding, grazing, or haying to reduce overstory cover from competing plants (USFWS 1995a). The project is not likely to affect Ute ladies'-tresses due to lack of suitable habitat in the project area and the unlikely probability that the project will affect wetlands. No Ute ladies' tresses orchids were found during rare plant surveys of the project area (Eagle Cap Consulting 2002) Implementation of the project will not affect Ute ladies'-tresses orchid.

1.5 Methods

The BA provides a description of the proposed action (project), a summary of bald eagle biology and distribution, and a description of the environmental baseline for the project including the status and distribution of bald eagle in the project area based on our current knowledge. Finally, the BA provides an assessment of the potential effects of the project on bald eagles and a determination about adverse effects based on this information.

The BA is based largely on available information, however, some primary data was collected from the site through winter bald eagle targeted roadside surveys and weekly surveys at fixed points across the project area (see below). Sources of available information included published literature (including internet resources); a search of the Priority Habitats and Species (PHS) database maintained by the Washington Department of Fish and Wildlife (WDFW); the Washington State Breeding Bird Atlas and Gap analysis; USFWS Breeding Bird Survey results for the last ten years; Audubon Society Christmas Bird Counts for the last ten years; and communication and interviews with resource experts and agency personnel. The searches of the PHS database included the township of the project and a buffer of one township in all directions. Agency information was gained from phone, personal meetings, email, and written requests with resource and agency personnel.

The information gathered for bald eagles focused on, but was not confined to:

X establishing the current status, use, and behavior of bald eagles in the project area,

X establishing the current distribution of important habitat in the project area for bald eagles,

X determining the direct, indirect, and cumulative effects (as defined by the ESA) on bald eagles within the project area, X determining the likelihood of the project adversely affecting bald eagles,

X identifying conservation measures (mitigation) that may be implemented to avoid and minimize adverse impacts to bald eagles, and

X determining the expected status of bald eagles within the project area after project completion.

Descriptions of the project are based on information provided by Zilkha. Descriptions of the project area and habitat are based on site visits, examination of aerial photographs and topographic maps, and results of the ecological baseline studies conducted for the project. Descriptions of bald eagle habitat, natural history, and behaviors are based mainly on published literature and communications with resource experts. The occurrence and status of bald eagles within Washington and the project area is based on the available information, communication with agency personnel, and data collected from the project area. Bald eagle observations and information were mapped in ArcView.

Primary data collected from the site included winter roadside surveys, weekly point counts from 11 fixed points established across the study area, and incidental/in-transit observations made outside designated survey periods. The studies were initiated as part of a baseline avian study to evaluate potential impacts from the proposed wind plant.

Winter Bald Eagle Surveys
Driving transects to evaluate the numbers of wintering bald eagles and their movements in the project area were initiated in mid-February, 2002. Surveys involved driving and counting bald eagles along four different routes (Figure 2). Surveyors drove the survey routes on an approximately weekly interval. A total of 9 complete surveys (all four transects) were conducted between February 15 and April 11, 2002. The one-way distance for all survey routes combined was approximately 35 miles. Most routes were surveyed twice on any given survey day (e.g., starting in an east to west direction, and returning in a west to east direction).

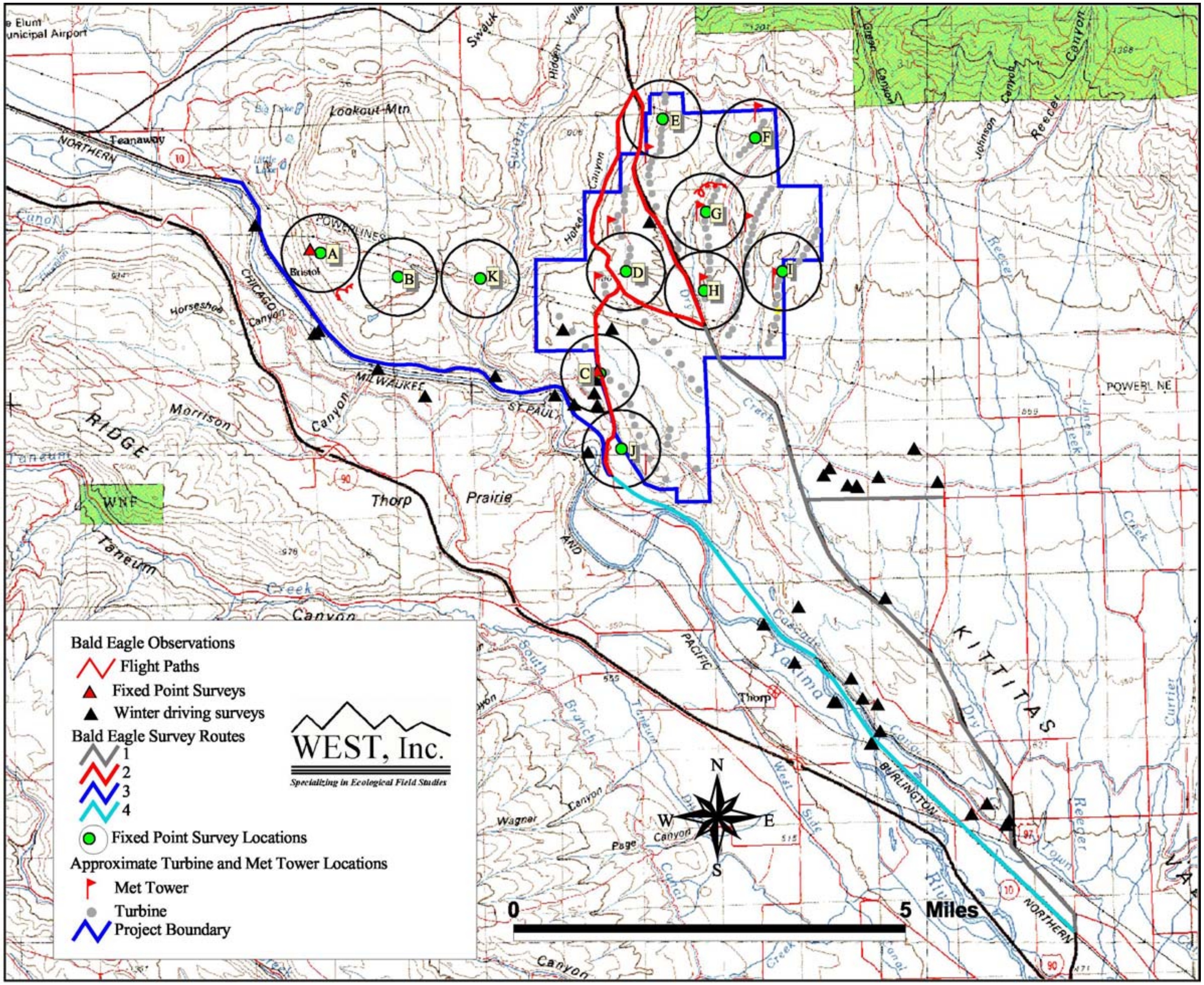
Survey routes were as follows:
Route 1: From the junction of Highway 97 and Highway 10 along 97 north to the intersection with Bettas Road. Also includes approximately 2.5 miles of Smithson road. Total distance (one-way) was approximately 11 miles.

Route 2: North on Highway 97 from Bettas Road to Northern Bettas Road Junction including all of Bettas Road and south on Hayward Road. Total distance (one-way) was approximately 10 miles.

Route 3: Junction of Hayward Road and Highway 10, west on Highway 10 to Junction with Hart Road. Total distance (one-way) was approximately 7.4 miles.

Route 4: Junction of Highway 97 and Highway 10 west on Highway 10 to Hayward Road. Total distance (one-way) was approximately 6.7 miles.

Figure 2. Winter bald eagle survey routes, fixed-point survey locations, and bald eagle observations.



Depending on traffic and safe pull-off availability, the surveyor looked for eagles within areas visible from the road. During periodic stops, the surveyor scanned areas of large cottonwoods and conifer trees with binoculars and spotting scope to look for perched eagles. Between stops, the observer drove at a slow speed of approximately 20-25 mph (40 kph), when possible. Surveys were conducted in the morning and evening hours, alternating each week. All bald eagles (or groups of bald eagles) observed were assigned a unique observation number and mapped on USGS 7.5' quadrangle maps. UTM coordinates from the road were recorded for each eagle or group of eagles observed. Habitat, activity, and time of day were also recorded for each observation. Flight paths of bald eagles were mapped for as long as the bird was visible. Perch sites and possible evening roost sites were recorded on the topo maps. The direction of the route followed (forward or reverse), total time spent, and distance driven was recorded for each survey route.

Weekly Fixed-point Surveys
Point count surveys were conducted weekly on site at 11 survey locations between March 21 and November 1, 2002. Each plot consisted of an 800-m radius circle centered on a fixed observation point location (Figure 2). Observations of birds beyond the 800 m radius were also recorded, but not included in the detailed analyses of avian use of the site. Survey periods lasted for 20 minutes per point count. Additional details of the survey methods and results can be found in the final technical report prepared for the baseline studies (Erickson *et al.* 2003). Results from the surveys as they pertain to bald eagles are reported below (see Section 4.0 Environmental Baseline)

Incidental/In-transit Observations
All wildlife species of concern, including bald eagles, and uncommon species observed while field observers were traveling between plots were recorded on incidental/in-transit data sheets. Other incidental observations made during other surveys or visits to the sites were also recorded. These observations were recorded in a similar fashion to those recorded during the fixed-point surveys.

2.0 PROJECT DESCRIPTION

The proposed Project would consist of the installation, operation, maintenance, and eventual decommissioning of approximately 120 wind turbines and supporting facilities. The project is anticipated to produce up to approximately 173 MW of electricity. The power would be sold to one or more regional utilities for transmission to regional consumers. The wind turbines proposed for the Project will have a capacity of 1.5 MW each with a rotor diameter of approximately 50 m (25 m blades). The turbines will be mounted on 50-75 m tubular towers, for a total height of approximately 100 m to the tip of the blade. The concrete tower foundations would be approximately 5-15 m square, and extend 6-15 m deep. Wind turbines would be grouped in turbine "strings" of about 4 to 32 turbines generally near the crest of the ridges. Turbines will be spaced approximately 90 to 150 m (300 to 500 ft) from the next or 1.5-2 times the diameter of the turbine rotor. Each turbine will be connected to adjacent turbines by a 34.5-kilovolt (kV) underground collector system.

The electrical output of each turbine string would be connected to the project substation by a combination of overhead and underground 34.5-kV transmission lines. The substation would be connected to the BPA and/or PSE transmission lines that are located adjacent to the substation site. The project would be monitored and controlled from an operations and maintenance (O&M) building located adjacent to the substation (Figure 1). Existing roads would be improved, and some new graveled roads would be constructed to provide access to the wind turbine locations during construction and for O&M. Wind speeds will be monitored using nine permanent meteorological (met) towers.

Total acres of impacted habitat will be relatively small. Approximately 77 acres (31 ha) will be permanently disturbed (occupied by roads, turbines and other infrastructure) and approximately 302 acres (122 ha) will be temporarily disturbed during construction. Approximately 12 miles (19 km) of new roads and driveway will be constructed, and approximately 10 miles (16 km) of existing roads will be graveled and widened to 20-30 ft (6-9 m).

2.1 Operation and Maintenance

Once constructed, there will be a permanent staff of O&M personnel responsible for upkeep of the wind plant. Approximately 15 wind smiths will be on site on a daily basis and there will be periodic traffic on the roads associated with O&M activity. During the first 3-6 months of wind plant operation, maintenance activity will be higher than normal while the wind plant becomes fully operational and problems are worked out. The primary O&M building will be located near the substations in approximately the center of the wind plant (Figure 1).

3.0 SPECIES DESCRIPTION AND HABITAT REQUIREMENTS

3.1 Bald Eagle

In 1978, the USFWS listed bald eagle throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was listed as threatened (USFWS 1978). In 1995, bald eagle was reclassified from endangered to threatened in all of the lower 48 states (USFWS 1995b). In July 1999, the USFWS proposed de-listing bald eagle (USFWS 1999). To date, bald eagle has not been removed from the list of threatened species. The species has been doubling its breeding population every 6-7 years in the lower 48 states since the late 1970's (USFWS 1995b). In 1963, a National Audubon Society survey reported only 417 active nests in the lower 48 states, with an average of 0.59 young produced per active nest. In 1994, about 4,450 occupied breeding areas were reported with an estimated average young per occupied territory (for 4,110 territories) of 1.17 (USFWS 1995b).

3.1.1 Life History and Characteristics

The nesting chronology of bald eagles is variable based on latitude. For more northern populations, nest maintenance and construction occurs during winter months, January and February (Buehler 2000). Eggs are laid between late February and late April, with peak laying during early March. Fledging dates vary accordingly with most young leaving the next between 8 and 14 weeks after hatching (Harmata and Oakleaf 1992, Buehler 2000). Nest production is usually between 1-3 young per year. Little is known of post-fledging behavior, however bald eagles do not reach sexual maturity until 4-5 years and may live up to 20-30 years (Buehler 2000).

Wintering bald eagles in Washington are primarily found along major waterways, with some found on upland wintering areas. During migration and at wintering sites, eagles that concentrate on locally abundant food tend to roost communally. Roost sites form critical habitat for wintering birds (Buehler 2000) with some roosts used regularly by large numbers of eagles. Bald eagle migration varies by populations and may extend over several months (Buehler 2000). In the Pacific Northwest, bald eagle migrations coincide with salmon migrations and both immature and adult bald eagles will migrate north in the late summer to take advantage of fall run salmon as far north as southern Alaska. These birds and more northern birds will then move back south over the fall, arriving on the wintering grounds in November and December (Hodges *et al.* 1987, Hansen *et al.* 1986). Open water and food availability dictate areas of use throughout the winter months. Upland areas may receive considerable use when carrion is available. Important prey includes waterfowl, salmonids, carrion, and small mammals.

3.1.2 Habitat Requirements

Generally, bald eagles require areas in the proximity of water for nesting, and areas with abundant readily available food sources and good roost sites during winter (Harmata 1989, Buehler 2000, Cederholm *et al.* 2001). Bald eagles nest in stands of mature or over-mature timber with old growth characteristics near (generally within one mile) significant water bodies with adequate food supplies. Most nests trees are located in timber stands three acres or larger with canopy closure of less than 80 percent and on flat to moderately sloping terrain with northern aspects. Live trees most often selected are ponderosa pine, Douglas-fir, and cottonwood. Snags of these trees are also used. Most nests are in mature or over-mature dominant or co-dominant trees with open crowns and sturdy horizontal limbs in line of sight to a lake or reservoir greater than 80 acres in size, or fourth order or larger stream (Buehler 2000, MBEWG 1986).

Wintering bald eagles tend to congregate near bodies of water where they feed on fish, carrion, and waterfowl (Buehler 2000, Cederholm *et al.* 2001). Major river drainages and large lakes constitute the majority of winter habitat use. Roosts consist of old large trees or snags where visibility is good and which have sturdy lateral limbs near the crown to provide easy entry and exit (USFS 1977, Green 1985). Communal roosts are usually located in stands of mature old-growth conifer or cottonwoods, and roosts may be several miles from feeding sites.

Important bald eagle habitat includes wetlands, major water bodies, salmonid spawning streams, ungulate winter ranges, spring green-up areas, and areas where open water occurs. Bald eagles have varying tolerances to human disturbance. Disturbance near winter roosts or at the nest site during egg-laying and incubation may result in abandonment of the roost or nest. However, some eagles develop considerable tolerance to human activity and several have been known to nest in the Seattle City limits (Smith *et al.* 1997).

3.1.3 Range and Distribution

Historically, bald eagles occurred over most of North America in a variety of habitats. In Washington, bald eagles are most common west of the Cascades but also occur along most major rivers in eastern Washington (Smith *et al.* 1997). In the winter, the population of bald eagles in Washington increases due to an influx of migrants from the north.

4.0 ENVIRONMENTAL BASELINE

4.1 Area of Effect

For the effects assessment, the area of affect from the project was assumed to be the construction zone or development corridors for the turbine strings, all associated construction permit areas, construction staging areas, plant sites, and any areas requiring reclamation post construction (e.g., disturbed areas) and a buffer zone of approximately ½ mile (approximately 800 m) around these areas.

4.2 Project Area

The Project is located in Kittitas County, Washington, approximately 9 miles (14 km) southeast of the town of Cle Elum, and 12 miles (20 km) northwest of the town of Ellensburg. The Yakima River flows in a southeasterly direction to the south of the Project. U.S. Highway 97 runs north-south through the middle of the project area, and State Highway 10 and Interstate 90 parallel the Yakima River to the south. The project is located in the following sections: Township 19N, Range 17E, Sections 1-3, 7, 9-16, 21-23, and 27, and Township 20N, Range 17E, Section 34 (Figure 1).

The Project is located at the western edge of the Columbia Basin physiographic province at the eastern base of the Cascade Mountain range (Franklin and Dyrness 1988). The Columbia Basin province is surrounded on all sides by mountain ranges and highlands, and covers a large portion of eastern Washington, and extends south into Oregon.

The Project extends over an approximately 4 by 5 mile (6 by 9 km) block of land, which consists primarily of long north-south trending ridges. Between the ridges are ephemeral drainages of Dry Creek and associated tributaries that flow into the Yakima River to the south. Slopes within the project area generally range from 5^{B} to 20^{B}, but can reach 40^{B} in the canyons. Elevations in the project area range from approximately 670 m (2,200 ft) above mean sea level along Highway 97, to approximately 960 m (3,150 ft) near the northernmost turbine string (see Figure 1).

A detailed survey for rare plants and habitat was conducted in spring and summer (April - August) 2002 and additional results and discussions of vegetation in the project are included in Eagle Cap and CH2MHILL (2002). The project area is near the western edge of the big sagebrush/bluebunch wheatgrass zone as defined by Franklin and Dyrness (1988). In addition to big sagebrush (*Artemisia tridentata*), a number of other shrub species may be present in the zone including: rabbitbrushes (*Chrysothamnus* spp. and *Ericameria* spp.), threetip sagebrush (*Artemisia tripartita*), and spiny hopsage (*Grayia spinosa*). The bluebunch wheatgrass is supplemented by variable amounts of grasses and forbs such as needle-and-thread grass (*Hesperostipa comata*), Thurber's needlegrass (*Achnatherum thurberianum*), Cusick's bludegrass (*Poa cusickii*), bottlebrush (*Elymus elymoides*), Sandberg's bluegrass (*Poa secunda*), cheatgrass (*Bromus tectorum)*, and flatspine stickseed (Lappula occidentalis).

Within the project area, many of the plant communities have been impacted and modified due to numerous factors, such as cattle grazing, introduction of exotic plant species, ground disturbance from development activities, past fires, transmission lines, roads and highways, and housing/farms. Much of the riparian vegetation has been removed and degraded from heavy cattle use.

The majority of lands within the project area are privately owned, although several parcels are owned and administered by the State of Washington Department of Natural Resources (DNR). Livestock production (cattle grazing) is a primary land use, although some rural homesite development has also taken place and many of the adjoining sections have been subdivided. The area is also used, on a much more limited basis, for recreational activities such as hunting. A high-voltage transmission line corridor crosses on a roughly east-west line through the middle of the project area. This corridor contains four steel-tower 230 kV electrical transmission lines. Additionally, there is a wood-pole 230kV transmission line that roughly parallels the four-line corridor, and a steel-tower 345 kV line running through the northern portion of the project area (see Figure 1).

4.2.1 Livestock Operations

Historically, the Ellensburg area and Kittitas County has been a large livestock production area and much of the project area is currently rangeland suitable for cattle and horse grazing. Zilkha surveyed the participating landowners for the project to determine the extent and amount of livestock production that occurred within the project area. Three of the participating landowners allow spring grazing on the property within the wind plant. These landowners are located in the southern and western portions of the proposed wind plant [Sections 9 and 21, 22, 27, Township 19 North, Range 17 East]. The Washington DNR land within the project area [Sections 10, 16, 22, Township 19 North, Range 17 East] is also grazed on a 3-year rotational basis which is typically early season one year, late season the next year, and no grazing (deferred) the third year. None of the landowners or the DNR have concentrated calving areas in the project area; however, there are occasional late season calves born on the property. Most of the calving in the Ellensburg area occurs in late January and February. Following the calving season, the cattle are moved to the spring pastures where they graze for approximately three months (typically April-June). In most years, it is during this time frame that cattle will be present within the wind plant.

4.3 Species Data and Occurrence

4.3.1 Washington State

Bald eagles occur in Washington year round. Breeding bald eagles are most abundant in Washington west of the Cascade Mountain Range, but also occur along major river drainages in the eastern portions of the state (Smith *et al.* 1997). The bald eagle population in Washington has been increasing since the early 1980's (Watson *et al.* 2002). Between 1980 and 1998, the state bald eagle population increased at an exponential annual rate of 10% from approximately 105 occupied territories to 666 occupied territories (Watson *et al.* 2002). The distribution of breeding bald eagles also increased as areas unoccupied in 1980 such as the northeast and southeast regions of the state experienced an influx of nesting pairs.

In winter, Washington experiences a significant influx of bald eagles from Canada, Alaska, Montana, and California, and the population may increase to three to six times the breeding population size (Stinson *et al.* 2001). Winter surveys were conducted in Washington from 1982 - 1989. During this time period the winter bald eagle population increased from approximately 1,200 to 2,800 individuals (Stinson *et al.* 2001). It is estimated that the current winter population of bald eagles in Washington may exceed 4,500 individuals (Stinson *et al.* 2001).

4.3.2 Kittitas Valley

Bald eagles are winter residents in the Kittitas Valley but are not known to breed in the area (Smith *et al.* 1997). The WDFW PHS database identifies the Yakima River riparian corridor from Yakima Canyon to Swauk Creek as important wintering habitat for 25-30 bald eagles, and upstream from Swauk Creek as important winter habitat for 10-15 eagles (WDFW PHS 2002). The PHS database also identifies the Teanaway River riparian corridor west of the Project as wintering habitat for bald eagles but does not provide an estimate of the number of bald eagles using this river (WDFW PHS 2002). Christmas bird count information for the Ellensburg count circle (latitude 47^{o}, longitude 120.6^{o}; approximately northwest Ellensburg town limits) indicates an increasing trend in bald eagle numbers (Table 1).

4.3.3 Project Area

Wintering Bald Eagle Surveys

Nine surveys were conducted along the four winter bald eagle survey routes established for the Project between February 15 and April 11, 2002. Counts of bald eagles (repeat counts are not included) observed during each survey were tallied by route (Table 2). The maximum number of bald eagles observed during one survey day was 12 (March 12, 2002), with one of the twelve observations being an unidentified eagle (either golden or bald eagle). On average, 5.6 bald eagles were observed per survey (including the unidentified eagle). Approximately 58 percent of the observations were adults, 30 percent were subadults (1-3 years of age), 10 percent were juveniles (<1 year old), and 1 observation unidentified as to age class (Table 2).

Table 1. Number of bald eagles observed during Christmas Bird counts for the Ellensburg count circle, 1978 - 2001.

Count Date	Bald Eagles Counted
December 16, 1978	0

December 30, 1979	1
December 20, 1980	2
December 19, 1981	0
December 26, 1982	0
December 17, 1983	3
December 22, 1984	1
December 21, 1985	2
January 3, 1987	2
December 19, 1987	1
December 17, 1988	5
December 16, 1989	7
December 1990	no count
December 25, 1991	1
December 25, 1992	8
December 25, 1993	7
December 25, 1994	1
December 25, 1995	5
December 25, 1996	11
December 25, 1997	8
December 19, 1998	11
December 18, 1999	13
December 16, 2000	13
December 15, 2001	15

Route 4, the southernmost route (Figure 2), had the highest bald eagle use (0.33/survey mile), followed by Route 3 (0.20/survey mile), Route 1 (0.15/survey mile), and Route 2 (0.04/survey mile). The mean observed at routes 4 and 3 were significantly higher than the mean for Route 2 ($p<0.10$). No night roost sites were identified in the upland areas. One potential night roost was identified along the river, although no large groups (> 3) of eagles were ever observed at any one location, including this roost.

Several of the eagle observations on Route 3 were near cattle pasture/calving area along Smithson Road (Figure 2). The survey route within the proposed development, Route 2, had the lowest bald eagle use. Three unique observations and a probable repeat observation of an adult were recorded along this route. One adult bald eagle was observed flying just south of the intersection of Hayward and Bettas Road (February 15) approximately 200 m above ground level. One adult eagle was observed perched in a conifer tree to the west of Highway 97 (February 18), 1.3 miles north of Bettas Road. Another adult eagle was observed perched in a lone tree one mile north of the intersection of Highway 10 and Highway 97 near the crest of the ridge above the Yakima River (April 3). The eagle apparently had been feeding on a dead cow, which was observed in close proximity to the tree.

Table 2. Results of bald eagle surveys in the vicinity of the Project.

Number of Eagle Observations	
Route	**Age Classification**

Date	1	2	3	4	Total	AD[1]	SA[2]	JUV[3]	UNK[4]
02/15/2002	0	1	6	0	7	3	3	1	0
02/18/2002	2	1	1	2	6	3	2	1	0
02/26/2002	4	0	0	3	7	5	2	0	0
03/04/2002	5	0	3	0	8	5	3	0	0
03/12/2002	2	0	3	7	12	8	3	0	1
03/21/2002	1	0	0	5	6	3	1	2	0
03/27/2002	0	0	0	2	2	0	1	1	0
04/03/2002	0	1	0	1	2	2	0	0	0
04/11/2002	0	0	0	0	0	0	0	0	0
Total	14	3	13	20	50	29	15	5	1
No./survey	1.56	0.33	1.44	2.22	5.56				
No./mile/survey	0.15	0.04	0.20	0.33					
95% CI (LL[5])	0.06	0.02	0.10	0.12					
95% CI (UL[6])	0.29	0.09	0.48	0.61					

Weekly Fixed-point Surveys

Seven bald eagles were observed during the weekly point count surveys in the spring 2002. Observations were made from points A, C, E, and G (Figure 2). Point A is west of the proposed development area. Survey points C, E and G are within the primary development area. The observations at point C were associated with a dead cow that was near the survey point. The observations at points E and G were of bald eagles flying. The dates of the observations were all between March 21, 2002 (the first date of the weekly surveys) and April 18, 2002. No bald eagles were observed during summer or fall surveys in 2002.

Based on the spring observations, the bald eagle use estimate for the site was 0.06 observations per 20-minute survey. Based on this use estimate, bald eagle was the 5th most common raptor on the site in the spring behind red-tailed hawk (0.26 observations/20-min survey), American kestrel (0.22), rough-legged hawk (0.13), and turkey vulture (0.08) and equal to prairie falcon (0.06) and sharp-shinned hawk (0.06). Bald eagle frequency of occurrence (percent of surveys in which species was observed) for the spring was 4.5% (85 total point surveys) which was the 7th most frequently observed raptor behind red-tailed hawk (22.9% of surveys), American kestrel (18.2%), rough-legged hawk (10.1%), turkey vulture (8.0%), prairie falcon (5.7%), golden eagle (5.0%), and equal to Cooper's hawk (4.5%) and sharp-shinned hawk (4.5%).

During the spring surveys, 6 of the 7 bald eagle observations (85.7%) were of birds flying. In half (3) of these observations (50%) the eagle was flying below 25 m above ground level (AGL), two of the observations (33%) were of eagles flying between 25 and 100 m AGL, and one eagle (17%) was flying above 100 m AGL. The zone between 25 and 100 m is approximately the rotor swept area for the turbines and tower heights proposed for the project.

Incidental/In-transit Observations

No bald eagles were observed incidentally or in-transit between scheduled surveys while observers were on site and no bald eagle nests were located during raptor nest surveys (May 6-8, 2002) of the Project and

[1] Adults (>3 years old)
[2] Subadults (1-3 years old)
[3] Juveniles (<1 year old)
[4] Unknown
[5] Lower limit of a 95% confidence interval
[6] Upper limit of a 95% confidence interval

surrounding area within 2 miles.

5.0 EFFECTS OF THE ACTION

Effects associated with major construction projects on threatened and endangered species (and wildlife in general) include both direct effects such as loss of habitat to the actual facility footprint or habitat alteration due to construction activity constraints (e.g., associated work space for heavy machinery to construct turbines); and indirect effects such as disturbance or displacement from increased human presence and activity in the project area (Table 3). Direct effects are results of the proposed action and would include effects such as loss of habitat and mortality of individuals. Indirect effects are those caused by the proposed action that are reasonably certain to occur and may include effects such as disturbance and/or displacement of individuals, and change in habitat suitability or habitat degradation. Effects may be temporary (short-term), for example the life of the construction, or long-term, such as effects arising from long-term operation and maintenance of the facility (Table 3). Also, effects may be cumulative, arising from the total impact of development, management, and use of the surrounding land.

Table 3. Potential impacts to threatened and endangered species from the project.

	Impact Type	
Impact Duration	**Direct**	**Indirect**
Short-Term	Loss of winter habitat from construction permit areas that will be reclaimed. Potential mortality from construction or related activity.	Prohibiting or altering (displacement) movement through an area due to construction activity. Altering or disturbing species behavior patterns due to construction activity.
Long-Term	Permanent loss of winter habitat to wind plant. Potential mortality due to wind plant operation.	Prohibiting or altering (displacement) movement through an area due to wind plant. Altering or disturbing species behavior patterns due to wind plant operation.

5.1 Direct Effects

Direct effects to bald eagles from the project may include loss of winter habitat (temporary and long-term) and potential mortality (temporary due to construction or long-term due to operation of wind plant).

5.1.1 Loss of Winter Habitat

The primary bald eagle winter habitat in the area includes the Yakima River riparian corridor for roosting and adjacent upland areas for foraging. Bald eagles may use the large trees within the riparian corridor for perching and roosting and may forage in the river for fish. Adjacent upland areas, and in particular where livestock operations occur, are used for foraging. The cattle operations in the area create patchy resources for scavenging and foraging due to dead cattle and calving operations.

The project will be constructed in steppe habitats along the ridge tops and will not result in the permanent (long-term) loss of important winter roosting or perching habitat. The actual turbines, roads, substation, and maintenance facilities will result in the loss of approximately 77 acres of upland habitat which is not considered important bald eagle winter habitat. These areas are not heavily used by wintering bald eagles except when dead cattle or big game may be present creating foraging/scavenging opportunities. Construction activity near the Yakima River riparian corridor (southernmost turbine string) may create disturbances which creates unsuitable roosting/perching habitat (i.e., displaces eagles from roosting/perching opportunities), however, these disturbances will be temporary for the construction period (9-12 months) and will affect only a minor portion of the available riparian habitat.

5.1.2 Potential Mortality

The possibility of short-term (i.e., due to construction activity) mortality effects from the project is considered negligible and very unlikely to occur. Bald eagles in the area during the construction period are unlikely to occur within the construction zones due to disturbances, and therefore are unlikely to be at risk of construction related mortality. In addition, the majority of construction is likely to take place during late spring, summer and fall months when bald eagles very rarely or do not occur in the area.

Once the wind plant is constructed and operational, bald eagles in the area may be at risk of collision with turbines or meteorological towers. Avian species, including some raptor species, are documented casualties due to collision with wind turbines and meteorological towers (see Erickson *et al.* 2001). Raptor mortality has been documented at many wind plants, although raptor mortality at the newer generation wind plants is estimated at 3-7 times less than the wind plant at Altamont Pass in California, which has many older generation wind turbines (Young *et al.* 2002). Golden eagles also appear to be more susceptible to collision mortality than many other raptors (Erickson *et al.* 2001). Despite the apparent susceptibility of golden eagles and some raptors to some wind turbines, there have been no documented bald eagle fatalities to date at wind plants (Erickson *et al.* 2001). Based on the available information about bald eagle use of the site, potential bald eagle mortality due to operation of the wind plant will be confined to the winter and early spring seasons. Bald eagles will not be at risk from the wind plant during summer or fall because they are not known to occur in the area during those seasons.

Estimates of bird mortality from wind projects may be based on bird use of a site and the propensity for that species to fly within the rotor swept area or zone of risk. For the proposed Project, there were only 7 observations of bald eagles during standardized point counts across the project area. Two of these observations were made in areas outside the proposed development. In addition, 33% of these observations were of eagles flying within the zone of risk, defined as the area between 25 and 100 m AGL based on the proposed turbine and tower heights. While the sample size is relatively small, it does show that wintering bald eagles may have some exposure to turbines by flying within the rotor swept area.

5.2 Indirect Effects

Indirect effects from the project may include disturbance and displacement related effects from construction (short-term) as well as operation (long-term) of the wind plant.

5.2.1 Disturbance

Construction of the project will create short-term (life of construction) disturbances that could affect bald eagles in the area. In addition, operation of the wind plant (actual turning turbines) may create disturbances which also affect eagles in the area. These effects are believed to be negligible for a number of reasons. Based on the site surveys and available information, bald eagles only occur in the area during the winter and early spring. Most of the construction activity is likely to take place during the late spring, summer and fall when weather conditions are more favorable, thus minimizing the potential for construction related disturbances. In addition, bald eagle use of the Project site is minimal compared to surrounding areas such as the Yakima River riparian corridor and likely based on the availability of prey or carrion. Bald eagles are not expected to frequently occur within the project area and operation of the wind plant should have minimal disturbance on bald eagles.

5.2.2 Displacement and Altered Movement Patterns

Wintering bald eagles will sometimes utilize night roosts which are located in secluded, sheltered, upland areas away from human disturbances and which may be considerable distances from foraging areas. There is the possibility that winter roosts may occur in forested areas north of the project and bald eagles therefore could travel across the Project site from areas near the Yakima River. In addition, bald eagles roosting along the Yakima River may fly across portions of the Project to foraging areas. Should a roost occur to the north and bald eagles travel back and forth across the site, both construction and operational disturbances from the wind plant have the potential to displace or alter eagle movement patterns. No evidence that winter roosts occur north of the project was observed during the winter roadside surveys for bald eagles. Due to the concentration of eagle observations along the river corridor, it is more likely that eagles roost in the riparian areas and move from the river to upland foraging areas, and in particular to where cattle are concentrated (e.g., along Smithson Road). It is more likely that bald eagles moving from the riparian areas will encounter the wind plant and therefore be subject to displacement or altered movement patterns.

5.3 Cumulative Effects

Cumulative effects under the ESA are effects of future non-federal actions/activities that are reasonably certain to occur in the foreseeable future. These types of actions include:

- population growth, particularly in Ellensburg and the Kittitas Valley,
- new housing developments and subdivisions,
- increased infrastructure to accommodate population growth,
- increased utilities/pipelines due to increased development,
- increased gravel/materials mining to accommodate development and roads,
- increased energy development including other wind plants,
- logging of state and private forests,
- future agriculture practices on private land including livestock grazing.

The proposed project is not expected to contribute to population growth and associated development activities such as new housing, but is designed to accommodate future power needs associated with population growth and development. The Ellensburg area and Kittitas County are undergoing substantial growth in population. A number of scattered rural residential home sites have been established in the foothills and surrounding areas including areas immediately within and adjacent to the Project. These developments have the effect of reducing open space, forests, and rangeland and activities associated with those landscapes such as logging and livestock production. In addition, due to the windy nature of the area, additional wind plants may be proposed for the County and Kittitas Valley. Further development may contribute cumulative effects to bald eagles by creating more disturbances, reducing foraging and secluded sheltering opportunities, and creating more collision hazards. To a certain degree, livestock production has benefited bald eagles by providing a source of carrion and forage. Reduction of livestock operations in the Kittitas Valley due to subdivisions and city expansion will reduce these resources for bald eagles.

Other cumulative effects associated with increased development, such as increased infrastructure, increased human presence and disturbance, and reductions in the historic land uses, may also effect bald eagles simply by using more space that could be utilized by bald eagles and creating more disturbances. Bald eagles are large avian predators capable of wide ranging movements. While bald eagles can and do become accustomed to human activity, they are also generally sensitive to human encroachment. Future non-federal activities listed above would be expected to affect bald eagles, especially as they allow more human use of areas occupied by eagles. Additional use of open and secluded spaces by humans would be expected to cause some habitat degradation or limit use by bald eagles as they avoid humans. Also, more human activity in the area will lead to more disturbance, displacement, and contribute to other environmental impacts, for example, water quality degradation. The impacts would depend, in part, on where human activities occur, particularly in relation to rivers and lakes. For example, the more activity that occurs in riparian areas and results in the loss of riparian vegetation, the greater the potential for impacts to wintering bald eagles along the Yakima River.

The magnitude of cumulative effects on bald eagles is difficult to measure. While cumulative effects to bald eagles are likely occurring from increased development and human population growth of the area, the project itself is not expected to substantially contribute to the cumulative effects because of the temporary nature of the construction project and the small likelihood that the operational wind plant will affect bald eagles. Operation of the wind plant could lead to disturbance/displacement effects, but it is likely that wintering eagles in the area will become accustomed (habituated) to the wind plant over the long term and continue to use areas nearby. Bald eagles have shown the ability to become accustomed to high human presence and have even nested with the Seattle City limits (Smith et al. 1997). Operation of the wind plant may also lead to a small level of bald eagle mortality if any eagles collide with turbines, however, this low level of mortality is unlikely to have a measurable effect on the growing bald eagle population in Washington. In addition, the presence of the wind plant itself may preclude some additional development such as houses and subdivisions, and preserve some of the historic land uses (livestock production), thus preserving some foraging habitat for wintering eagles.

5.4 Conservation Measures

The following measures will be incorporated into the Project construction to minimize potential short-term (construction) effects on bald eagles from the Project:

- minimize construction activity that will occur during the winter;
- maintain best management practices within the construction zones to minimize adjacent habitat disturbance;
- establish and enforce reasonable driving speed in the Project to minimize wildlife or livestock roadkills;
- provide adequate on-site waste disposal;
- adhere to the NPDES permit stipulations, including erosion control measures;
- reclaim disturbed areas as soon as practical following construction;
- establish and adhere to a fire prevention plan for the construction zone.

The following measures will be employed to minimize potential long-term (operational) effects from the Project:

- establish and enforce reasonable driving speed limits within the wind plant to minimize the potential for road killed wildlife or livestock which may attract foraging bald eagles;
- provide adequate on-site waste disposal;
- remove and disposed of all carcasses of livestock, big game, and other wildlife from within the wind plant that may attract foraging bald eagles;

- ensure that livestock calving areas of participating landowners remain outside the wind plant;
- install bird flight diverters on all guy wires associated with met towers;
- install raptor perch guards on all power poles constructed for the wind plant.

In addition to measures described above, Zilkha proposes to purchase and protect, for the life of the project, a privately-owned parcel of land approximately 500 acres in size [Sections 22 and 27, Township 19 North, Range 17 East] which is adjacent to land owned by the Washington DNR. This parcel is currently one of the areas grazed by cattle within the project and is under immediate threat of development and conversion to rural residential development. In addition, Zilkha will implement measures to enhance the value of the native habitat on this parcel through weed control and by excluding livestock. The location of this parcel is within the southern extent of the proposed wind plant. The proposed action will essentially remove foraging opportunities for bald eagles within the portion of the wind plant closest to the Yakima River riparian corridor.

6.0 DETERMINATION

6.1 Adverse Effects

Under the ESA, effects are classified as those "not likely to adversely affect" or those "likely to adversely affect" a listed species. Not likely to adversely affect is the appropriate conclusion when effects are expected to be discountable, insignificant, or beneficial. Discountable effects are those which are extremely unlikely to occur and are essentially not expected to occur. Insignificant effects refer to the size and/or magnitude of the effect, and are those effects which should never reach a scale where take occurs. Insignificant effects are effects which can not be detected, measured, or evaluated to any meaningful degree. Beneficial effects are positive effects to a species which occur without any associated adverse effects.

The ESA (Section 3) defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct". The USFWS further defines harm as "significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering". The USFWS defines harass as "actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering".

Disturbance and Displacement
The project may conceivably result in short-term and long-term disturbance and/or displacement effects to bald eagles from construction and operation of the wind plant. However, based on the on-site surveys and available information about bald eagle use of the area, the seasonal and spatial use of the site by bald eagles is relatively low and likely directly correlated with the presence of carrion for foraging. The potential for disturbance and displacement to occur which result in adverse effects is considered discountable (i.e., extremely unlikely to occur and essentially not expected to occur) and insignificant (i.e., will not reach a scale where take occurs). That is, the project is not expected disturb or displace bald eagles to the point where harm or harassment (as defined above by the USFWS for listed species) occurs. Additionally, proposed conservation measures are intended to further reduce the possibility of disturbance or displacement.

Potential Mortality
Construction of the wind plant is unlikely to result in the death of a bald eagle; however, operation of the wind plant may put wintering eagles in the area at risk of collision with turbines or met towers. The death of a bald eagle from the wind plant would be considered take and therefore an adverse effect. To date

there have been no reported (known) bald eagle fatalities associated with wind plants in the U.S. (see Erickson *et al.* 2001). While use of the Project site by bald eagles does occur, it is relatively low and appears to be related to the presence of livestock or wildlife carcasses (carrion), which they utilize for forage. Bald eagle use of the Project site appears to be primarily related to eagles moving across the site to foraging areas. Site management measures for the Project are intended to minimize foraging opportunities for bald eagles within the wind plant. All livestock and wildlife carcasses found will be removed and disposed of and livestock calving operations by Project area landowners will remain outside the Project. These measures should effectively minimize foraging opportunities for eagles on site and thus minimize the risk of collision related fatalities. However, despite these measures, there is still the possibility that an eagle flying through the area collides with or is hit by a moving turbine. Because the potential for adverse effects can not be reduced to discountable or insignificant levels (i.e., a scale where take does not occur), the appropriate determination is operation of the wind plant is **likely to adversely affect** bald eagles.

6.2 Future Status of Species

The status of bald eagle in the project area and range wide is not expected to change due to the project. Bald eagle is well on the way to recovery and the USFWS has proposed the species for delisting (USFWS 1999). The bald eagle populations in Washington and throughout North America will continue to increase during and after the project is constructed.

7.0 REFERENCES

7.1 Literature Cited

Arcata Fish and Wildlife Office (AFWO). 2001. Species profile: Northern Spotted Owl, *Strix occidentalis caurina*. U. S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, CA

Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). *In* The Birds of North America, No. 506. (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Carbyn, L. N. 1987. Gray wolf and red wolf. Pages 358-376 *in* M. Novak, J. A. Baker, M. E. Obbard, and B. Malloch (eds.). Wild Furbearer Management and Conservation in North America.

Cederholm, D. J., D. H. Johnson, R. E. Bilby, L. G. Dominguez, A. M. Garrett, W. H. Graeber, E. L. Greda, M. D. Kunze. 2002. Pacific Salmon and Wildlife - Ecological Contexts, Relationships, and Implications for Management. Pages 628-684 *in* Honson, D. H. and T. A. Neil. 2001. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Eagle Cap Consulting, Inc. and CH2M Hill. 2002. An investigation of rare plant resources associated with the proposed Kittitas Valley wind power project (Kittitas County, Washington). Technical report prepared by Eagle Cap Consulting, Inc., Beaverton, Oregon and CH2M Hill, Portland, Oregon. August 20, 2002.

Erickson, W. P., G. D. Johnson, M. D. Strickland, D. P. Young, Jr., K. J. Sernka and R. E. Good. 2001. Avian collisions with wind turbines: A summary of existing studies and comparisons to other sources of avian collision mortality in the United States. National Wind Coordinating Committee Resource Publication.

Erickson, W., J. Jeffrey, D. Young, K. Bay, R. Good, and K. Sernka. 2003. Ecological Baseline Study for the Kittitas Valley Wind Project Summary of Results from 2002 Wildlife Surveys Final Report February 2002– November 2002. Technical Report prepared for: Zilkha Renewable Energy, Portland, OR. Prepared by: Western EcoSystems Technology, Inc., Cheyenne, WY.

Fraley, J.J. and B.B. Shepard. 1989. Life history, ecology, and population statue of bull trout (*Salvelinus confluentus*) in the Flathead Lake and River system, Montana. Northwest Science 63: 133-143. *In:* USFWS 1998a.

Franklin, J.F. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, Oregon. 452 pp

Goetz, F. 1989. Biology of the bull trout (*Salvelinus confluentus*): a literature review. U. S. Department of Agriculture, Forest Service, Willamette National Forest, Eugene, OR. *In:* USFWS 1998a.

Green, N.F. 1985. The bald eagle. Audubon Wildl. Rep. 1985. Pages 508-531.

Gutiérrez, R. J., A. B. Franklin, and W. S. Lahaye. 1995. Spotted Owl (*Strix occidentalis caurina*). *In* The Birds of North America, No. 506. (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Hays, D. W., M. J. Tirhi, and D. W. Stinson. 1998. Washington state status report for the sage grouse. Washington Department Fish and Wildlife, Olympia. 62 pp.

Hansen, A. J., M. I. Dyer, H. H. Shugart, and E. L. Boeker. 1986. Behavioral ecology of bald eagles along the northwest coast: landscape perspective. Oak Ridge Nat. Lab. Environmental Science Div. Publ. No. 2,548. Oak Ridge, TN.

Harmata, A. R. 1989. Bald Eagle *Haliaeetus leucocephalus*. Pages 65-67 *in*: T.W. Clark, A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves (eds.). Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. Northern Rockies Conservation Cooperative, Jackson, Wyoming. 186 pp.

Harmata, A. R., and R. Oakleaf. 1992. A management oriented study of bald eagle ecology in the Greater Yellowstone Ecosystem. Wyoming Game and Fish Department, 1 December 1992.

Hodges, J. I., E. L. Boeker, and A. J. Hansen. 1987. Movements of radio-tagged bald eagles, *Haliaeetus leucocephalus*, in and from southwestern Alaska. Can. Field Nat. 101:136-140.

Montana Bald Eagle Working Group (MBEWG). 1986. Montana bald eagle management plan. U. S. Department of the Interior, Bureau of Land Management, Billings, MT.

Quigley, T. M. and S. J Arbelbide, eds. 1997. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Vol. III. USDA-FS, Gen. Tech. Rep. PNW-GTR-405. Pacific Northwest Research Station, Portland, OR.

Rieman, B. E. and J. D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. Transactions of the American Fisheries Society 124:285-296.

Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding birds of Washington state location data and predicted distributions. Seattle Audubon Society Publications in Zoology No. 1. Seattle 538 pp.

Stinson, D. W., J. W. Watson, and K. R. McAllister. 2001. Washington State Status Report for the Bald Eagle. Washington Department of Fish and Wildlife, Olympia. 92 pp.

Tucker, P.A., D.L. Davis, and R.R. Ream. 1990. Wolves, identification, documentation, population monitoring and conservation considerations. National Wildlife Federation, Northern Rockies Natural Resource Center, Missoula, Montana. 28 pp.

U. S. Department of Agriculture Forest Service (USDA FS). 1977. Bald eagle habitat management guidelines. USDA FS, San Francisco, CA.

U. S. Fish and Wildlife Service. 1978. Determination of Certain Bald Eagle Populations as Endangered or Threatened. Federal Register 43:6230-6233

U. S. Department of Interior Fish and Wildlife Service. 1990. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Northern Spotted Owl; Final Rule. Federal Register 55(123):26114-26194.

U. S. Fish and Wildlife Service. 1992. Endangered and Threatened Wildlife and Plants: Final Rule to List the Plant *Spiranthes diluvialis* as a Threatened Species. Fed. Reg. 57(12): 2048-2054.

U. S. Fish and Wildlife Service. 1995a. Recommendations and guidelines for Ute ladies'-tresses orchid (*Spiranthes diluvialis*), Recovery and fulfilling Section 7 Consultation responsibilities. U.S. Fish and Wildlife Service. 7pp + attachments.

U. S. Fish and Wildlife Service. 1995b. Endangered and Threatened Wildlife and Plants; Final Rule to Reclassify the Bald Eagle from Endangered to Threatened in All of the Lower 48 States. Fed. Reg. 60(133):36000-36010.

U. S. Fish and Wildlife Service. 1998a. Gray Wolf, *Canis lupus*. U. S. Fish and Wildlife Service, http://www.fws.gov July 1998

U. S. Fish and Wildlife Service. 1998b. Endangered and threatened wildlife and plants; determination of threatened status for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register: June 10, 1998 Vol. 63, Number 111.

U.S. Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife. Federal Register 64(128):36454-36464.

U. S. Fish and Wildlife Service. 2000a. The Endangered Species Act and Candidate Species. U. S. Fish and Wildlife Service, Division of Endangered Species, Arlington, Virginia. 1p.

U. S. Fish and Wildlife Service. 2000b. Endangered and Threatened Wildlife and Plants; Proposal to Reclassify and Remove the Gray Wolf from the List of Endangered and Threatened Wildlife in Portions of the Conterminous United States; Proposal to Establish Three Special Regulations for Threatened Gray Wolves; Proposed Rule. Fed. Reg. 65(135):43450-43496.

U. S. Fish and Wildlife Service. 2001. Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petition to list Yellow-Billed Cuckoo (*Coccyzus americanus*) in the Western Continental United States. Federal Register 66(143):38611-38626, July 25, 2001.

Washington Cooperative Fish and Wildlife Research Unit (WCFWRU). 1999. Washington GAP Analysis Project. University of Washington, Seattle, Washington . <http://www.fish.washington.edu/naturemapping/wagap/public_html/index.html>

Washington Department of Fish and Wildlife. 1999. Wolves in Washington: Fact Sheet, June 1999. Washington Department of Fish and Wildlife, Olympia. 2pp.

Washington Department of Fish and Wildlife, Priority Habitats and Species (WDFW PHS). 2002. Habitat and Species Maps for Townships: T18N, R16E; T18N, R17E; T18N, R18E; T19N, R16E; T19N, R17E; T19N, R18E; T20N, R16E; T20N, R17E; and T20N, R18E.

Washington Natural Heritage Program (WNHP). 1999. Field guide to selected rare plants of Washington. Washington Department of Natural Resources, Natural Heritage Program and U. S. Department of Interior, Bureau of Land Management.

Watson, G. and T. W. Hillman. 1997. Factors affecting the distribution and abundance of bull trout: an investigation at hierarchial scales. North American Journal of Fisheries Management 17:237-252. *In:* USFWS 1998a.

Watson, J. W., D. W. Stinson, K. E. McAllister, and T. E. Owens. 2002. Population status of bald eagles breeding in Washington at the end of the 20^{th} century. Journal of Raptor Research 36(3):161-169.

Young, D. P. Jr., W. P. Erickson, R. E. Good, M. D. Strickland, and J. P. Eddy. 2002. Avian and bat mortality associated with the initial phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming: November 1998 - June 2000. Technical Report prepared by WEST, Inc. for Pacificorp, Inc., SeaWest Windpower, Inc. and Bureau of Land Management.

APPENDIX A – U.S. FISH AND WILDLIFE SERVICE LETTER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
P. O. Box 848
Ephrata, Washington 98823
Phone: 509-754-8580 Fax: 509-754-8575

July 9, 2002

JUL 15 2002

Wally Erikson
West Inc.
2003 Central Avenue
Chyenne, Wyoming 82001

RE: Species List Request
FWS Reference: 02-SP-E0269

Thank you for your request dated June 17, 2002. The following threatened, endangered, proposed, and candidate species may be present near the proposed wind plant, Kittitas County, Washington:

KITTITAS COUNTY

LISTED
Endangered
Gray wolf *(Canis lupus)*

Threatened
Bald eagle *(Haliaeetus leucocephalus)*
Bull trout *(Salvelinus confluentus)*
Northern spotted owl *(Strix occidentalis caurina)*
Ute ladies'-tresses *(Spiranthes diluvialis)*, plant

Designated
None

PROPOSED
None

CANDIDATE
Western sage grouse *(Centrocercus urophasianus phaios)*
Western yellow-billed cuckoo (*Coccyzus americanus*)

This list fulfills the requirements of the U. S. Fish and Wildlife Service (Service) under Section 7(c) of the Endangered Species Act of 1973, as amended (Act).

If there is federal agency involvement in this project (funding, authorization, or other action), the involved federal agency must meet its responsibilities under section 7 of the Endangered Species Act of 1973, as amended (Act), as outlined in Enclosure A. Enclosure A includes a discussion of the contents of a Biological Assessment (BA), which provides an analysis of the impacts of the project on listed and proposed species, and designated and proposed critical habitat. Preparation of a BA is required for all major construction projects. Even if a BA is not prepared, potential project effects on listed and proposed species should be addressed in the environmental review for this project. Federal agencies may designate, in writing, a non-federal representative to prepare a BA. However, the involved federal agency retains responsibility for the BA, its adequacy, and ultimate compliance with section 7 of the Act.

Preparation of a BA would be prudent when listed or proposed species, or designated or proposed critical habitat, occur within the project area. Should the BA determine that a listed species is likely to be affected by the project, the involved federal agency should request section 7 consultation with the U. S. Fish and Wildlife Service (Service). If a proposed species is likely to be jeopardized by the project, regulations require conferencing between the involved federal agency and the Service. If the BA concludes that the project will have no effect on any listed or proposed species, we would appreciate receiving a copy for our information.

Candidate species receive no protection under the Act, but are included for your use during planning of the project. Candidate species could be formally proposed and listed during project planning, thereby falling within the scope of section 7 of the Act. Protection provided to these species now may preclude possible listing in the future. If evaluation of the subject project indicates that it is likely to adversely impact a candidate species, we encourage you to modify the project to minimize/avoid these impacts.

If there is no federal agency involvement in your project, and you determine that it may negatively impact a listed or proposed species, you may contact us regarding the potential need for permitting your actions under section 10 of the Act.

Several species of anadromous fishes that have been listed by the National Marine Fisheries Service (NMFS) may occur in the project area. Please contact NMFS in Seattle, Washington, at (206) 526-6150, in Portland, Oregon, at (503) 231-2319, or in Boise, Idaho, at (208) 378-5696 to request a list of these species.

If you would like information concerning state listed species or species of concern, you may contact the Washington Department of Fish and Wildlife, at (360) 902-2543, for fish and wildlife species; or the Washington Department of Natural Resources, at (360) 902-1667, for plant species.

This letter fulfills the requirements of the Service under section 7 of the Act. Should the project plans change significantly, or if the project is delayed more than 90 days, you should request an update to this response.

Thank you for your efforts to protect our nation's species and their habitats. If you have any questions concerning the above information, please contact Skip Stonesifer at (509) 754-8580.

Sincerely,

Mark G. Miller

Supervisor

Enclosure

Enclosure B

Additional Information for *Spiranthes diluvialis* - Ute Ladies'-tresses
Status: Threatened

Spiranthes diluvialis was first described in 1984 (Sheviak 1984), and it is not yet included in many of the dichotomous keys commonly used by botanists in the northwest or Great Basin regions. It is found up to about 6,000 feet in elevation throughout much of its range in the western United States, below the lower margin of montane forests or in the transitional zone. It generally occurs in wetland and riparian areas of open shrub or grassland habitats, including springs, mesic to wet meadows, river meanders, and flood plains. This species has only recently been recorded on a few sites in central Washington, where it can occur at relatively low elevations (down to roughly 700 feet in Chelan County). It is possible that the species occurs in other appropriate wetland and riparian areas in central and eastern Washington.

Ute ladies'-tresses is a perennial, terrestrial orchid (family Orchidaceae) with stems 20 to 50 centimeters (cm) (8 to 20 inches [in]) tall, arising from tuberously thickened roots. Its narrow (0.5 to 1 cm; 0.2 to 0.4 in) leaves are about 28 cm (11 in) long at the base of the stem, and become reduced in size going up the stem. The flowers consist of 7 to 32 small (0.8 to 1.5 cm; 0.3 to 0.6 in) white or ivory flowers clustered into a spike arrangement at the top of the stem. The species is characterized by whitish, stout, ringent (gaping at the mouth) flowers. The sepals and petals, except for the lip, are rather straight, although the lateral sepals are variably oriented, often spreading abruptly from the base of the flower. Sepals are sometimes free to the base.

The non-blooming plants of Ute ladies'-tresses are very similar to those of the widespread, congeneric species *S. romanzoffiana* - hooded ladies' tresses. Usually, it is only possible to positively identify Ute ladies'-tresses when it is flowering. *S. romanzoffiana* has a tight helix of inflated ascending flowers around the spike and lateral appressed sepals. *S. diluvialis* has flowers facing directly away from the stalk, neither ascending nor nodding, and appressed or free lateral sepals (please refer to the attached drawings). Ute ladies'- tresses generally blooms from late July through September, depending on location and climatic conditions. However, in some areas, including central Washington, this species may bloom in early July or as late as early October. Bumblebees are apparently required for pollination.

Mature plants may not produce above ground shoots for one or more growing seasons, or may exhibit vegetative shoots only. Orchids generally require symbiotic associations with mycorrhizal fungi for seed germination. In addition, many plants of some *Spiranthes* species are initially saprophytic, and persist underground for several years before emerging (USFWS 1995). Therefore, it may require multiple years of surveys to document the presence or absence of Ute ladies'-tresses in a given area.

This species may be adversely affected by alterations of its habitat due to livestock grazing, vegetation removal, excavation, construction, stream channelization, and other actions that alter hydrology.

References Cited

Sheviak, C.J. 1984. *Spiranthes diluvialis* (Orchidaceae), a new species from the western United States. Brittonia 36(1):8-14.

USFWS. 1995. Ute Ladies'-tresses *(Spiranthes diluvialis)*: Agency Review Draft Recovery Plan. Prepared by the U.S. Fish and Wildlife Service Ute Ladies'-tresses Recovery Team for Region 6, Denver, Colorado.

Enclosure A

Responsibility of Federal Agencies under Section 7
of the Endangered Species Act

Section 7(a) - Consultation/Conferencing

Requires: 1) Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2) Consultation with the U.S. Fish and Wildlife Service (Service) when a federal action may affect a listed species to ensure that any action authorized, funded, or carried out by a federal agency will not jeopardize the continued existence of listed species, or result in destruction or adverse modification of critical habitat. The process is initiated by the federal agency after determining that the action may affect a listed species; and

3) Conferencing with the Service when a federal action may jeopardize the continued existence of a proposed species, or result in destruction or adverse modification of proposed critical habitat.

Section 7(c) - Biological Assessment for Major Construction Activities

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities[1]. The BA analyzes the effects of the action, including indirect effects and effects of interrelated or interdependent activities, on listed and proposed species, and designated and proposed critical habitat. The process begins with a request to the Service for a species list. If the BA is not initiated within 90 days of receipt of the species list, the accuracy of the list should be verified with the Service. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable between the Service and the involved federal agency).

We recommend the following for inclusion in a BA: an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if listed or proposed species are present; a review of pertinent literature and scientific data to determine the species' distribution, habitat needs, and other biological requirements; interviews with experts, including those within the Service, state conservation departments, universities, and others who may have data not yet published in scientific literature; an analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; and an analysis of alternative actions considered. The BA should document the results of the impacts analysis, including a discussion of study methods used, any problems encountered, and other relevant information. The BA should conclude whether or not any listed species may be affected, proposed species may be jeopardized, or critical habitat may be adversely modified by the project. Upon completion, the

BA should be forwarded to the Service.

Major concerns that should be addressed in a BA for listed and proposed animal species include:

1. Level of use of the project area by the species, and amount or location of critical habitat;

2. Effect(s) of the project on the species' primary feeding, breeding, and sheltering areas;

3. Impacts from project construction and implementation (*e.g.*, increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to the species and/or their avoidance of the project area or critical habitat.

Major concerns that should be addressed in a BA for listed or proposed plant species include:

1. Distribution of the taxon in the project area;

2. Disturbance (*e.g.*, trampling, collecting) of individual plants or loss of habitat; and

3. Changes in hydrology where the taxon is found.

Section 7(d) - Irreversible or Irretrievable Commitment of Resources

Requires that, after initiation or reinitiation of consultation required under section 7(a)(2), the Federal agency and any applicant shall make no irreversible or irretrievable commitment of resources with respect to the action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives which would avoid violating section 7(a)(2). This prohibition is in force during the consultation process and continues until the requirements of section 7(a)(2) are satisfied.

---

[1] A major construction activity is a construction project, or other undertaking having similar physical impacts, which is a major action significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act [42 U.S.C. 4332 (2)(c)].

Figure 1. Proposed Zilkha Kittitas Valley wind power project location.

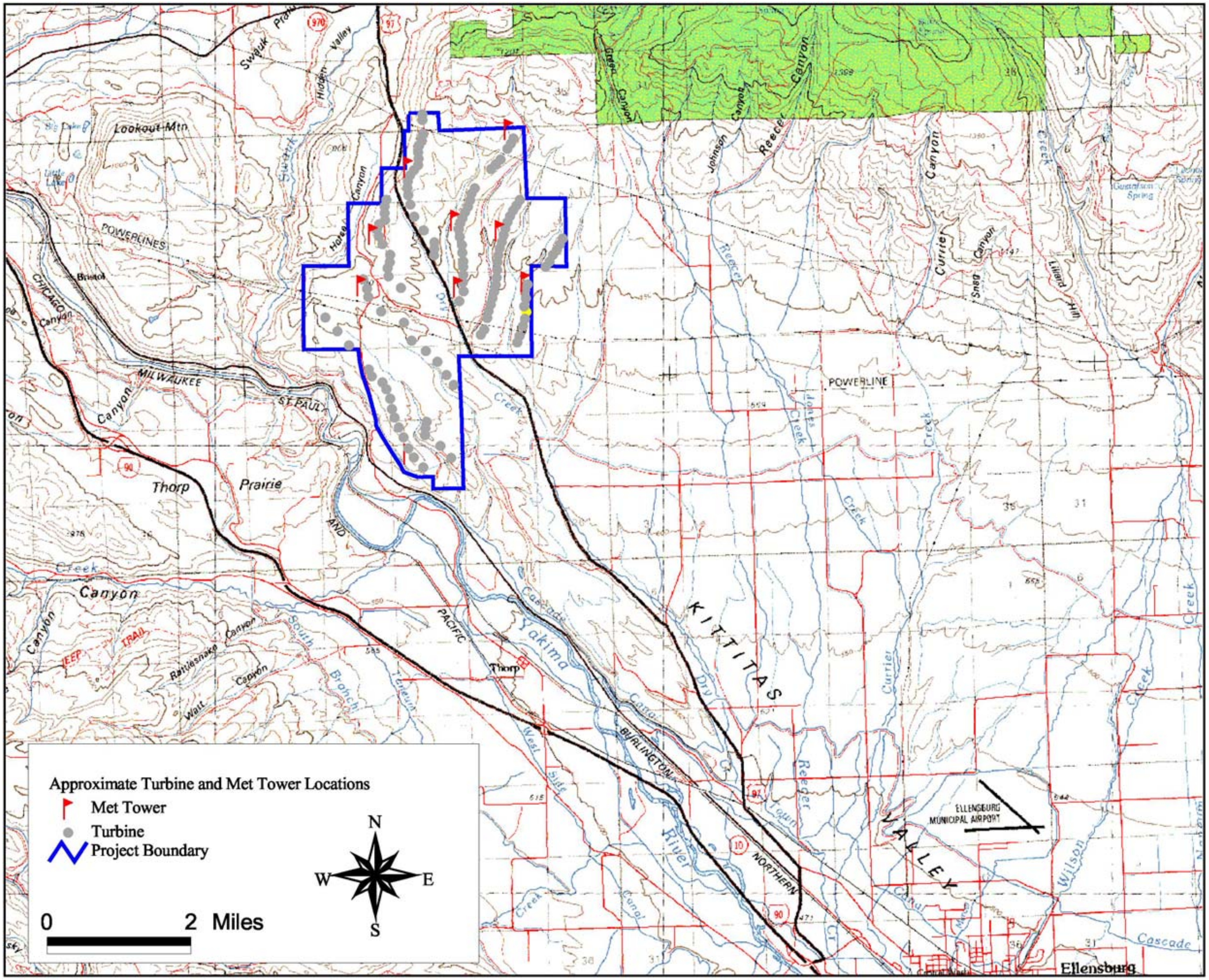
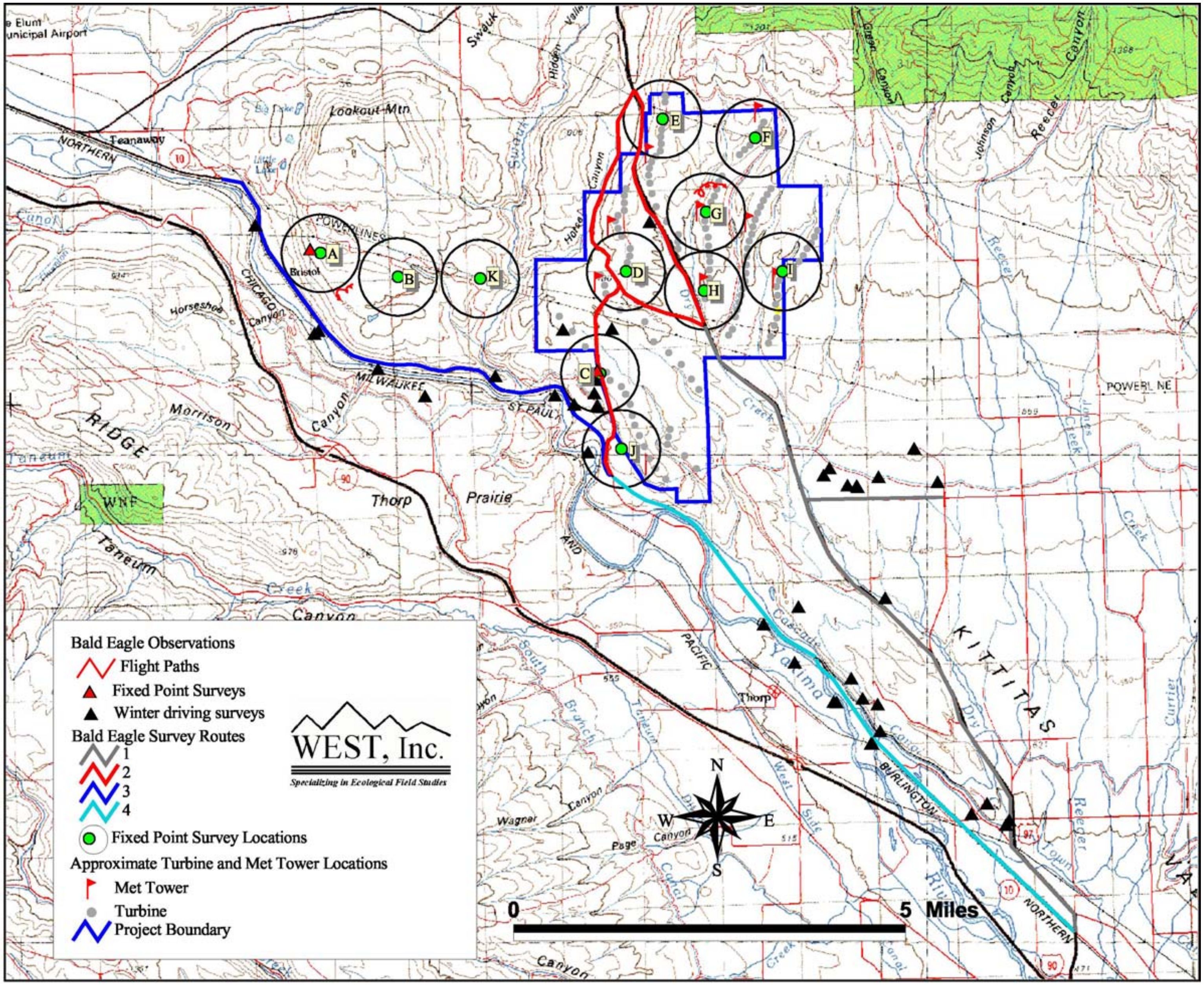


Figure 2. Winter bald eagle survey routes, fixed-point survey locations, and bald eagle observations.



Search Criteria Used: Township: 19, Range: 17E, Section(s): (01, 02, 03, 04, 09, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27, 28)
There were 39 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

Search Results - Derived from the Text Search Engine

To print or email the following results, use the buttons above.
10/31/02

1. Well Owner Name: BERNDT OBERG
Public Land Survey: NW, NW, S-04, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address: HIDDEN VALLEY RD, CLE ELLUM
Well Log ID: 303089, Well Tag:
Well Diameter: 8.00 (inches), Well Depth: 464.00 (feet)
Well Type: Water, Well Completion Date: 10/17/98 12:00:00AM, Well Received Date: 6/14/99 12:00:00AM

2. Well Owner Name: BERNOT OBERG
Public Land Survey: NW, NW, S-04, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address: HIDDENVALLEY RD 5
Well Log ID: 257403, Well Tag:
Well Diameter: 8.00 (inches), Well Depth:
Well Type: Water, Well Completion Date: 10/27/98 12:00:00AM, Well Received Date: 11/17/98 12:00:00AM

3. Well Owner Name: BOB BRUUKE
Public Land Survey: NW, NW, S-01, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 257309, Well Tag: AFE273, Notice of Intent Number: W109662
Well Diameter: 10.00 (inches), Well Depth: 590.00 (feet)
Well Type: Water, Well Completion Date: 7/6/00 12:00:00AM, Well Received Date: 7/20/00 12:00:00AM

4. Well Owner Name: BRETT THOMPSON
Public Land Survey: SW, SE, S-14, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 121966, Well Tag: ACL117, Notice of Intent Number: W087473
Well Diameter: 10.00 (inches), Well Depth: 360.00 (feet)
Well Type: Water, Well Completion Date: 11/14/96 12:00:00AM, Well Received Date:

5. Well Owner Name: CHARLES SHARP
Public Land Survey:
County: KITTITAS, Well Address:
Well Log ID: 113269, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 502.00 (feet)
Well Type: Water, Well Completion Date: 6/18/86 12:00:00AM, Well Received Date: 10/24/86 12:00:00AM

6. Well Owner Name: DAVE ARCHAMBEAU
Public Land Survey: NE, SE, S-04, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 113805, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 230.00 (feet)
Well Type: Water, Well Completion Date: 8/27/87 12:00:00AM, Well Received Date: 8/28/87 12:00:00AM

7. Well Owner Name: DAVE BOWEN
Public Land Survey: SW, NE, S-27, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 113809, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 220.00 (feet)
Well Type: Water, Well Completion Date: 10/1/92 12:00:00AM, Well Received Date: 11/6/92 12:00:00AM

Search Criteria Used: Township: 19, Range: 17E, Section(s): (01, 02, 03, 04, 09, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27, 28)
There were 39 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

8. Well Owner Name: DAVE MALININSKIE
Public Land Survey: SE, SW, S-26, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 113822, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 315.00 (feet)
Well Type: Water, Well Completion Date:

9. Well Owner Name: DEAN TONSETH
Public Land Survey: NW, NE, S-28, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 113899, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 84.00 (feet)
Well Type: Water, Well Completion Date: 10/24/77 12:00:00AM, Well Received Date: 12/5/77 12:00:00AM

10. Well Owner Name: DEL HEISTAND
Public Land Survey: SW, SW, S-26, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 113921, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 300.00 (feet)
Well Type: Water, Well Completion Date: 3/4/81 12:00:00AM, Well Received Date:

11. Well Owner Name: DENNIS HIGGIMBOTHOM
Public Land Survey: NW, SW, S-23, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 113974, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 200.00 (feet)
Well Type: Water, Well Completion Date: 4/29/91 12:00:00AM, Well Received Date:

12. Well Owner Name: DICK ELMORE
Public Land Survey: SW, SE, S-26, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 114031, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 210.00 (feet)
Well Type: Water, Well Completion Date: 11/30/84 12:00:00AM, Well Received Date: 12/2/84 12:00:00AM

13. Well Owner Name: DOUG NOSTY
Public Land Survey:
County: KITTITAS, Well Address:
Well Log ID: 122621, Well Tag: ACX668, Notice of Intent Number: W089692
Well Diameter: 10.00 (inches), Well Depth: 160.00 (feet)
Well Type: Water, Well Completion Date: 9/11/98 12:00:00AM, Well Received Date:

14. Well Owner Name: EARL CARLSON
Public Land Survey: SW, NE, S-28, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 114244, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 142.00 (feet)
Well Type: Water, Well Completion Date: 9/7/75 12:00:00AM, Well Received Date: 12/9/77 12:00:00AM

15. Well Owner Name: EARL PRICE
Public Land Survey: NE, NE, S-14, T-19-N, R-17-E, Tax Parcel Number:

Search Criteria Used: Township: 19, Range: 17E, Section(s): (01, 02, 03, 04, 09, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27, 28)
There were 39 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

County: KITTITAS, Well Address:
Well Log ID: 114249, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 460.00 (feet)
Well Type: Water, Well Completion Date:

16. Well Owner Name: EDWARD TAASEVIGEN
Public Land Survey: SE, SE, S-23, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 114338, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 90.00 (feet)
Well Type: Water, Well Completion Date: 6/6/91 12:00:00AM, Well Received Date: 6/26/91 12:00:00AM

17. Well Owner Name: ELAINE & GUY WISE
Public Land Survey: NW, SW, S-23, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 120581, Well Tag: ABL335, Notice of Intent Number: W050589
Well Diameter: 6.00 (inches), Well Depth: 116.00 (feet)
Well Type: Water, Well Completion Date: 12/13/95 12:00:00AM, Well Received Date: 2/14/96 12:00:00AM

18. Well Owner Name: FRED NORMAN
Public Land Survey: NE, NE, S-26, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 114731, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 163.00 (feet)
Well Type: Water, Well Completion Date: 12/18/90 12:00:00AM, Well Received Date: 1/3/91 12:00:00AM

19. Well Owner Name: GEORGE ANDERSON
Public Land Survey: NW, SW, S-26, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 114900, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 195.00 (feet)
Well Type: Water, Well Completion Date: 5/26/91 12:00:00AM, Well Received Date:

20. Well Owner Name: JAMES MELVIN
Public Land Survey: SE, NW, S-04, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 115577, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 180.00 (feet)
Well Type: Water, Well Completion Date: 3/24/93 12:00:00AM, Well Received Date: 4/6/96 12:00:00AM

21. Well Owner Name: JIM FRANKLIN
Public Land Survey:
County: KITTITAS, Well Address:
Well Log ID: 122131, Well Tag: ACL893, Notice of Intent Number: W089687
Well Diameter: 10.00 (inches), Well Depth: 710.00 (feet)
Well Type: Water, Well Completion Date: 6/5/98 12:00:00AM, Well Received Date: 6/11/98 12:00:00AM

22. Well Owner Name: JOHN MILLER
Public Land Survey: SE, NE, S-26, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 115941, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 62.00 (feet)
Well Type: Water, Well Completion Date: 10/11/78 12:00:00AM, Well Received Date:

Search Criteria Used: Township: 19, Range: 17E, Section(s): (01, 02, 03, 04, 09, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27, 28)
There were 39 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

23. Well Owner Name: LEE GEREAN
Public Land Survey: NW, NW, S-01, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 121177, Well Tag: ABX128, Notice of Intent Number: W050352
Well Diameter: 10.00 (inches), Well Depth: 280.00 (feet)
Well Type: Water, Well Completion Date: 6/21/95 12:00:00AM, Well Received Date: 6/30/95 12:00:00AM

24. Well Owner Name: MICHAEL ROBERTSON
Public Land Survey: SW, SW, S-09, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address: 4101 BATTES RD, ELLENSBURG
Well Log ID: 302935, Well Tag: AFH664, Notice of Intent Number: W136506
Well Diameter: 8.00 (inches), Well Depth: 320.00 (feet)
Well Type: Water, Well Completion Date: 6/28/01 12:00:00AM, Well Received Date: 7/11/01 12:00:00AM

25. Well Owner Name: MORLEY MOSEBAR
Public Land Survey: SW, NW, S-23, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 116958, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 210.00 (feet)
Well Type: Water, Well Completion Date:

26. Well Owner Name: PAMP MAIERS
Public Land Survey: SW, SW, S-21, T-19-N, R-17-E, Tax Parcel Number:
County: GRANT, Well Address: HIAWATHA RD, MOSES LAKE
Well Log ID: 176794, Well Tag: AEC278, Notice of Intent Number: W079661
Well Diameter: 12.00 (inches), Well Depth: 70.00 (feet)
Well Type: Water, Well Completion Date: 4/24/98 12:00:00AM, Well Received Date: 6/2/98 12:00:00AM

27. Well Owner Name: PAUL DE FACCIO
Public Land Survey: SE, SW, S-28, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 122334, Well Tag: ACR784, Notice of Intent Number: W091963
Well Diameter: 8.00 (inches), Well Depth: 58.00 (feet)
Well Type: Water, Well Completion Date: 12/2/98 12:00:00AM, Well Received Date:

28. Well Owner Name: PAUL DE FACCIO
Public Land Survey: SE, SW, S-28, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 122337, Well Tag: ACR791, Notice of Intent Number: W091965
Well Diameter: 8.00 (inches), Well Depth: 57.00 (feet)
Well Type: Water, Well Completion Date: 11/26/98 12:00:00AM, Well Received Date:

29. Well Owner Name: PAUL NACHATELO
Public Land Survey:
County: KITTITAS, Well Address:
Well Log ID: 117486, Well Tag:
Well Diameter: 6.00 (inches), Well Depth:
Well Type: Water, Well Completion Date: 10/1/91 12:00:00AM, Well Received Date:

30. Well Owner Name: RANDY KIMBLER
Public Land Survey: NE, SE, S-23, T-19-N, R-17-E, Tax Parcel Number:

Search Criteria Used: Township: 19, Range: 17E, Section(s): (01, 02, 03, 04, 09, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27, 28)
There were 39 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

County: KITTITAS, Well Address:
Well Log ID: 117826, Well Tag:
Well Diameter:
Well Type: Water, Well Completion Date: 8/17/90 12:00:00AM, Well Received Date:

31. Well Owner Name: RAY W. & HELEN NEUMAN
Public Land Survey: SW, SW, S-27, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 117856, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 341.00 (feet)
Well Type: Water, Well Completion Date: 3/5/74 12:00:00AM, Well Received Date:

32. Well Owner Name: RICK LETSON
Public Land Survey:
County: KITTITAS, Well Address:
Well Log ID: 117997, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 720.00 (feet)
Well Type: Water, Well Completion Date: 6/14/79 12:00:00AM, Well Received Date: 2/11/80 12:00:00AM

33. Well Owner Name: ROBERT HARTWILK
Public Land Survey: NW, SE, S-09, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address: HORSE CANYON RD, LAUDERVALE
Well Log ID: 118068, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 227.00 (feet)
Well Type: Water, Well Completion Date: 10/3/91 12:00:00AM, Well Received Date:

34. Well Owner Name: SHANE RHODEN
Public Land Survey:
County: KITTITAS, Well Address:
Well Log ID: 120147, Well Tag: AAL288, Notice of Intent Number: 036379
Well Diameter: 6.00 (inches), Well Depth: 184.00 (feet)
Well Type: Water, Well Completion Date: 11/17/93 12:00:00AM, Well Received Date: 12/1/93 12:00:00AM

35. Well Owner Name: SHARON MILLET
Public Land Survey: SE, NW, S-14, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 118487, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 304.00 (feet)
Well Type: Water, Well Completion Date: 1/27/87 12:00:00AM, Well Received Date:

36. Well Owner Name: SHEILA HARTWICK
Public Land Survey: NW, SE, S-09, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 118491, Well Tag:
Well Diameter: 6.00 (inches), Well Depth:
Well Type: Water, Well Completion Date: 6/27/95 12:00:00AM, Well Received Date:

37. Well Owner Name: SLIM JORGENSEN
Public Land Survey: NW, NW, S-09, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address: TEANAWAY HEIGHTS
Well Log ID: 302934, Well Tag: AFH663, Notice of Intent Number: W129664
Well Diameter: 8.00 (inches), Well Depth: 540.00 (feet)
Well Type: Water, Well Completion Date: 6/21/01 12:00:00AM, Well Received Date: 7/11/01 12:00:00AM

Search Criteria Used: Township: 19, Range: 17E, Section(s): (01, 02, 03, 04, 09, 10, 11, 12, 13, 14, 15, 16, 17, 21, 22, 23, 26, 27, 28)
There were 39 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

38. Well Owner Name: STEVE GEORGE
Public Land Survey: NE, NE, S-10, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 118849, Well Tag:
Well Diameter: 6.00 (inches), Well Depth: 68.00 (feet)
Well Type: Water, Well Completion Date: 9/22/80 12:00:00AM, Well Received Date:

39. Well Owner Name: TODD GEREAN
Public Land Survey: NW, NW, S-01, T-19-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 257310, Well Tag: AET623, Notice of Intent Number: W113434
Well Diameter: 10.00 (inches), Well Depth: 225.00 (feet)
Well Type: Water, Well Completion Date: 6/13/00 12:00:00AM, Well Received Date:

Search Criteria Used: Township: 20, Range: 17E, Section(s): (, 34, 35)
There were 3 well logs which matched your search criteria.
The results are sorted by Well Owner Name.

Search Results - Derived from the Text Search Engine

To print or email the following results, use the buttons above.
10/31/02

1. Well Owner Name: H. S. SANDALL
Public Land Survey: SW, SW, S-35, T-20-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 121577, Well Tag: ACE831, Notice of Intent Number: W050351
Well Diameter: 10.00 (inches), Well Depth: 440.00 (feet)
Well Type: Water, Well Completion Date: 8/26/96 12:00:00AM, Well Received Date:

2. Well Owner Name: JERRY JARNAGIN
Public Land Survey: SW, NW, S-35, T-20-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 257379, Well Tag: AEM700, Notice of Intent Number: W109671
Well Diameter: 10.00 (inches), Well Depth: 824.00 (feet)
Well Type: Water, Well Completion Date: 6/9/00 12:00:00AM, Well Received Date: 6/27/00 12:00:00AM

3. Well Owner Name: JERRY JARNAGIN
Public Land Survey: SW, NW, S-35, T-20-N, R-17-E, Tax Parcel Number:
County: KITTITAS, Well Address:
Well Log ID: 257380, Well Tag: AEM700, Notice of Intent Number: W109671
Well Diameter:
Well Type: Water, Well Completion Date: 6/9/00 12:00:00AM, Well Received Date:

(Ord. 96-19 (part), 1996; Ord. 88-4 § 11 (part), 1988: Res. 83-10, 1983).

17.60.070 Appeal. Repealed by Ord. 96-19. (Ord. 88-4 § 11 (part), 1988: Res. 83-10, 1983).

Chapter 17.61

UTILITIES

Sections:

17.61.010 Definitions. A. "Utility" or "utilities" means the supply, treatment and distribution, as appropriate, of gas, gas meter stations, municipal domestic and irrigation water, sewage, storm water, electricity, telephone, fiber-optic and cable television. Such utilities consist of both the service activity along with the physical facilities necessary for the utilities to be supplied, except for associated facilities and special utilities as defined herein.

B. "Special utility" or "special utilities" shall mean the following:

1. Natural gas, synthetic fuel gas, or liquefied petroleum gas pipelines operating at a pressure which results in a hoop stress of 20 percent or more of the specified minimum yield strength;

2. Electrical transmission lines exceeding 115,000 volts;

3. Electrical substations;

4. Cellular, mobile or fiber-optic telecommunication facilities;

5. Geothermal power facilities;

6. Minor thermal power plant facilities;

7. Minor alternative energy facilities.

C. "Antenna" or "antennas" means any system of poles, panels, rods, dishes, reflecting discs or similar devices used for the transmission or reception of radio frequency signals.

D. "Associated facility" or "associated facilities" means a land use whose principal purpose involves the distribution, processing, storage, handling, or other related and supporting activities necessary for a special utility, not including administrative activities or offices.

E. "Communication facility" or "communication facilities" means any real property or portion thereof used for the reception, transmission and/or regeneration of electromagnetic and light signals, including but not limited to cellular, fiber-optic, microwave, mobile radio, radio, satellite, and television mediums. The term does not include poles or lattice-work towers supporting aboveground distribution or transmission lines for utility services such as electricity, telephone, or cable television. Communication facilities consist of all buildings, transmission structures, and other appurtenant improvements necessary for the support, shelter and operation of applicable communication equipment.

F. "Fuel cell" or "fuel cells" means a device which uses an electrochemical process to produce electrical energy using as its fuel source natural gas, methanol, propane, or like fuel.

G. "Geothermal power facility" or "geothermal facility" means a facility used to produce electricity by extracting and converting the natural thermal energy of the earth. The term does not include ground-source heat pumps or the direct use of geothermal energy for the heating of buildings located on or adjacent to the subject property.

H. "Hydroelectric plant" or "hydroelectric plants" means a facility used to produce electricity by converting the kinetic energy of flowing water to electric power. Hydroelectric facilities include but may not be limited to a dam, powerhouse apparatus (penstock, turbines and generators), step-up transformers, and any other buildings, support structures, or other related improvements necessary for the generation of electric power. The term does not include irrigation diversion dams, electrical distribution or transmission lines, or electrical substations otherwise regulated by this chapter.

I. "Major alternative energy facility" means a hydroelectric plant, solar farm, or wind farm that is not a minor alternative energy facility.

J. "Major thermal power plant facility" or "major thermal power plant facilities" means an electrical generating facility that utilizes nuclear or fossil fuels with output exceeding 10 mva.

K."Minor alternative energy facility" or "minor alternative energy system" means a fuel cell or a facility for the production of electrical energy that:

1. a. Uses as its fuel either solar, wind, or hydropower;

b. Is located on the power beneficiary's premises;

c. Is intended primarily to offset part or all of the beneficiary's requirements for electricity; and

d. Is secondary to the beneficiary's use of the premises for other lawful purpose(s); or

2. Is intended to mitigate electrical system improvement requirements.

L. "Minor thermal power plant facility" or "minor thermal power plant facilities" means an electrical generating facility that utilizes nuclear or fossil fuels with an output of at least one mva but equal to or less than 10 mva.

M. "Normal maintenance" includes those usual acts to prevent a decline, lapse, or cessation from a lawfully established condition. "Normal repair" means to restore a development to a state comparable to its original condition within a reasonable period after decay or partial destruction.

N. "Utility corridor" or "utility corridors" means a lineal transportation route utilized by one or more special utilities.

O. "Solar farm" or "solar farms" means a facility or area of land principally used to convert solar radiation to electricity. The term does not include devices or combination of devices which rely upon direct sunlight as an energy source for a minor alternative energy system.

P. "Wind farm" means a single wind turbine exceeding 120 feet in height above grade or more than one wind turbine of any size proposed and/or constructed by the same person or group of persons on the same or adjoining tax parcels. The term does not include turbines mounted to existing structures principally used for other lawful purposes (such as buildings or electric utility poles) provided the nacelle does not extend more than 20 feet above the uppermost portion of the structure to which it is mounted or attached.

Q. "Wind turbine" or "wind turbines" means any of various machines used to produce electricity by converting the kinetic energy of wind to rotational, mechanical and electrical energy. Wind turbines consist of the turbine apparatus (rotor, nacelle and tower) and any other buildings, support structures, or other related improvements necessary for the generation of electric power. The term does not include electrical distribution or transmission lines, or electrical substations otherwise regulated by this chapter. (Ord. 2001-12 (part), 2001: Ord. 2000-06 (part), 2000; Ord. 99-14 (part), 1999: Ord. 98-17 (part), 1998).

17.61.020 Permitted and conditional uses. A. Utilities shall be a permitted use in all zoning districts.

B. Minor alternative energy facilities shall be a permitted use in all zoning districts, provided the following limitations shall apply to wind turbines located within urban growth areas:

1. Wind turbines shall not exceed a total height of 75 feet above grade; and

2. Rotors shall not exceed 30 feet in diameter.

C. Minor thermal power plant facilities may be authorized by the planning director as an administrative conditional use in all zoning districts, pursuant to the criteria and procedures of this chapter and KCC Title 15A.

D. Major alternative energy facilities may be authorized by the board of adjustment as a conditional use in the Agriculture-20, forest and range, commercial agriculture, and commercial forest zones.

E. Major thermal power plant facilities may be authorized by the board of adjustment as a conditional use in the Agriculture-20, forest and range, commercial agriculture, and commercial forest zones.

F. Special utilities may be authorized by the board of adjustment as a conditional use in all zoning districts, except for minor thermal power plant facilities as provided in subsection C of this section, and communication facilities as provided in KCC 17.61.040. Normal maintenance and repair of existing developments shall be a permitted use for both nonconforming and lawfully established special utilities.

G. Associated facilities may be authorized by the board of adjustment as a conditional use in the general industrial zone (Chapter 17.52 KCC).

H. The board of adjustment shall review all conditional use requests and administrative appeals pursuant to the procedures contained in KCC Title 15A, Project Permit Application Process, and the criteria contained in Chapter 17.60 KCC, Conditional Uses, this chapter, and other applicable law.

I. Nothing in this chapter is intended to interfere with the storage and/or distribution of products associated with on-site natural resource activities, including but not limited to fossil fuels. (Ord. 2001-12 (part), 2001: Ord. 2000-06 (part), 2000; Ord. 99-14 (part), 1999: Ord. 98-17 (part), 1998).

17.61.030 Review criteria – Special utilities and associated facilities. A. The board of adjustment shall determine that adequate measures have been undertaken by the proponent of the special utility and/or associated facility to reduce the risk of accidents caused by hazardous materials.

B. The board of adjustment, as required by existing statutes, shall determine that the proposed special utility and/or associated facilities are essential or desirable to the public convenience and/or not detrimental or injurious to the public health or safety, or to the character of the surrounding neighborhood.

C. The board of adjustment shall determine that the proposed special utility and/or associated facilities will not be unreasonably detrimental to the economic welfare of the county and/or that it will not create excessive public cost for public services by finding that:

1. It will be adequately serviced by existing services such as highways, roads, police and fire protection, emergency response, and drainage structures, refuse disposal, water and sewers, and schools; or

2. The applicant shall provide such services or facilities.

D. Special utilities and/or associated facilities as defined by this chapter shall use public rights-of-way or established utility corridors when reasonable. Although Kittitas County may map utility corridors, it is recognized and reaffirmed that the use of such corridors is subject to conditional use approval and just compensation to the landowner for the use of such corridor. While a utility corridor may be used for more than one utility or purpose, each utility or use should be negotiated with the landowner as a separate easement, right-of-way, or other agreement, or other arrangement between the landowner and all owners of interests in the property. Any county map which shows utility corridors shall designate such corridors as "private land closed to trespass and public use" where such corridors are on private land. Nothing in this paragraph is intended to conflict with the right of eminent domain.

E. The board of adjustment shall consider industry standards, available technology, and proposed design technology for special utilities and associated facilities in promulgating conditions of approval.

F. The construction and installation of utilities and special utilities may necessitate the importation of fill material which may result in the displacement of native material. The incidental generation of earthen spoils resulting from the construction and/or installment of a utility or special utility, and the removal of said material from the development site shall not require a separate zoning conditional use permit.

G. The operation of some utilities and special utilities identified within this chapter may necessitate unusual parcel configurations and/or parcel sizes. Such parcels:

1. Need not conform with applicable zoning requirements; provided, they comply with the procedures provided in KCC Title 16, Subdivisions, and so long as used for a utility or special utility;

2. Are not eligible for any other use or any rights allowed to nonconforming lots in the event the utility or special utility use ceases;

3. Shall continue to be aggregated to the area of the parent parcel for all other zoning and subdivision requirements applicable to the parent parcel. (Ord. 2001-12 (part), 2001: Ord. 2000-06 (part), 2000; Ord. 99-14 (part), 1999: Ord. 98-17 (part), 1998).

17.61.040 Communication facilities – Administrative review – General requirements. A. Communication facilities may be authorized by the planning director as an administrative conditional use in all zoning districts, pursuant to the criteria and procedures of this chapter and KCC Title 15A. An administrative conditional use permit is not required for the operation of amateur or noncommercial communication equipment as defined by FCC regulations under Part 95D and Part 97 CFR (i.e., citizen band, ham radio).

B. Construction of all improvements shall be completed within one year of the date of permit issuance except as provided for in subsections E and F of this section.

C. The lot line setback requirements of this title may be waived by the planning director, in order to improve the facilities' reception and/or transmission capabilities or to achieve greater levels of audible or visual screening than that which would be available by using the applicable zone's yard requirements.

D. Communication facilities shall be designed to blend with existing surroundings; provided, no conflicts exist with existing Federal Communications Commission and the Federal Aviation Administration regulations relating to aircraft safety. This should be achieved through the use of compatible colors and materials, and alternative site placement to allow the use of topography, existing vegetation or other structures to screen the proposed transmission support structure from adjacent lands.

E. The co-location of antennas on both existing and proposed transmission structures is encouraged. Communication antennas shall be permitted outright in all zoning districts provided the following:

1. An antenna shall not extend more than six feet horizontally from any structure to which it is attached.

2. An antenna shall not extend vertically more than 15 feet above the uppermost portion of the structure to which it is mounted or attached.

F. Modifications to, including the expansion of, existing approved communication facilities shall be outright permitted; provided, there is no increase in the height of the transmission tower. For purposes of this subsection, "transmission tower" means a pole or lattice-work structure specifically designed and intended to support antenna and related communication equipment. (Ord. 2001-12 (part), 2001: Ord. 2000-06 (part), 2000).

Chapter 17.62

PUBLIC FACILITIES PERMITS

Sections:

17.62.010 Definitions. A. "Public facility" means the capital improvements and systems of transportation, law enforcement, fire protection, and recreational facilities (i.e., parks and playgrounds). Public facilities may be sited in any zoning, classification, subject to the review and approval requirements of this chapter.

B. "Public facility permit" means a written decision by the planning department authorizing a public facility use to locate at a specific location. (Ord. 2002-03 (part), 2002).

17.62.020 Purpose. The purpose of this chapter is to establish decision criteria and procedures for the permitting of public facilities and to provide coordinated review of the proposed project. Certain public facilities provide necessary services to other uses but are deemed unique due to factors such as siting criteria, size,

KITTITAS COUNTY BOARD OF COUNTY COMMISSIONERS
STATE OF WASHINGTON

ORDINANCE NO. 2002-19

AMENDING KCC 17.61 AND ADDING KCC 17.61A REGARDING WINDFARM DEVELOPMENTS

WHEREAS, Kittitas County Code 17.61 currently authorizes wind farms in certain zones in Kittitas County; and

WHEREAS, Questions were raised regarding the advisability of the existing regulatory structure that provides for the Board of Adjustment to make decisions regarding specific wind farm application rather than the elected Board of County Commissioners; and

WHEREAS, The Board of County Commissioners found it in the best interest of the public to enact a temporary moratorium on the acceptance, processing, and/or approval of wind farms developments and enacted a temporary moratorium on October 23, 2002 with the adoption of Ordinance 2002-13; and

WHEREAS, With the adoption of Ordinance 2002-13 the Kittitas County Board of County Commissioners directed that duly advertised public hearing would be held by the Board of County Commissioners on November 26, 2002 to further consider whether the moratorium should be reconfirmed, revised, or rescinded and to consider possible amendments to the Kittitas County Code relative to the siting of wind farms; and

WHEREAS, The Kittitas County Board of County Commissioners encouraged the Kittitas County Planning Commission to hold a public hearing prior to the commissioners November 26, 2002 public hearing to consider possible revisions to regulations related to wind farms and submit their recommendation to the Board of County Commissioners prior to the above referenced public hearing; and

WHEREAS, A SEPA notice of action was issued on October 25, 2002 and a Determination of Non-Significance was issue at that time for this nonproject legislative proposal amending Title 17 of the Kittitas County Code; and

WHEREAS, The SEPA notice solicited comments from jurisdictional governmental agencies and other interested parties; and

WHEREAS, The Kittitas County Planning Commission held public hearings regarding regulations relative to wind farms on November 18, November 20, and November 25, 2002 but did not forward a recommendation to the Board of County Commissioners for their November 26, 2002 public hearing; and

WHEREAS, On November 26, 2002 the Kittitas County Board of County Commissioners held a public hearing to consider whether the moratorium should be reconfirmed, revised, or rescinded and to consider possible revisions to regulations related to wind farms after having given the required public legal notice and all person present were given the opportunity to submit public comment to the record; and

WHEREAS, due notice has been given as required by law, and the necessary inquiry has been made into the public interest to be served by amending these ordinances; and

WHEREAS, The Board of County Commissioners finds it in the best interest of the public to have decisions regarding the possible siting of wind farms be made by the duly elected Board of County Commissioner rather than the volunteer appointed Board of Adjustment; and

WHEREAS, The Board of County Commissioners finds that the amendments adopted in this ordinance properly serves the goal of shifting the decision making process to the Board of County Commissioners and provides for a process that allows each proposal to be reviewed on a site specific basis.

NOW THEREFORE, BE IT HEREBY ORDAINED by the Board of County Commissioners of Kittitas County, Washington, that KCC Chapter 17.61 is amended to provide as follows:

Amend KCC 17.61.020(D) as follows:

Major Alternative Energy Facilities may be authorized ~~by the Board of Adjustment as a conditional use~~ in the Agricultural 20, Forest and Range, Commercial Agriculture, and Commercial Forest zones as follows: (1) Wind farms may be authorized pursuant to the provisions of KCC 17.61A; (2) all other major alternative energy facilities may be authorized by the Board of Adjustment as a conditional use.

BE IT FURTHER ORDAINED that a new Chapter 17.61A Wind Farm Resource Overlay Zone be and is hereby adopted as set forth in pages 4 and 5 attached hereto and incorporated herein by reference as if set forth in full.

BE IT FURTHER ORDAINED that the code revisions adopted and enacted in this ordinance are effective immediately upon adoption of this ordinance.

DATED this 3rd day of December 2002, at Ellensburg, Washington.

BOARD OF COUNTY COMMISSIONERS
KITTITAS COUNTY, WASHINGTON

ATTEST:

SEAL

Clerk of the Board

Approved as to form:

(Deputy) Prosecuting Attorney

Vacant

~~Bill Hinkle, Chairman~~

Perry D. Huston, Vice-Chairman

Max Golladay, Commissioner

Chapter 17.61A
Wind Farm Resource Overlay Zone

Sections:

17.61A.010 Legislative Findings, Purpose and Intent.
The purpose and intent of this chapter is to establish a process for recognition and designation of properties located in areas of Kittitas County suitable for the location of wind farms, to protect the health, welfare, safety, and quality of life of the general public, and to ensure compatible land uses in the vicinity of the areas affected by wind farms.

17.61A.020 Definitions. The following definitions shall be used in conjunction with the administration of this chapter.

A. Wind farm: "Wind farm" means a single wind turbine exceeding one hundred and twenty (120) feet in height above grade or more than one wind turbine of any size proposed and/or constructed by the same person or group of persons on the same or adjoining parcels.

B. Wind Turbine: "Wind turbine" means any machine used to produce electricity by converting the kinetic energy of wind to electrical energy. Wind turbines consist of the turbine apparatus and any other buildings, support structures or other related improvements necessary for the generation of electric power.

17.61A.030 Development Uses, Requirements, and Restrictions. All listed permitted uses in the underlying zoning district of this overlay zone are permitted. All listed conditional uses in the underlying zoning district of this overlay zone are subject to conditional use permit process and review. Wind farms are a permitted use in a Wind Farm Resource Overlay Zoning District, subject to the additional approval requirements and restrictions set forth in Section 17.61A.040.

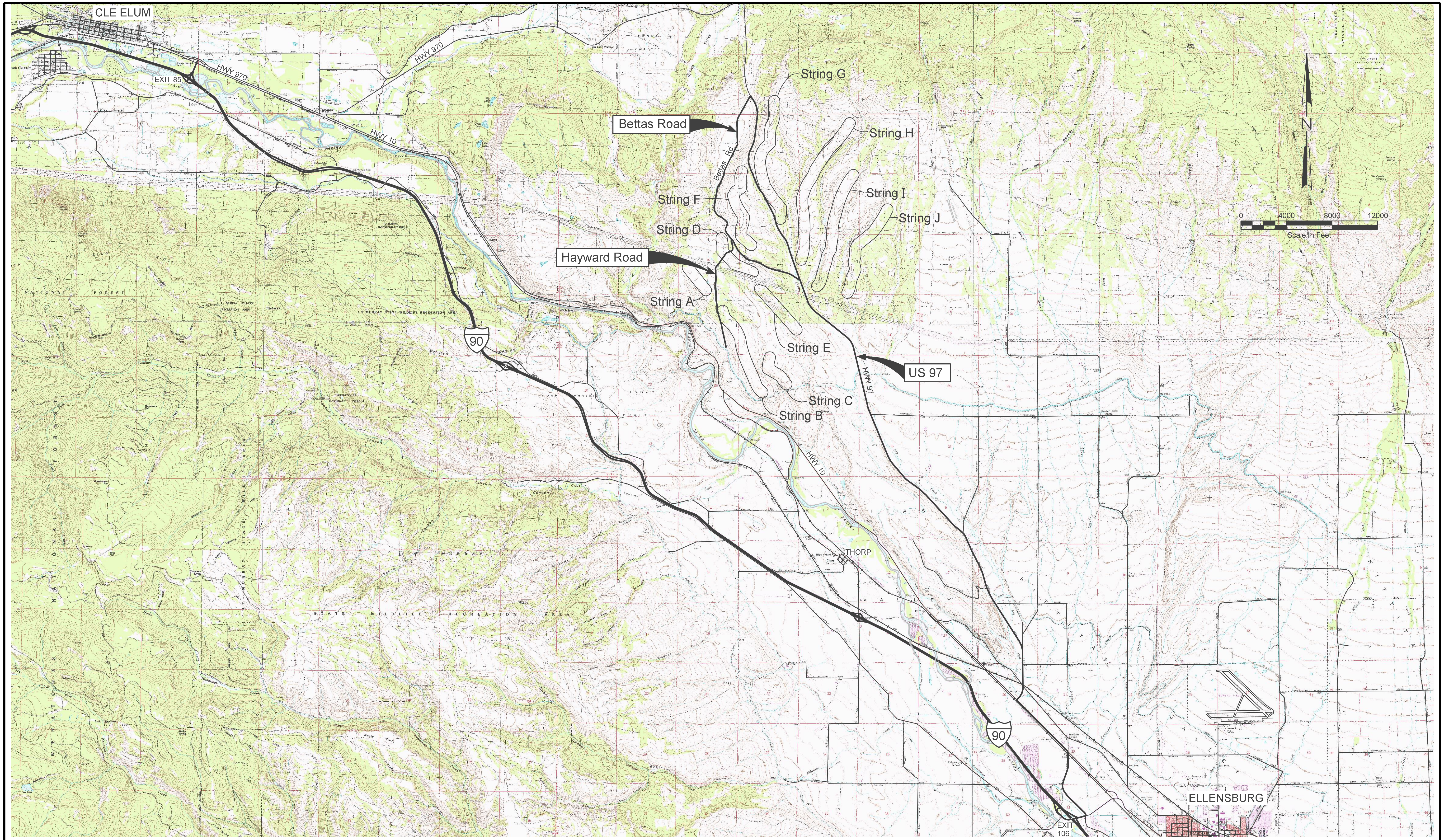
17.61A.040 Approvals Required for Wind Farm Resource Overlay Zone.

A. A wind farm may be authorized by the county only through approval of a Wind Farm Resource Development Permit in conjunction with approval by the Board of County Commissioners of a development agreement as authorized by KCC 15A.11, *Development Agreements*, and RCW 36.70B.170 - .210. Consistent with KCC 15A.11.020B. and RCW 36.70B.170, the development agreement approved by the Board of County Commissioners must set forth the development standards applicable to the development of a specific wind farm, which may include, but are not limited to: (i) densities, number, size, setbacks, and location of turbines, (ii) mitigation measures and such other development conditions as deemed appropriate by the Board of County Commissioners to be necessary including measures to protect the best interests of the surrounding property or neighborhood or the county as a whole, and (iii) other development standards including those identified in KCC 15A.11.020E. and RCW 36.70B.170(3).

B. Required Applications/Approvals. In addition to approval of a Wind farm Resource Development Permit and a development agreement as set forth in Section A above, a wind farm shall require the following approvals from the county: (1) a site-specific amendment of the Comprehensive Plan land use designation map to Wind Farm Resource overlay district (the sub-area planning process described in Chapter 1 of the county Comprehensive Plan and KCC 15B.03, *Amendments to Comprehensive Plan*, may be used if deemed appropriate by the applicant and county); (2) a site-specific rezone of the county zoning map to Wind Farm Resource Overlay Zoning District pursuant to KCC 17.98, *Amendments*.

C. The approvals by the Board of County Commissioners set forth in KCC 17.61A.040 A. and B. shall only be made if it determined that (1) the proposal is essential or desirable to the public convenience (2) the proposal is not detrimental or injurious to the public health, peace, or safety or to the character of the surrounding neighborhood and (3) the proposed use at the proposed location(s) will not be unreasonably detrimental to the economic welfare of the county and it will not create excessive public cost for facilities and service.

D. A Comprehensive Plan amendment or subarea plan for a Wind farm Resource overlay district must be processed by the county concurrent with the rezone application, Development Permit, and development agreement required for approval of a wind farm.



Sagebrush Power Partners, LLC

Zilkha *Renewable Energy*

LEGEND:

- TRANSPORTATION ROUTE
- EXISTING ROADS
- LOCATION OF PROPOSED WTG STRING

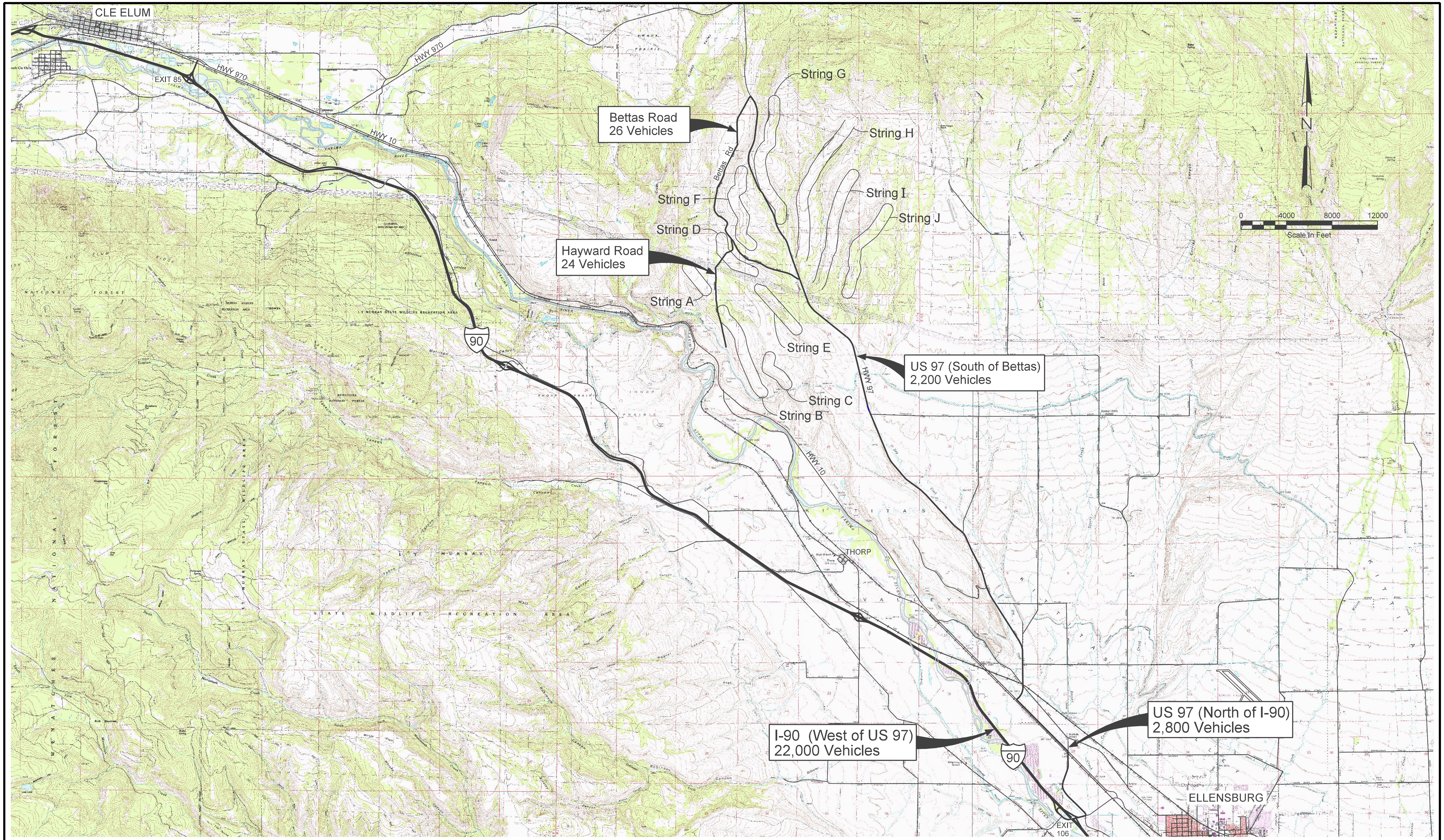
EXHIBIT 17-1
PROJECT SITE AND SURROUNDING ROADWAY NETWORK

APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

170365.C1

FILENAME: zp-fig07-road.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:04:56



LEGEND:

TRANSPORTATION ROUTE

EXISTING ROADS

LOCATION OF PROPOSED WTG STRING

Sagebrush Power Partners, LLC

Zilkha *Renewable Energy*

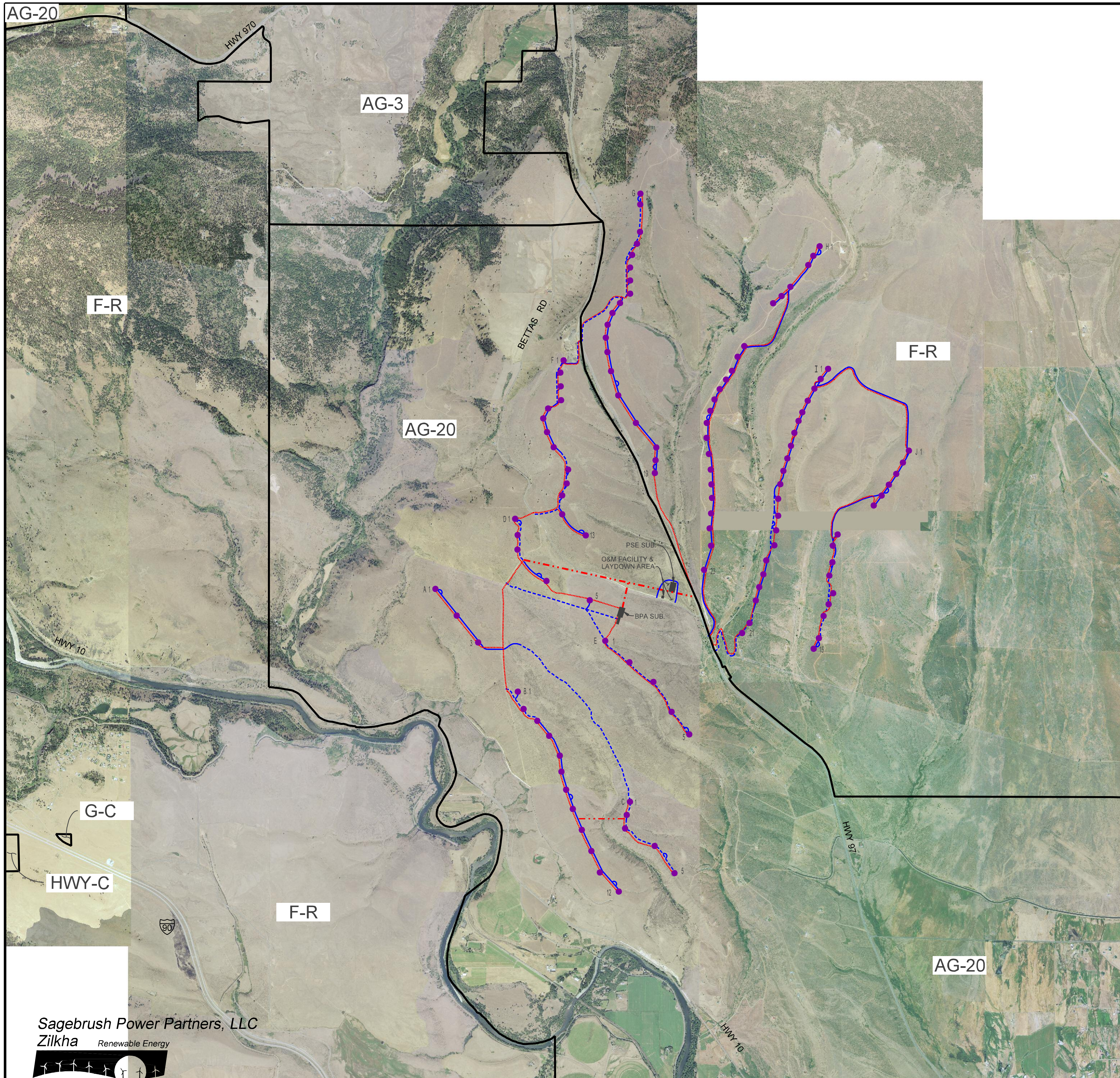
170365.C1

EXHIBIT 17-2
EXISTING AVERAGE DAILY
TRAFFIC VOLUME

APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

FILENAME: zp-fig06-traffic.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:10:15



N

0 2000 4000 6000
Scale In Feet

LEGEND:

- ZONING BOUNDARY
- PROPOSED WTG LOCATION
- N 1 STRING NAME & TURBINE COUNT
- EXISTING ACCESS ROAD
- NEW ACCESS ROAD
- UNDERGROUND ELECTRICAL
- OVERHEAD ELECTRICAL
- UGND AND/OR O.H. ELECTRICAL
- N12 MET TOWER - PERMANENT

ZONING CODES:

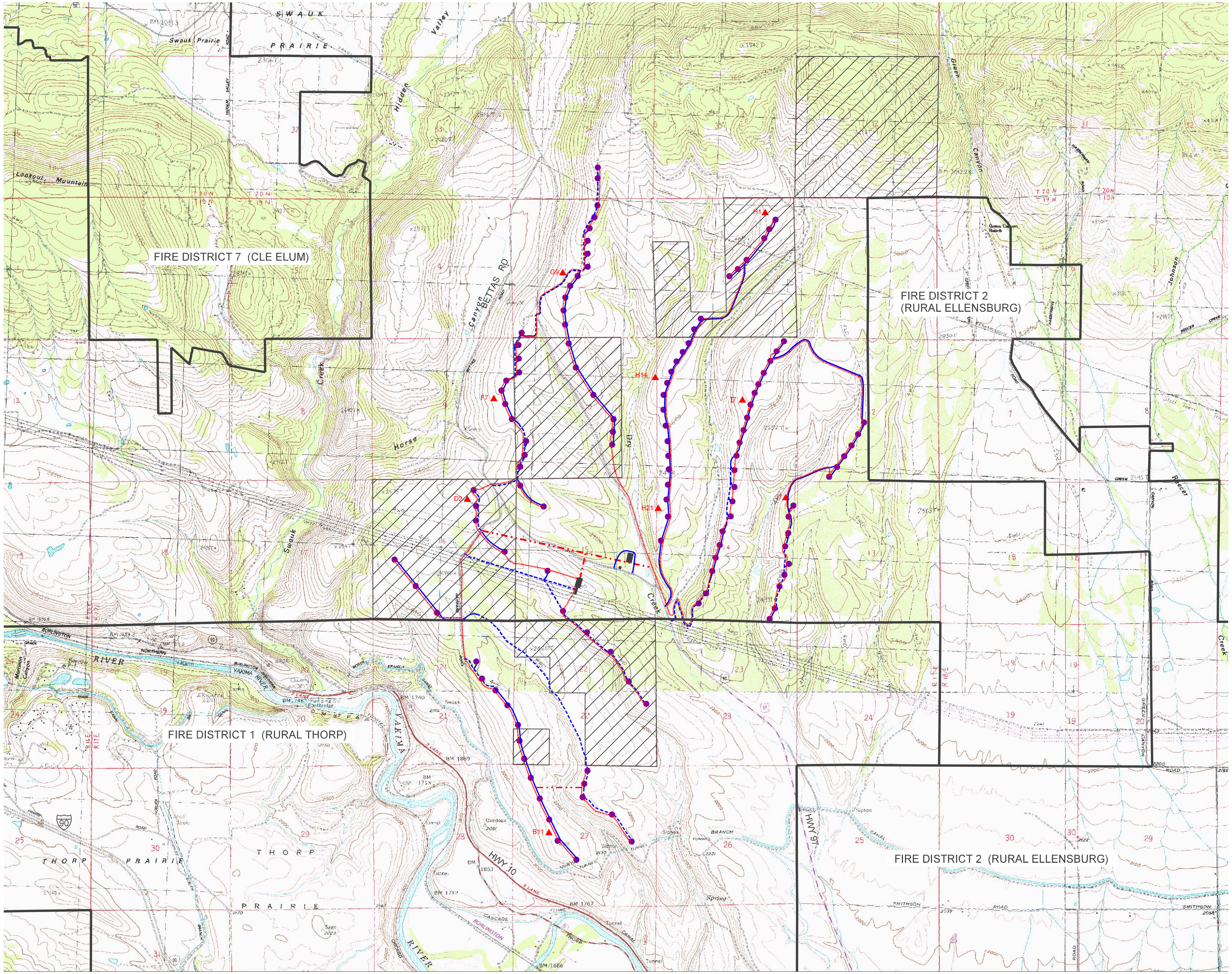
AG-20	AGRICULTURAL - 20 ACRE
AG-3	AGRICULTURAL - 3 ACRE
C-F	COMMERCIAL FOREST
F-R	FOREST & RANGE
G-C	GENERAL COMMERCIAL
HWY-C	HIGHWAY - COMMERCIAL

Sagebrush Power Partners, LLC
Zilkha *Renewable Energy*

EXHIBIT 18
ZONING DESIGNATIONS &
PHOTOGRAPH OF EXISTING LAND USE
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

170365.C1
FILENAME: zp-fig02-zoning.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:13:47



N

0 2000 4000 6000
Scale In Feet

LEGEND:

- DISTRICT BOUNDARY
- PROPOSED WTG LOCATION
- STRING NAME & TURBINE COUNT
- EXISTING ACCESS ROAD
- NEW ACCESS ROAD
- UNDERGROUND ELECTRICAL
- OVERHEAD ELECTRICAL
- UGND AND/OR O.H. ELECTRICAL
- N12 MET TOWER - PERMANENT
- DNR PROPERTY

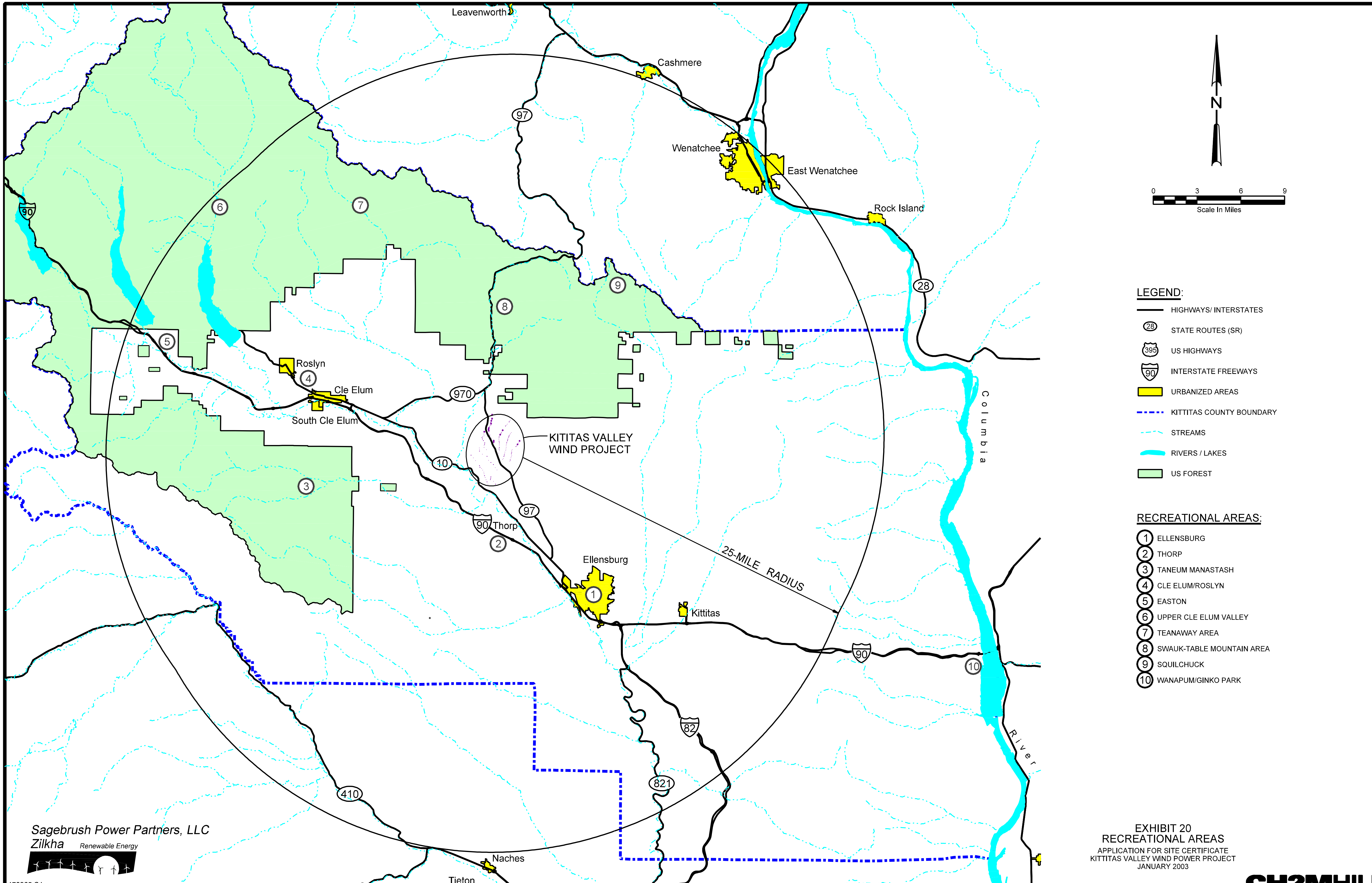
Sagebrush Power Partners, LLC
Zilkha *Renewable Energy*

170365.C1

EXHIBIT 19
FIRE DISTRICTS
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

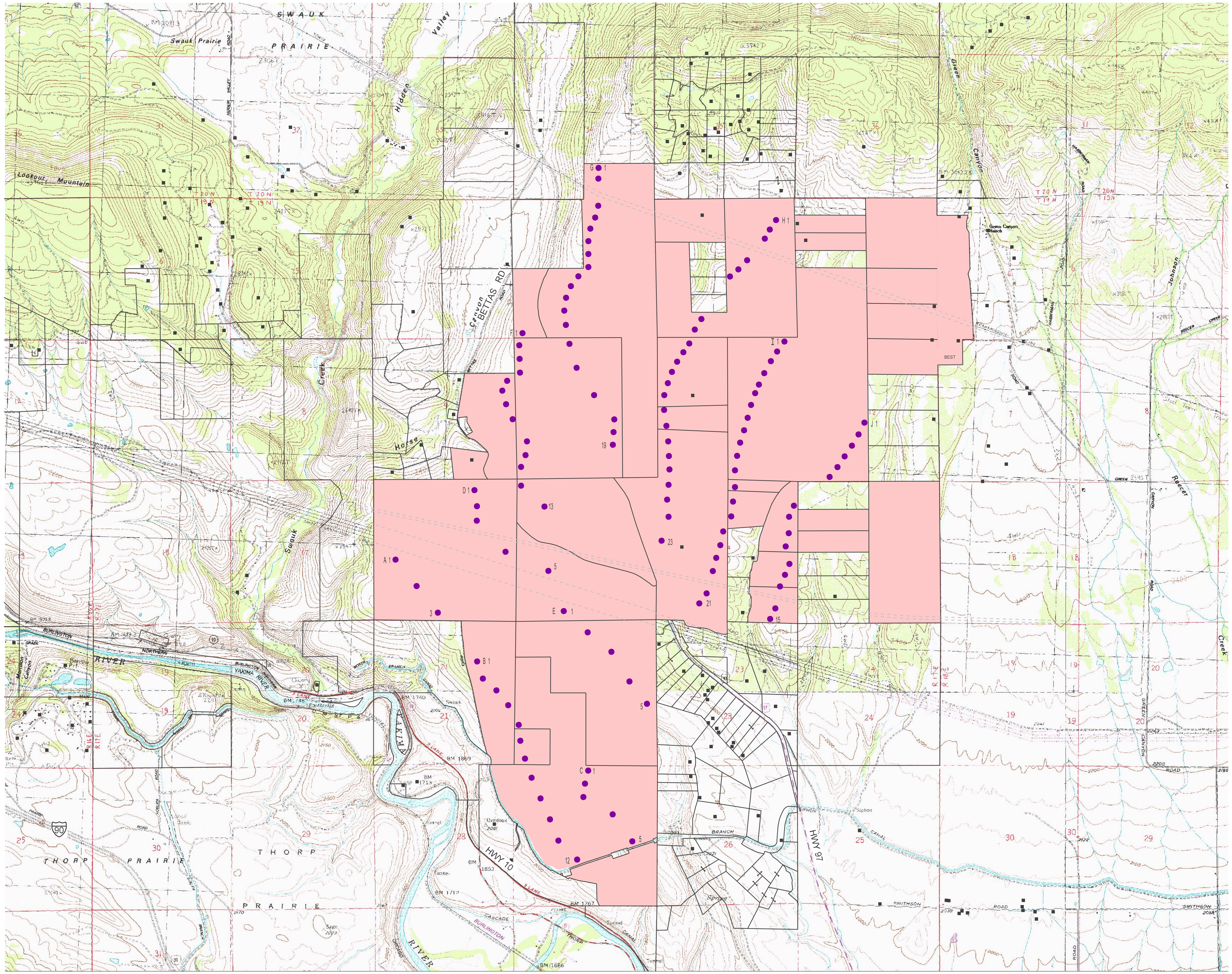
CH2MHILL

FILENAME: zp-fig05-fire.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:16:09



170365.C1

FILENAME: zp-fig03-recreation.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:21:13



N

0	2000	4000	6000

Scale In Feet

LEGEND:

- PARTICIPATING LAND OWNER
- PROPOSED WTG LOCATION
- N 1 NAME & TURBINE COUNT
- EXISTING HOUSES/BLDGS

Sagebrush Power Partners, LLC

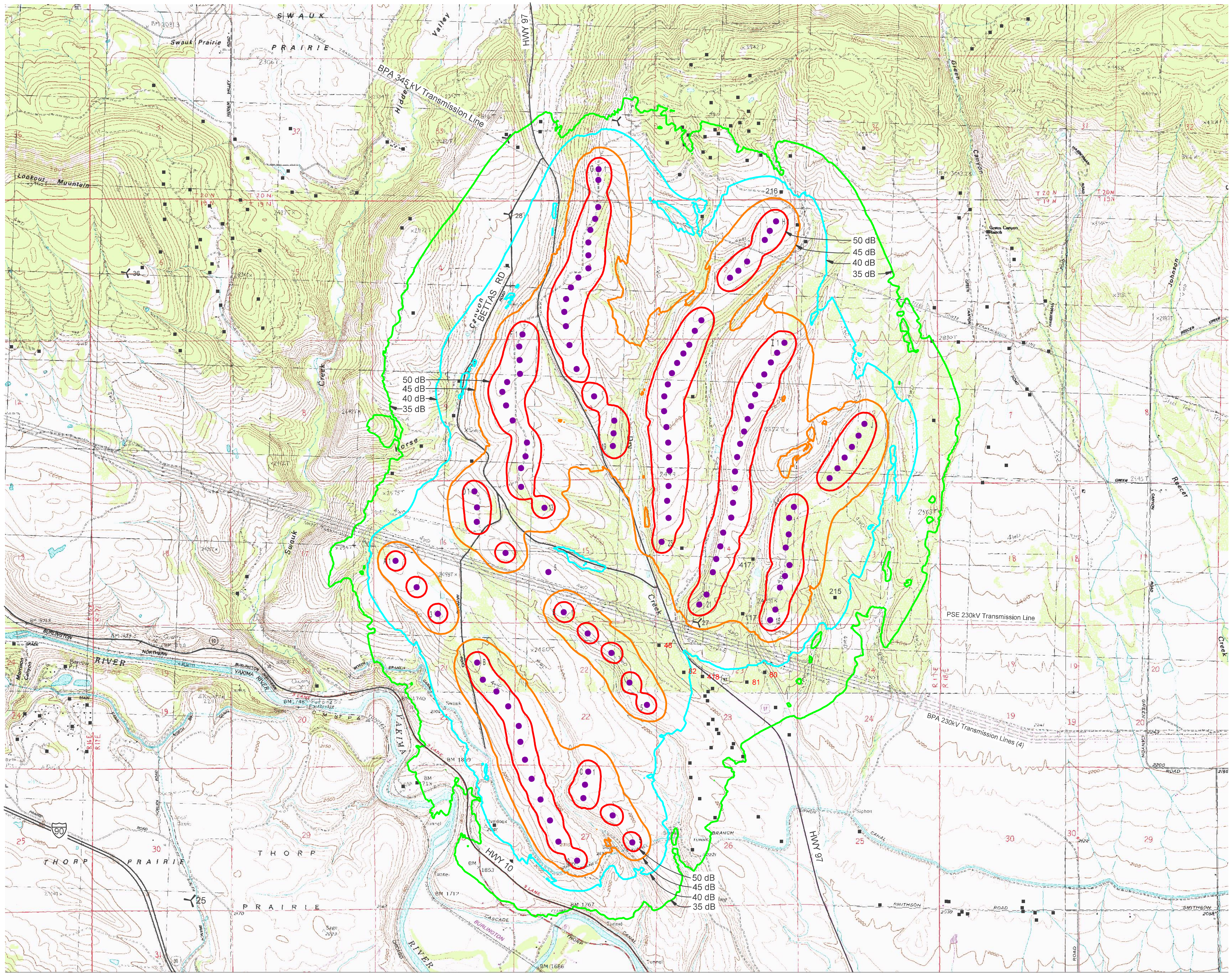
Zilkha Renewable Energy

170365.C1

FILENAME: zp-fig08-noise.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:37:24

EXHIBIT 21-1
HOUSE AND WTG LOCATIONS
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL



N

0 2000 4000 6000
Scale In Feet

LEGEND:

- 35 dB(A)
- 40 dB(A)
- 45 dB(A)
- 50 dB(A)
- PROPOSED WTG LOCATION
- N 1 STRING NAME & TURBINE COUNT
- EXISTING HOUSES/BLDGS

Sagebrush Power Partners, LLC
Zilkha *Renewable Energy*

EXHIBIT 21-2
NOISE IMPACT ZONES
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

170365.C1
FILENAME: zp-fig09-noise.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:43:19

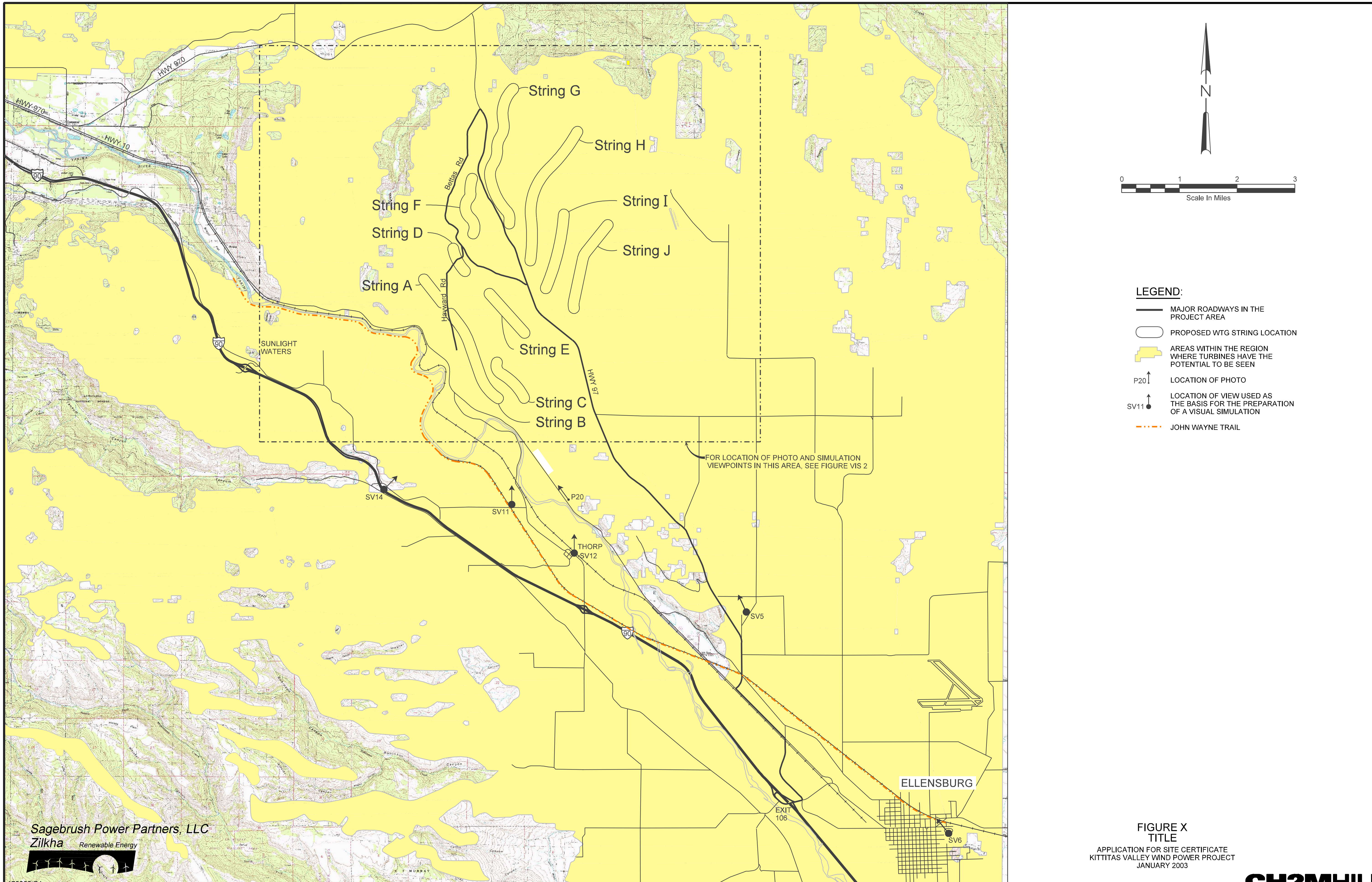
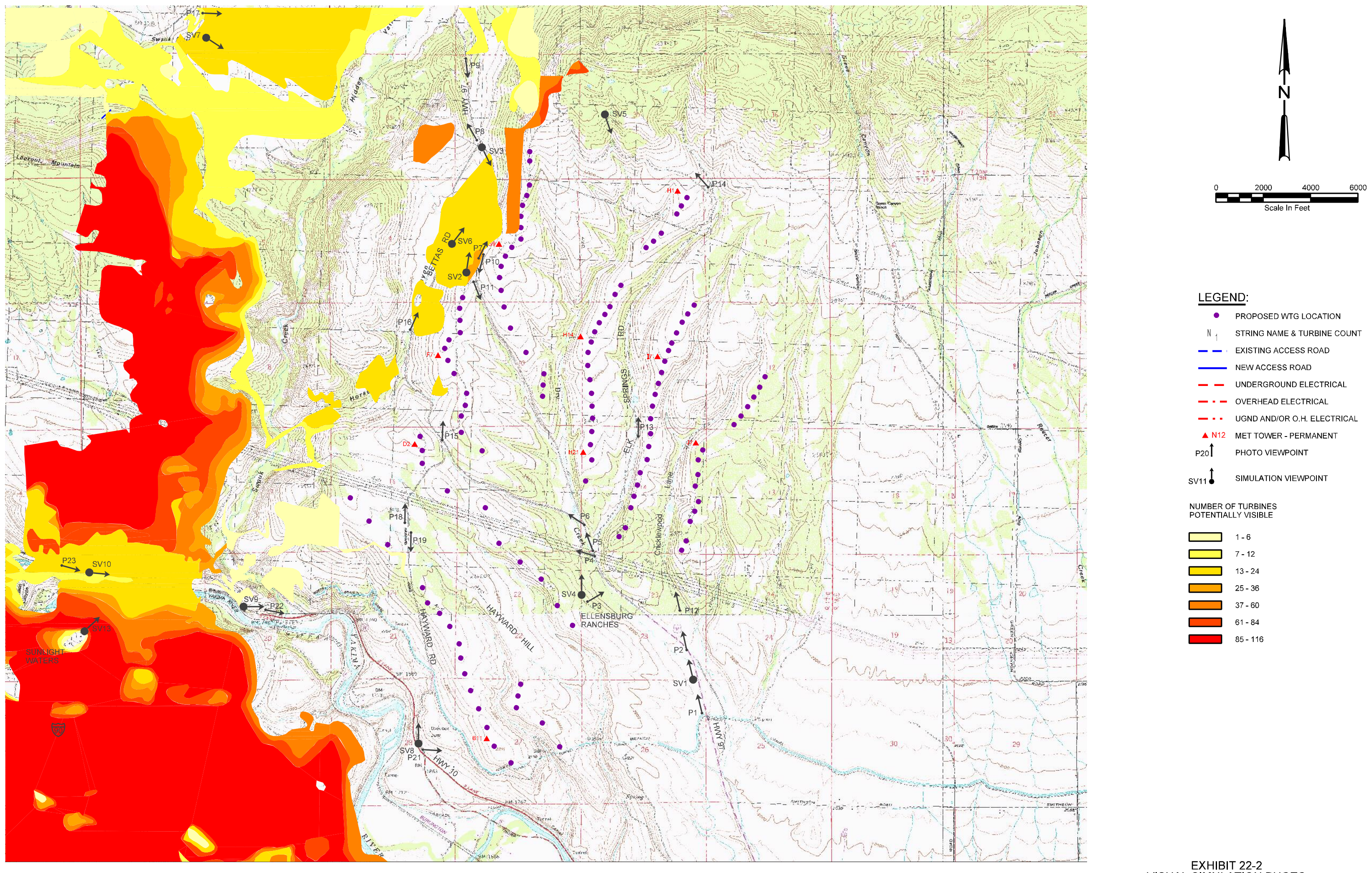


FIGURE X
TITLE
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

FILENAME: zp-fig10-visual.dgn PLOT DATE: 07-JAN-2003 PLOT TIME: 17:57:30



Sagebrush Power Partners, LLC
Zilkha Renewable Energy

EXHIBIT 22-2
VISUAL SIMULATION PHOTO AND VIEWPOINT LOCATIONS
APPLICATION FOR SITE CERTIFICATE
KITTITAS VALLEY WIND POWER PROJECT
JANUARY 2003

CH2MHILL

170365.C1
FILENAME: zp-fig10-visual.dgn PLOT DATE: 10-JAN-2003 PLOT TIME: 12:52:32

Exhibit 22-3a Technical Terms

Aesthetics. Generally, the study, science, or philosophy dealing with beauty and with judgements concerning beauty. In scenery management, it describes landscapes that give visual and sensory pleasure.
Background. The distant part of a landscape. The landscape area located from 4 miles to infinity from the viewer.
Contrast. Diversity or distinction of adjacent parts. Effect of striking differences in form, line, color, or texture of a landscape.
Corridor. A linear strip of land which accommodates or is expected to accommodate a utility or all the utilities with similar orientation passing through a given land area. Its width can be variable and it normally measured in feet.
Distance Zones. Landscape areas denoted by specific distances from the observer. Used as a frame of reference in which to discuss landscape attributes or the scenic effect of human activities in a landscape.
Foreground. The detailed feature landscape generally found from the observer to ½ mile away. See also immediate foreground.
Immediate Foreground. The detailed feature landscape found within the first few hundred feet of the observer, generally from the observer to 300 feet away.
Intactness. The integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.
Landscape. An area composed of interacting ecosystems that are repeated because of geology, land for, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern which is determined by interacting ecosystems.
Landscape Character. Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique.
Middleground. The one between the foreground and the background in a landscape. The area located from ½ mile to up to 5 miles from the observer.
Natural-Appearing Landscape Character. Landscape character that has resulted from human activities, yet appear natural, such as historic conversion of native forests into farmlands, pastures, and hedgerows that have reverted back to forests through reforestation activities or natural regeneration.
Right-of-way. (Abbreviated: ROW; plural: rights-of-way) An accurately located strip of land with defined width, point of beginning, and point of ending. The area within which the user has the authority to conduct operations approved or granted by the land owner in an authorizing document such as a permit, easement, lease, license, memorandum, or understanding.
Scale. Visual scale is the apparent size relationships between landscape components or features and their surroundings.
Scenic. Of or relating to landscape scenery; pertaining to natural or natural appearing scenery; constituting or affording pleasant views of natural landscape attributes or positive cultural elements.
Scenic Attractiveness. The scenic importance of a landscape based on human perceptions of the intrinsic beauty of landform, rockform, waterform, and vegetation pattern. Reflects varying visual perception attributes of variety, unity, vividness, intactness, coherence, mystery, uniqueness, harmony, balance, and pattern.
Visual Absorption Capability. Relative ability of a landscape to accept human alterations without loss of character of scenic quality.
Typical or Common Landscape. Refers to prevalent, usual, or widespread landscapes within a landscape province. It also refers to landscapes with ordinary and routine scenic attractiveness.

Unity. The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of intercompatibility between landscape elements.

View. A scene observed from a given vantage point.

View Cone/Cone of Vision. The observer's field of view. For drivers of cars, the effective width of the view cone is inversely related to speed. For drivers travelling at 60 miles per hour, a standard estimate is that the view cone is 45 degrees.

Viewshed. Total visible area from a single observer position, or the total visible area from multiple observer positions. Viewsheds are accumulated seen-areas from highways, trails, campgrounds, towns, cities, or other viewer locations. Examples are corridor, feature, or basin viewsheds.

Visual Salience. The degree to which an object, feature, or condition is noticeable or prominent in a landscape scene

Vividness. The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.

Photo 1. Highway 97 at North Branch Canal – view looking north.

Photo 2. Highway 97 at northern end of Nacho Lane – view looking north.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 3. Sagebrush Lane - view looking north and northeast. Highway 97 is the road visible in the valley below.

Photo 4. Highway 97 - view looking west along Bonneville Power Authority (BPA) transmission corridor.

Photo 5. Highway 97 at crossing of BPA transmission corridor

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 6. Highway 97 at Bettas Road. View looking north northwest toward proposed site of project operation and maintenance facility and substation.

Photo 7. Highway 97 just north of gravel pit. View looking north as road begins to travel down slope.

Photo 8. Highway 97 at intersection with northern end of Bettas Road.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 9. Highway 97 between Highway 97 and northern end of Bettas Road. View looking south.

Photo 10. Highway 97 just north of gravel pit – view looking south.

Photo 11. Highway 97 just south of gravel pit. View looking south as road starts to travel down slope.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 12. Cricklewood Lane – view looking north into ridge area east of Highway 97.

Photo 13. Elk Springs Road – view looking north.

Zilkha Renewable Energy

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 14. Northern portion of Elk Springs Road –view looking north toward Section 35.

Photo 15. Bettas Road at Hayward Road – view looking north.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 16. Bettas Road - view looking north.

Photo 17. Hidden Valley Road – view looking east.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 18. Hayward Road – view looking north.the culvert to use as a landmark to compare with Photo A.

Photo 19. Hayward Road – view looking south.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 20. Highway 10 at Fire District 1 fire station. View looking northwest.

Photo 21. Thorp Highway at Highway 10 – view looking east.

Photo 22. Highway 10 west of Swauk Creek – view looking east.

Photo 23. Highway 10 3.8 miles west of Thorp Highway – view looking east.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 4a - Simulation View 1: Existing view from Highway 97 at Eburg Ranches Road looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 4b - Simulation View 1: Simulated view of project seen from Highway 97 at Eburg Ranches Road looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•1/8/03•ccc

Figure Vis 4c - Simulation View 1: Simulated view of project seen from Highway 97 at Eburg Ranches Road looking north illustrating the appearance of larger turbines

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•1/8/03•ccc

Figure Vis 5a - Simulation View 2: Existing view from Highway 97 north of gravel pit looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 5b - Simulation View 2: Simulated view of project seen from Highway 97 north of gravel pit looking north illustrating appearance of gray turbine structures

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 5c - Simulation View 2: Simulated view of project seen from Highway 97 north of gravel pit looking north illustrating appearance of brown turbine structures

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 6a - Simulation View 3: Existing view looking south from Highway 97 at intersection with northern end of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 6b - Simulation View 3: Simulated view of project seen looking south from Highway 97 at intersection with northern end of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 6c - Simulation View 3: Simulated view of project seen looking south from Highway 97 at intersection with the northern end of Bettas Road illustrating the appearance of larger turbines

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 7a - Simulation View 4: Existing view from Sagebrush Road looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 7b - Simulation View 4: Simulated view of project seen from Sagebrush Road looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 8a - Simulation View 5: Existing view looking south from residence in Section 35 at upper end of Elk Springs Road

Figure Vis 8b - Simulation View 5: Simulated view of project seen looking south from residence in Section 35 at upper end of Elk Springs Road

Figure Vis 9a - Simulation View 6: Existing view looking north along northern portion of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 9b - Simulation View 6: Simulated view of project seen looking north from a viewpoint along northern portion of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 10a - Simulation View 7: Existing view looking east from a viewpoint on the northern portion of Hidden Valley Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 10b - Simulation View 7: Simulated view of project seen looking east from a viewpoint on the northern portion of Hidden Valley Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 11a - Simulation View 8: Existing view looking west from a viewpoint along Highway 10 at Hayward Road

Figure Vis 11b - Simulation View 8: Simulated view of project seen looking west from a viewpoint along Highway 10 at Hayward Road

Figure Vis 12a - Simulation View 9: Existing view looking east from a viewpoint along Highway 10 between Morrison Canyon and Swauk Creek

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 12b - Simulation View 9: Simulated view of project seen looking east from viewpoint along Highway 10 between Morrison Canyon and Swauk Creek

Figure Vis 13a - Simulation View 10: Existing view looking east from a viewpoint along Highway 10 west of Swauk Creek

Figure Vis 13b - Simulation View 10: Simulated view of project seen looking east from viewpoint along Highway 10 west of Swauk Creek

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 14a - Simulation View 11: Existing view looking north from a viewpoint along the John Wayne Trail at Taneum Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 14b - Simulation View 11: Simulated view of project seen looking north from a viewpoint along the John Wayne Trail at Taneum Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 15a - Simulation View 12: Existing view looking north from a viewpoint along Thorp Highway in the center of the community of Thorp

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 15b - Simulation View 12: Simulated view of project seen looking north from a viewpoint along Thorp Highway in the center of the community of Thorp

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 16a - Simulation View 13: Existing view looking east from a viewpoint along Highline Loop in Sunlight Waters

Figure Vis 16b - Simulation View 13: Simulated view of project seen looking east from a viewpoint along Highline Loop in Sunlight Waters

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 17a - Simulation View 14: Existing view looking northeast from a viewpoint along I-90 at Springwood Ranch

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 17b - Simulation View 14: Simulated view of project seen looking northeast from a viewpoint along I-90 at Springwood Ranch – turbines painted gray

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 17c - Simulation View 14: Simulated view of project seen looking northeast from a viewpoint along I-90 at Springwood Ranch – turbines painted brown

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 18a - Simulation View 15: Existing view looking northwest from a viewpoint along Lower Green Canyon Road

Figure Vis 18b - Simulation View 15: Simulated view of project seen looking northwest from a viewpoint along Lower Green Canyon Road

Figure Vis 19a - Simulation View 16: Existing view looking northwest from a viewpoint in Reed Park in Ellensburg

Figure Vis 19b - Simulation View 16: Simulated view of project seen looking northwest from a viewpoint in Reed Park in Ellensburg

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Economic Impacts of Wind Power in Kittitas County

Final Report

A Report for the

Phoenix Economic Development Group

by

ECONorthwest
888 SW Fifth Ave, Suite 1460
Portland, OR 97204
(503) 222-6060

October 2002

Acknowledgements

This report was prepared by ECONorthwest's Portland office and was paid for by the Phoenix Economic Development Group of Ellensburg, WA. Dr. Stephen Grover was the ECONorthwest project manager for this analysis and was the primary author of this report. Questions regarding this report should be directed to him at grover@portland.econw.com or by phoning the Portland office at (503) 222-6060. Dr. Grover was assisted in this project by Anne Fifield, Alec Josephson, and Bob Whelan.

The Economic Impacts of A Proposed Wind Power Plant in Kittitas County, WA

An Evaluation of Potential Impacts on Property Values, Tax Revenues, and the Local Economy

I. Introduction and Summary

Two different wind energy companies are currently developing plans for constructing and operating wind power turbines in Kittitas County. The energy company Zilkha Renewable Energy has proposed a project with 110 wind turbines that have the combined potential to generate approximately 165 megawatts of electricity during peak wind periods. A second company enXco is proposing building 150 additional wind turbines with a total of 225 megawatts of generation potential. These two project combined would involve the construction and operation of 265 wind turbines with a potential generating capacity of 390 megawatts of electricity.

As part of the planning process for these projects, the Phoenix Economic Development Group has hired ECONorthwest to evaluate the potential economic impacts of constructing and operating the wind plants in Kittitas County. Specifically, ECONorthwest was asked to analyze and help quantify impacts in three key areas of interest:

- **Property Values**. Local residents have voiced concern that constructing numerous wind turbines in the valley will detract from views and ultimately reduce property values.
- **Economic Impacts.** The wind plants will create jobs and increase spending in the economy during the construction phase and during plant operations.
- **Tax Revenues.** The increase in jobs and local spending will also increase tax revenues for Kittitas County.

To research these issues, we utilized several different analysis techniques. We surveyed tax assessors in other counties with wind projects to determine the potential effects of wind farms on property values. We also conducted a review of the available academic literature for additional information on property value effects. Local economic impacts were estimated using an input-output model based on construction and operations data obtained from the two companies proposing wind projects in Kittitas County. Tax revenues were estimated from the input-output model results based on tax rate and spending information obtained from Kittitas County.

Our analysis in these areas has resulted in the following key findings:

- *Views of wind turbines will not negatively impact property values.* Based on a nation-wide survey conducted of tax assessors in other areas with wind power projects, we found no evidence supporting the claim that views of wind farms decrease property values.

- *Wind plant construction will have significant economic benefits.* The construction of over 250 turbines will create approximately 185 full and part time jobs in Kittitas County and will increase total income to the county by over $12 million during the construction period.

- *Wind plant operation will provide additional annual economic benefits.* The wind farm operations will require 53 additional jobs and will increase income to the county from salaries and operations expenses by over $4 million annually.

- *Property tax revenues will increase.* The construction of the wind farm will increase property tax revenues collected in the Kittitas County by approximately $2.8 million dollars annually -- an increase of 11 percent over current property tax revenues. The majority of this increase is due to the property tax paid on the wind turbines.

- *Tax revenues to Kittitas County Government will also increase.* Tax revenues accruing directly to Kittitas County Government will be approximately $693,000 annually. This increase results from the County's share of new property tax revenue and from increases in other taxes.

Details on the analysis underlying each of these results are presented in the remainder of this report.

II. Property Value Impacts

One of the biggest concerns of the community is that the installation of numerous wind turbines will detract from the current viewscape in the Kittitas Valley and that the destruction of this view will ultimately reduce residential property values.

We conducted two separate analysis tasks to address this issue. First, we conducted a phone survey of tax assessors for counties that recently had wind turbines installed in their areas. In addition to interviewing tax assessors, we also reviewed the current literature for statistical studies that quantified the impact of wind turbines on property values. For comparison purposes, we also reviewed the literature on the impact that transmission lines have on property values.

A. Tax Assessor Interviews

The first step in our survey of tax assessors was to develop an appropriate sample of sites for the analysis. These sites were chosen using the following criteria:

- *Projects constructed within the last 10 years.* Recently completed projects were used to ensure that reliable information was obtained from the assessor. Recent sites are also more likely to have the same turbine technology that is planned for Kittitas County.

- *View locations.* As much as possible, we attempted to find wind farms that could be seen from residences rather than focusing only on sites in remote or very rural locations.

- *Multiple turbines*. We focused on those areas where multiple turbines were installed to be comparable with the projects proposed for Kittitas County.

We applied these criteria to information obtained from the American Wind Energy Association website to locate candidate wind projects in areas throughout the U.S. Table 1 shows descriptive information on 19 projects we located using this method.

Table 1: Location and Size of Wind Farms Used In Analysis

State	Location	County	Project Name	Year	MW	Turbine Manufactu	# of Turbines
WY	Carbon County	Carbon	Foote Creek Rim 4	2000	16.80	NEG Micon	28
CA	San Gorgonio Pass	Riverside	Cabazon	1999	39.75	Zond Z-750	53
CA	San Gorgonio Pass	Riverside	Westwind	1999	46.50	NEG Micon	65*
CA	Tehachapi	Kern	Oak Creek Phase 2	1999	23.10	NEG Micon-700	33
CA	Tehachapi	Kern	Cameron Ridge	1999	56.00	NEG Micon	80
CA	Tehachapi	Kern	Pacific Crest	1999	45.54	Vestas V-47	69
WY	Carbon County	Carbon	Foote Creek Rim 1	1999	41.40	Mitsubishi	69
WY	Carbon County	Carbon	Foote Creek Rim 3	1999	24.75	NEG Micon	33
TX	Culberson County	Culberson	American Nat. Wind Power/ Orion Energy	1999	30.00	Zond	40
TX	Big Spring I	Howard	Howard County	1999	27.72	Vestas V-47	42
TX	Crockett County	Crockett	Southwest Mesa Wind Farm	1999	74.90	NEG Micon (107)	107
MN	Pipestone County	Lincoln	Lake Benton - 2	1999	103.50	Zond	138
IA	Storm Lake	Buena Vista	Storm Lake	1999	112.50	Zond - 50 (150)	150
IA	Storm Lake	Buena Vista	Storm Lake	1999	80.25	Zond - 50 (150)	107*
OR	Helix	Umatilla	1. Vansycle Ridge	1998	25.10	Vestas V-47	38
MN	Pipestone County	Lincoln	Lake Benton - I	1998	107.25	Zond	143
TX	Culberson County	Culberson	Lower Colorado River Authority	1995	35.00	Kenetech	112
MN	Buffalo Ridge	Nobles	Kenetech Windpower	1994	25.00	Kenetech	73
CA	Tehachapi	Kern	Sky River	1993	76.95	Vestas V-27	342

Note: * Number of turbines estimated by ECONorthwest based on reported MW capacity.

In addition to the sites shown in Table 1, we also added projects in Alameda County, California, Walla Walla County, Washington, and the Town of Lincoln, Wisconsin as they all contain wind projects that are similar to that proposed for Kittitas County. The final sample included 22 wind projects located in 13 different counties throughout the country.

Once the sample was determined, the next step was to interview tax assessors within each county to determine the effect these projects had on residential property values. We chose to interview assessors as they are required to provide objective assessments of property values. If assessments are perceived to be too high by the landowners, the assessed value may be challenged in court. Unlike real estate agents, who have a financial stake in the market values of properties they sell, tax assessors do not have an incentive to inflate property values or to exaggerate the possible effects of wind turbines. For these reasons, we chose to interview tax assessors as they are the best available source for unbiased information on the effects of wind turbines on property values.

From our initial target sample, we were able to interview assessors from all thirteen counties. Based on these interviews, we found no evidence indicating that views of wind turbines decreased property values. Of the counties we interviewed, six contain residential properties with views of the wind turbines, and six counties lack residences with a view of the turbines. One county reported that the wind farm is too new for the assessor's office to know if nearby property values have been affected.

Six counties reported that residential properties have views of the wind turbines, but the turbines have not altered the value of those properties. Responses from assessors in these counties were similar:

- Kern, California—Residents are able to see the turbines from many locations within the town of Tehachapi. The views of the wind turbines have not affected the assessed values of these residences.
- Lincoln, Minnesota—The turbines are located about two miles outside of town. The turbines do not block the view of any particular feature, but residents can see them if they look for them. The assessor hasn't heard anyone complain about the turbines' appearance. Some residences located in the rural parts of the county have closer views of the turbines, but the turbines have not impacted their land values.
- Buena Vista, Iowa—Many residences in the towns of Alta and Storm Lake have views of the turbines. The turbines are easily seen from town, they are located a couple of miles outside of town, and sit on a high ridge. There has been no impact on land values.
- Howard, Texas—There are no homes within two miles of the wind turbines, but because the terrain is so flat, the turbines are visible from as far as 25 miles away. Appraised land values have not declined because of views of the turbines. The appraiser reported that their office expected property owners to complain about lowered property values caused by a diminished view, but so far they have received no complaints.
- Walla Walla County, WA—The turbines are on a high cliff that has a lot of wind and low land values. The unincorporated town of Touchet lies about 8 miles from the turbines and some residents do not like the views of the turbines as it affects their view of the sunset. This factor has not translated into lower land values according to the assessor. Touchet's tax base rose from just over $100 million to $265 million with the addition of the wind farm and resulted in the addition of 20 to 25 permanent local jobs according to the assessor.
- Town of Lincoln, Wisconsin—The assessor reported that when the turbines were first installed, residents complained about the diminished view. However, in the three years since installation, residents have become used to them, and no one complains now. One homeowner had claimed that the assessed value of his property should be reduced because of the wind turbines. The County asked him to show that the value of sales of properties near the turbines had diminished, and he was unable to do so.

  To investigate further the potential impacts on property values, Lincoln's assessor compared the 2001 assessed value to actual sales (for arms-length transactions of residential properties) and found that the ratio of assessed values to actual sales prices for properties less than one mile from the wind turbines was no greater than for properties more than a mile from the wind turbines. The assessor noted that the wind turbines had negatively impacted television reception for nearby properties, but the utility company provided the impacted homes with better antennas or a satellite dish to bring reception back to previous levels.

The wind farms have had no impact on neighboring property values in five counties as neighboring properties are in agricultural production. Assessors' offices in Alameda, California, Carbon, Wyoming, Crockett and Culberson in Texas, and Umatilla, Oregon reported that no residential properties have views of the wind farms. The neighboring properties are grazing land, and the value of the land is determined by its productivity, not its views. For Riverside County, California, the wind farm was built along the freeway with a buffer zone to separate it from residences. Consequently, very few homes have a view of the turbines in that county and the assessor reports that there has been no impact on property values. Nobles County, Minnesota reported that the wind farm in the county was installed in the past year, and it is too early to determine if they have affected neighboring property values.

One county reported that land parcels with wind turbines located on them have changed in value. Kern County, California reported that property eligible for a wind turbine greatly increases in value. The first step to siting a wind turbine is to change the land from a grazing zone to a "wind-energy" zone. By changing the zone, the land value increases from about $300 to about $1000 per acre. No other county reported such an impact to land values.

Wind farms in two counties, Howard in Texas and Umatilla in Oregon, have added to the tax base. The assessors' offices reported that the wind turbines are large capital improvements, and they have contributed to the tax base. This was not a specific question in the interview, and these two counties volunteered the information. The same is likely true in other counties, but the issue was not pursued during the assessor interviews.

Representatives from three assessors' officers reported that community members like the appearance of the wind turbines. The appraiser in Kern County speculated that residents like the appearance of the wind turbines as long as the turbines are functioning. The turbines that were built in the early 1980s had a high failure rate, and many of the turbines just sat on the property in disrepair. That experience led many to feel that wind farms are an eyesore. The newer turbines have a very low failure rate, and residents can see the turbines are operating and creating an economic good, which positively impacts their perceptions of the turbines.

In Kern County, some residents located on rural properties complained about the plan to locate wind turbines near their properties. They argued that they had bought their properties with the expectation of a view of grazing land, not a wind farm. To solve the problem, the wind developer paid them for the property and the people moved. The wind developer then sold the property, although the property values did not decrease.

B. Literature Review

The results of the tax assessor interview show that views of wind turbines do not negatively impact property values. In addition to these interviews, we also conducted a literature review to determine if other studies had found credible evidence of a negative impact on property values. We restricted our literature review to academic journals that only publish articles that have been subjected to a peer review process. References for the articles we reviewed are included in Appendix B of this report.

We found only one study that specifically addressed the potential impact of wind turbines on property values and this study was based on residential property in Denmark. The hedonic study showed that house values were 94 Danish kroners (about $17 per home in 1995 U.S. dollars) lower close to wind farms than other houses located further away but with otherwise similar characteristics. This result was based on a small sample of homes, however, and was not statistically significant.

One of the likely reasons that wind turbines do not diminish property values is that not all people agree that views of wind turbine are undesirable. As reported by the tax assessors, some residents find views the wind turbines attractive. If a homeowner dislikes having a view of the wind farm, they may move and sell their house to someone who likes the view. In this case, property values would not be diminished.

We also reviewed the academic literature addressing transmission lines and their impact on property values. Unlike wind turbines, transmission lines are almost universally considered unattractive. There is also widespread belief that living near transmission lines is a health hazard. For these reasons, there is a much clearer case that transmission lines will negatively affect property values.
Legal cases have agreed that the public perception of danger or health risk can impact property value, regardless of the reasonableness of the public's fear (Rikon 1996).

It is important to emphasize the purpose of reviewing the literature on transmission lines for this analysis. Our review of the literature on transmission lines was done solely to provide an indication of the maximum negative effect views of wind turbines might have on property values *if such a negative impact exists*. As we have indicated from our assessor interviews and literature review, we have not found any evidence that views of wind turbines have any effect on property values. Nevertheless, the information from the literature on power lines is informative.

The evidence from the literature on transmission lines shows that their effect on property values is small and relatively short-lived. The maximum impact on adjacent properties due to transmission lines is about a 10 percent reduction in value. Many studies use hedonic estimation techniques to measure the impact transmission lines have on property values while controlling for other features of the homes. The most recent study (Des Rosiers 2002) found a severe visual encumbrance due to a direct view on a transmission line pylon does exert a negative impact on property prices. Overall, the price reduction stands at roughly 10 percent of average house value. However, being adjacent to the easement will not necessarily cause a house to depreciate. It may even increase its value where proximity advantages (enlarged visual field, increased privacy) exceed drawbacks. Additionally, findings for the non-adjacent properties that have views of the power lines translates in most cases into higher values, due to the improved visual clearance.

Some earlier studies agree that transmission lines have a slight negative impact on property values. Hamilton (1995) found that properties adjacent to a line lose 6.3 percent of their value due to proximity and the visual impact. Properties more distant from transmission lines are scarcely affected, losing roughly 1 percent of their value. Delaney and Timmons (1992) found that, generally, real estate appraisers believe that transmission lines reduce the value of nearby residential properties by 10 percent. The authors' survey found that 84 percent of the surveyed appraisers believed transmission line have a negative impact, 10 percent believed that there is no impact, and 6 percent believed that there was a positive impact on property values. Colwell (1990) found that properties within 50 feet of an HTVL have a 6 percent to 9 percent lower value than comparable properties, but that drop in value lessens over time and tends to fade away.

As the literature indicates, the negative effect on property values due to transmission lines is 10 percent or less, with this effect diminishing over time. This is reported only for comparison purposes for the case of wind turbines. Again, information from tax assessors and the literature indicate that views of wind turbines do not negatively affect property values.

III. Local Economy

A second component of our analysis addressed the economic impact of the wind turbines on the Kittitas County economy. We interviewed representatives from both Zilkha and enXco to determine the amount of spending and employment for the proposed projects. Using this information, we used a regional 'input-output' model with data specific to Kittitas County to estimate the economic impacts of the project. We used our model to estimate the economic impacts for both the construction phase and the operations phase of this project. Details on both these phases are reported below.

A. Construction

The construction of 265 individual wind turbines will involve a significant amount of employment and spending during the construction period. We have talked to representatives from both Zilkha and enXco to determine the likely employment and construction spending. Based on these conversations and our experience analyzing similar projects we developed estimates for use in our model. Our input parameters for the construction phase included:

- 85 full and part time local construction jobs
- 10 full and part time jobs for wind company and utility personnel to manage the plant construction phase
- $6,400,000 in local spending on construction materials (i.e., gravel, concrete)
- $886,000 in spending on food and lodging for non-local labor brought to Kittitas County for the construction period

Based on these and other input parameters, we estimated the impacts to the local economy for a construction period predicted to last approximately one year.

For the input-output model, economic impacts are grouped into three different categories:

- **Direct economic impacts**. Businesses directly purchase goods and services in their local economies. An increase in spending, therefore, affects the economy directly through increased purchases.

- **Indirect economic impacts**. Businesses also indirectly affect local economies, as those firms that provide direct services to the wind project must also purchase materials and supplies themselves. For instance, a construction contractor working on this project will lease some equipment or purchase supplies locally. Increased purchases of "intermediate" goods and services will also promote additional economic activity.

- **Induced economic impacts**. The direct and indirect effects of employment and income affect overall economy purchasing power, thereby affecting further consumption spending. For instance, wind plant employees who use their income to buy groceries or take their family to the movies generate economic impacts for workers and businesses in those sectors. These individuals will, in turn, spend their income much like the wind plant employees do. This cycle continues until the spending eventually leaks out of the local economy as a result of taxes, savings, or purchases of non-locally produced goods and services or "imports."

In addition to these categories, economic impacts are also divided into different income effects. In the following tables, the impact on *Wages* reflects the increase in wage income for all workers as a result of the project. Similarly, *Business Income* is the increase in income to local business as a result of spending associated with the wind plant. *Personal Income* is the sum of wages and business income. The *Other Income* category is used to capture additional income that results from other sources due to the project, such as rents to land owners leasing land for wind turbines. Finally, *Jobs* reflects the number of full and part time jobs that result directly from the project and from the increase in spending in other sectors of the economy.

Additional technical detail on the input-output model is included in Appendix A of this report.

The following tables show the economic impacts for the construction period.

Table 2: Construction Phase Economic Impacts for Kittitas County

Impact type	Wages	Business Income	Personal Income	Other Income	Jobs
Direct	$8,420,000	$1,027,000	$9,447,000	$388,000	95.2
Indirect	732,000	139,000	871,000	242,000	30.3
Induced	1,050,000	225,000	1,275,000	234,000	60.0
Total	$10,202,000	$1,391,000	$11,593,000	$864,000	185.5

As shown in Table 2, the construction phase of the project will result in approximately 95 full and part time jobs. Spending from this project on labor and materials will result in an additional 90 jobs for a total of approximately 185 full and part time jobs during the construction period. Wages during this period will be $10,202,000 due to the hiring of local construction workers and the increases in services needed to support the construction work. Similarly, business incomes will increase by $1,391,000 due to spending on local materials and other items such as food and lodging for non-local labor hired for the project. Taken together, personal income is estimated to increase by $11,593,000 in Kittitas County due to spending during the construction phase. When the income of $864,000 from other sources is considered, the increase in income to the county totals $12,457,000.

Table 3 provides the same information broken out by industry sector. Most of the spending during this phase occurs in the Construction sector. Sectors that will support this sector such as the Wholesale and Retail Trade and Services sectors will also see a significant increase in spending.

Table 3: Construction Phase Economic Impacts by Industry

Industry	Wages	Business Income	Personal Income	Other Income	Jobs
Agriculture, Forestry, and Fisheries	$37,000	$7,000	$44,000	$15,000	1.7
Construction	7,978,000	$1,044,000	$9,022,000	$389,000	90.4
Manufacturing	42,000	$4,000	$46,000	$16,000	1.4
Trans., Comm., & Utilities	778,000	$34,000	$812,000	$57,000	9.7
Wholesale and Retail Trade	611,000	$56,000	$667,000	$90,000	36.2
Finance, Insurance, & Real Estate	66,000	$29,000	$95,000	$120,000	3.5
Services	618,000	$218,000	$836,000	$146,000	41.2
Government	71,000	$0	71,000	$31,000	1.3
Total	$10,202,000	$1,391,000	$11,593,000	$864,000	185.5

B. Operations

Spending will continue in the local economy during the operation of the wind turbines once the construction phase has ended. During the operations phase, spending will consist of primarily:

- 22 employees hired to operate and manage the wind power plants
- Spending on equipment, maintenance and materials to operate the wind turbines
- Income to property owners that rent land for the wind turbines ($4,500 per turbine.)

The impact to the local economy due to the wind plant operations was modeled based on these factors. As during the construction phase, there is a direct effect from these factors as well as an indirect effect that results from the spending due to the increases in income from the new jobs and from the rental income. These impacts are summarized in Table 4 and Table 5.

Table 4 shows the effect on incomes due to continued operations of the wind turbines. The operations will require 22 full and part time jobs, and the spending on these jobs and plant equipment will create approximately 31 additional jobs in businesses that support the wind plants. The combined effect of direct and indirect spending will result in approximately 53 additional new and part time jobs in Kittitas County. Similarly, spending on these jobs will increase annual wages by $2,728,000 and yearly business income by $351,000. Income from other sources is estimated at $1,188,000 annually and will consist primarily of rental fees paid to land owners where the wind turbines are situated. Taken together, the wind turbines operations will increase income to the county by $4,267,000 annually.

Table 4: Wind Plant Operations Annual Economic Impacts for Kittitas County

Impact type	Wages	Business Income	Personal Income	Other Income	Jobs
Direct	$2,165,000	$216,000	$2,381,000	$819,000	22.0
Indirect	77,000	30,000	107,000	22,000	3.1
Induced	486,000	105,000	591,000	347,000	28.2
Total	$2,728,000	$351,000	$3,079,000	$1,188,000	53.3

Table 5 shows the economic impacts resulting from wind turbine operations broken out by industry sector. Most of the impacts will be in the Transportation, Communications, and Utilities sector. The Real Estate and Service sectors will also see increased economic activity due to the continued operation of the wind farm.

Table 5: Annual Wind Plant Operation Impacts by Industry

Industry	Wages	Business Income	Personal Income	Other Income	Jobs
Agriculture, Forestry, and Fisheries	$10,000	$1,000	$11,000	$4,000	0.5
Construction	63,000	29,000	92,000	4,000	2.6
Manufacturing	11,000	1,000	12,000	5,000	0.4
Trans., Comm., & Utilities	2,190,000	226,000	2,416,000	27,000	22.7
Wholesale and Retail Trade	211,000	19,000	230,000	76,000	13.3
Finance, Insurance, & Real Estate	29,000	12,000	41,000	1,012,000	1.5
Services	185,000	64,000	249,000	35,000	11.8
Government	29,000	0	29,000	25,000	0.5
Total	$2,728,000	$351,000	$3,079,000	$1,188,000	53.3

IV. Tax Revenues

The overall increase in economic activity from the wind power plant will increase tax revenues for Kittitas County. ECONorthwest was asked to estimate the impact on tax revenues for the major sources of tax income for the county. Note that we did not attempt to estimate the increases in costs or the provision of county services (i.e., fire, sheriff) that the wind power plant might require.

Based on our review of Kittitas County budgets and spending and our evaluation of the proposed wind power facility, we have estimated the potential revenue impacts for the Kittitas County. Table 6 shows the estimated increases in revenue for the major tax revenue sources.

As shown in Table 6, the primary increase in tax revenues is from property taxes on the wind turbines themselves. For this calculation, we have used the value of $750,000 per turbine, which is consistent with our experience in other wind projects and with the information provided to us by the wind companies involved with the Kittitas County project. The property tax rate used for the calculation is the 1.35 percent for Kittitas County. Using this tax rate and property value for the 265 turbines results in new property tax revenues of $2,683,125 annually.

The development of this project will also have an effect of increasing the value of other properties due to the increase in wages and overall economic activity in Kittitas County. This results in an additional $201,971 in property tax revenues annually due to increases in other property values.

When the property tax revenues from both sources are combined, the additional tax revenue collected within Kittitas County totals $2,885,096 annually.[1] For comparison, property tax revenues from all sources in Kittitas County totaled $25,223,948 for the 2001-02 budget year.[2] The increase in property tax revenues due to the wind farm amounts to an increase of 11 percent over these levels.

Table 6: Increases in Annual Property Tax Revenues in Kittitas County

Revenue Source	Amount
Property taxes on wind farms	$2,683,125
Taxes from higher values on other properties	201,971
Total	**$2,885,096**

A complicating factor in these revenue estimates is the recently passed Initiative 747 (I-747) in Washington State, which limits increases in tax levies to 1 percent a year. From our conversations with the Kittitas County assessor and from information provided by Washington State, it appears that most of the value of a wind turbine ($500,000) would be considered personal property and as such would be subjected to this limit. For Kittitas County, total personal property is assessed at $2,355.4 million. The addition of 265 windmills with a personal property value of $500,000 each would add $132.5 million to the total property value of the county - an increase of 5.6 percent. Since this increase is greater than 1 percent, it is possible that taxes in other areas would need to be reduced in order to comply with I-747. This might involve decreases in personal property tax rates and/or bond levies. It should be stressed that ECONorthwest is not an accounting firm, and the implication of I-747 is discussed here only as one possible scenario based on preliminary tax estimates. However, the tax revenue estimates provided here should be viewed with I-747 in mind, as actual revenues may ultimately be reduced in the County in order to comply with the initiative.

Table 7 shows the likely distribution of the new tax revenues based on the spending allocations reported in the 2002 Kittitas County Budget. This information is also presented graphically in Figure 1.

---

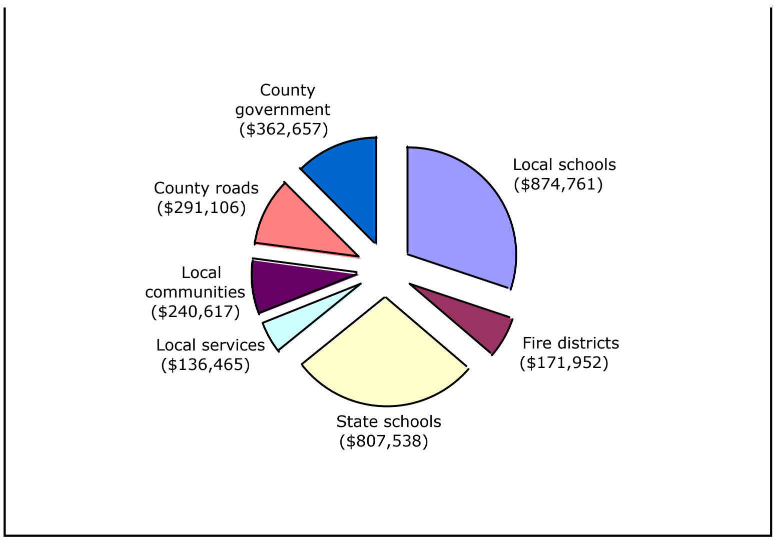
[1] Approximately 30 percent of the turbines are to be built on land managed by the Washington Department of Natural Resources rather than on private land. For these turbines, the rental fee for land will be paid to the State, which then returns these funds to schools throughout the state based on district need. At the annual rental rate of $4,500 per turbine, this amounts to an additional $351,000.

[2] *Kittitas County Assessor's Report 2001 Assessed Valuations Levies and Taxes to be Collected 2002*, page 4.

Table 7: Allocation of Property Tax Revenues

Spending Category	Amount
Local schools	$874,761
State schools	$807,538
Fire districts	$171,952
Local communities	$240,617
County roads	$291,106
County government	$362,657
Hospitals and other local services	$136,465
Total	**$2,885,096**

Figure 1: Allocation of Property Tax Revenues



Based on current spending patterns, local schools receive the largest share of the tax revenue increase at $874,761 annually. Following the local schools, state schools would receive the next largest share of revenues at $807,538 annually. The local county government budget would receive $362,657 annually, local county roads revenues would increase by $291,106 annually, and annual funds going to local communities from the county would increase by $240,617. Finally, annual spending for local fire districts would increase by $171,952 and funds allocated to hospitals and other services in the county would increase by $136,465.

The property tax revenue estimates reflect funds that are spent in a variety of sectors, both inside and outside Kittitas County. In addition to these property taxes, we estimated the tax revenue that will accrue to the Kittitas County Government. This was done by comparing the current tax revenues as a fraction of total economic output for Kittitas County with and without the wind farm. Using the results from our input-output model, we estimated the total increase in economic output from the proposed wind plant. Given the increase of output with the project, we estimated the increase in tax revenues assuming that tax rates remained constant. For each individual tax, the increases were generally on the order of 0.2 percent annually.

The estimated increase in annual revenue for the Kittitas County Government from these taxes is shown in Table 8. The majority of these additional tax revenues are the property taxes collected for county government and roads. Other sources include smaller taxes such as those collected for fees and services as well as revenue returned to the county by the State. Together, these tax revenues total $693,777. Given the Kittitas County Government expenditures of $44,312,102 planned for 2002, the additional revenue generated by the wind farm represents an increase of almost 2 percent over the budgeted amount.[3]

Table 8: Additional Kittitas County Government Tax Revenues

Spending Category	Amount
Property taxes – County government and roads	$653,763
Sales and use taxes	$7,103
All other taxes	$2,927
Licenses and permits	$2,094
Charges for services	$8,509
Fines and forfeits	$2,138
State collected taxes distributed to County	$17,244
Total	**$693,777**

[3] *Kittitas County 2002 Annual Budget,* page 15.

V. Alternative Uses

A final analysis issue was to assess the types of additional costs Kittitas County would likely occur with a new residential development. Our understanding is that a residential development as has been suggested as an alternative to building the wind farm, although it is unlikely that such a development would utilize all the land that is currently being considered for the wind project.

For this task, we did not attempt to estimate these costs or the amount of tax revenue that might be generated from such a development. Rather, we are listing areas of increased costs to the County based on our experiences conducting fiscal impact analyses for other jurisdictions.

With a new residential development, additional costs will be incurred for extending utilities and roads to the development, with road construction likely comprising the highest share of costs. Utility-related costs include extending water lines, sewer, phone lines, and power lines to the new development. The utility-related costs are usually paid for by system development charges and if the charges are properly constructed, these services will be cost neutral to the County as they will be paid for entirely by the fees collected. Maintenance of items such as roads, however, will likely increase costs for the County.

Additional cost considerations for Kittitas County will be the extension of all county services to a new development. Affected service areas include fire, sheriff, hospital, libraries, and other community services funded by the County. In order to maintain current levels of service to the new county residences in these areas, additional staff may need to be hired.

If the new residential development is large enough, it may also require that additional Kittitas County government officials be hired to handle the increased workloads in all government areas. For example, the addition of a large residential development may require hiring more staff in the assessor's office or possibly additional teachers for that particular school district.

Appendix A: Modeling Process

Expenditure in the utility sectors and construction sectors affect the Washington economy *directly*, through the purchases of goods and services in this state, and *indirectly*, as those purchases, in turn, generate purchases of intermediate goods and services from other, related sectors of the economy. In addition, the direct and indirect increases in employment and income enhance overall economy purchasing power, thereby *inducing* further consumption- and investment- driven stimulus.

The economic modeling framework that best captures these direct, indirect, and induced effects is called input-output modeling. Input-output models provide an empirical representation of the economy and its inter-sectoral relationships, enabling the user to trace out the effects (economic impacts) of a change in the demand for commodities (goods and services).

Because input-output models generally are not available for state and regional economies, special data techniques have been developed to estimate the necessary empirical relationships from a combination of national technological relationships and county-level measures of economic activity. This modeling framework, called IMPLAN (for IMpact Analysis for PLANning), is the technique that ECONorthwest has applied to the estimation of impacts.[4]

The IMPLAN model reports the following economic impacts:

- Total Industrial Output (output) is the value of production by industries for a specified period of time. Output can be also thought of as the value of sales including reductions or increases in business inventories.

- Personal income consists of the wages and salaries received by households (employee compensation) and the payments received by small-business owners or self-employed individuals (proprietary income). Employee compensation includes workers' wages and salaries, as well as other benefits such as health and life insurance, and retirement payments. Proprietary income, for example, would include income received by private business owners, doctors, accountants, lawyers, etc.

[4] IMPLAN was developed by the Forest Service of the US Department of Agriculture in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management of the US Department of the Interior to assist federal agencies in their land and resource management planning. Applications of IMPLAN by the US Government, public agencies and private firms span a wide range of projects, from broad, resource management strategies to individual projects, such as proposals for developing ski areas, coal mines, and transportation facilities, and harvesting timber or other resources. ECONorthwest has applied the model to a variety of public and private sector energy projects including a major US/Canada gas pipeline project and the proposed purchase of Portland General Electric by local counties.

- Other property type income (other income) in the IMPLAN model includes payments to individuals in the form of rents received on properties, royalties from contracts, dividends paid by corporations, and corporate profits earned by corporations.

- Job impacts include both full and part time employment.

- Tax revenues for various federal, state and local taxing jurisdictions.

Ideally, expenditures for the proposed wind farm would be available and specific enough to allocate to each of the 528 industry sectors contained in the IMPLAN model. In addition, the expenditures should be delineated between local and non-local providers, as purchases of goods and services from out-of-state vendors will have no economic impact on Washington employees and businesses.

In absence of this detailed information, ECONorthwest opted to use the production function data for the utility and government sectors contained in the IMPLAN modeling software. From an input-output modeling perspective, this is a standard modeling approach in the absence of detailed primary source data. Indeed, IMPLAN's production function data contains information, called regional purchase coefficients that describe the proportion of a given commodity that will be provided by Washington producers. Our previous modeling experience has shown that the data contained in the IMPLAN modeling system for the various sectors is sufficient to permit an accurate rendering of impacts.

VI. Appendix B: References

Colwell, Peter F. 1990. "Power Lines and Land Value." *Journal of Real Estate Research*. Volume 5(1): 117-127.

Delaney, Charles J. and Douglas Timmons. 1992. "High Voltage Power Lines: Do They Affect Residential Property Value?" *Journal of Real Estate Research*. Volume 7(2): 315-329.

Des Rosiers, Francois. 2002. "Power Lines, Visual Encumbrance and House Values: A Microspatial Approach to Impact Measurement." *Journal of Real Estate Research*. Volume 23(3): 275-301.

Hamilton, Stanley W. 1995. "Do High Voltage Electric Transmission Lines Affect Property Value?" *Land Economics*. Volume 71(4): 436-444.

Jordal-Jorgensen, J. 1995. "Social Costs of Wind Power: Partial Report of Visual Impacts and Noise from Windturbines." Institute of Local Government Studies, Copenhagen, Denmark.

Kung, Hsiang-te and Charles F. Seagle. 1992. "Impact of Power Transmission Lines on Property Values: A Case Study." *The Appraisal Journal*. Volume 64(3): 413-418. July.

Rikon, Michael. 1996. "Electromagnetic Radiation Field Property Devaluation." *The Appraisal Journal*. Volume 64(1): 87-90. January.

Photo 1. Highway 97 at North Branch Canal – view looking north.

Photo 2. Highway 97 at northern end of Nacho Lane – view looking north.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 3. Sagebrush Lane - view looking north and northeast. Highway 97 is the road visible in the valley below.

Photo 4. Highway 97 - view looking west along Bonneville Power Authority (BPA) transmission corridor.

Photo 5. Highway 97 at crossing of BPA transmission corridor

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 6. Highway 97 at Bettas Road. View looking north northwest toward proposed site of project operation and maintenance facility and substation.

Photo 7. Highway 97 just north of gravel pit. View looking north as road begins to travel down slope.

Photo 8. Highway 97 at intersection with northern end of Bettas Road.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 9. Highway 97 between Highway 97 and northern end of Bettas Road. View looking south.

Photo 10. Highway 97 just north of gravel pit – view looking south.

Photo 11. Highway 97 just south of gravel pit. View looking south as road starts to travel down slope.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 12. Cricklewood Lane – view looking north into ridge area east of Highway 97.

Photo 13. Elk Springs Road – view looking north.

Zilkha Renewable Energy

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 14. Northern portion of Elk Springs Road –view looking north toward Section 35.

Photo 15. Bettas Road at Hayward Road – view looking north.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 16. Bettas Road - view looking north.

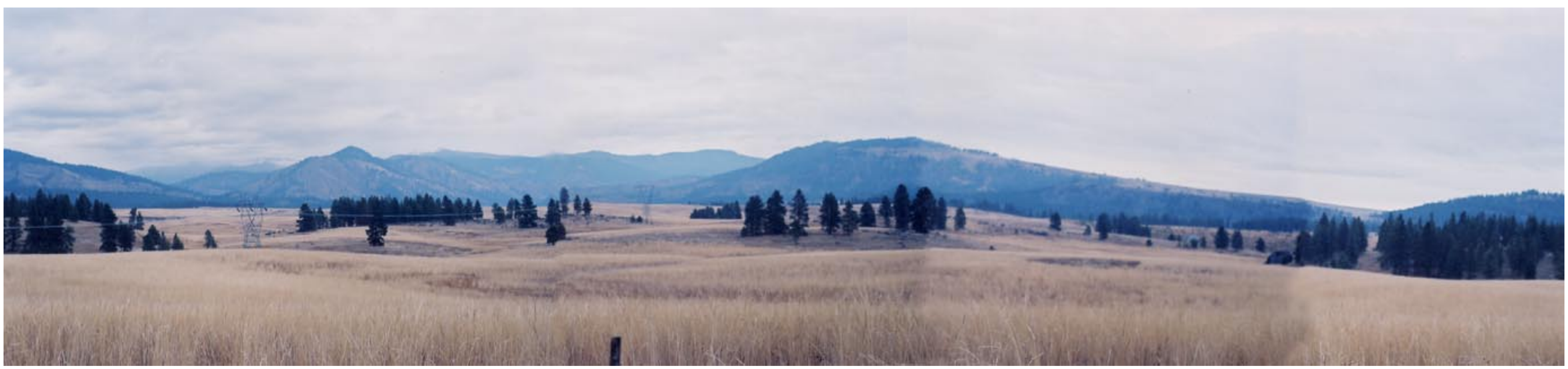


Photo 17. Hidden Valley Road – view looking east.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 18. Hayward Road – view looking north.the culvert to use as a landmark to compare with Photo A.

Photo 19. Hayward Road – view looking south.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 20. Highway 10 at Fire District 1 fire station. View looking northwest.

Photo 21. Thorp Highway at Highway 10 – view looking east.

Photo 22. Highway 10 west of Swauk Creek – view looking east.

Photo 23. Highway 10 3.8 miles west of Thorp Highway – view looking east.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 1. Highway 97 at North Branch Canal – view looking north.

Photo 2. Highway 97 at northern end of Nacho Lane – view looking north.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 3. Sagebrush Lane - view looking north and northeast. Highway 97 is the road visible in the valley below.

Photo 4. Highway 97 - view looking west along Bonneville Power Authority (BPA) transmission corridor.

Photo 5. Highway 97 at crossing of BPA transmission corridor

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 6. Highway 97 at Bettas Road. View looking north northwest toward proposed site of project operation and maintenance facility and substation.

Photo 7. Highway 97 just north of gravel pit. View looking north as road begins to travel down slope.

Photo 8. Highway 97 at intersection with northern end of Bettas Road.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 9. Highway 97 between Highway 97 and northern end of Bettas Road. View looking south.

Photo 10. Highway 97 just north of gravel pit – view looking south.

Photo 11. Highway 97 just south of gravel pit. View looking south as road starts to travel down slope.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 12. Cricklewood Lane – view looking north into ridge area east of Highway 97.

Photo 13. Elk Springs Road – view looking north.

Zilkha Renewable Energy

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 14. Northern portion of Elk Springs Road –view looking north toward Section 35.

Photo 15. Bettas Road at Hayward Road – view looking north.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 16. Bettas Road - view looking north.

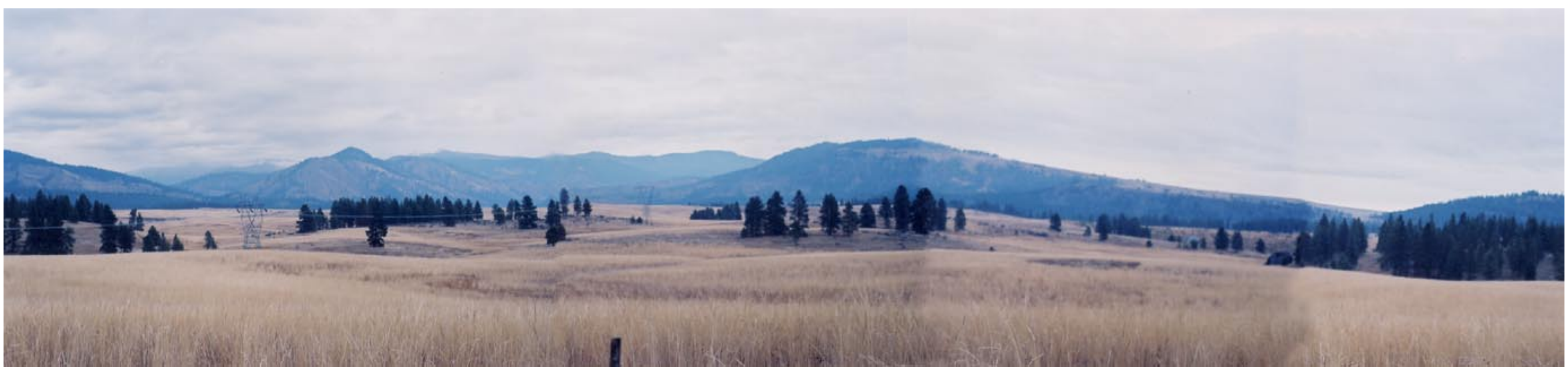


Photo 17. Hidden Valley Road – view looking east.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 18. Hayward Road – view looking north.the culvert to use as a landmark to compare with Photo A.

Photo 19. Hayward Road – view looking south.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Photo 20. Highway 10 at Fire District 1 fire station. View looking northwest.

Photo 21. Thorp Highway at Highway 10 – view looking east.

Photo 22. Highway 10 west of Swauk Creek – view looking east.

Photo 23. Highway 10 3.8 miles west of Thorp Highway – view looking east.

FIGURE XXX
KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 4a - Simulation View 1: Existing view from Highway 97 at Eburg Ranches Road looking north

Figure Vis 4b - Simulation View 1: Simulated view of project seen from Highway 97 at Eburg Ranches Road looking north

Figure Vis 4c - Simulation View 1: Simulated view of project seen from Highway 97 at Eburg Ranches Road looking north illustrating the appearance of larger turbines

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•1/8/03•ccc

Figure Vis 5a - Simulation View 2: Existing view from Highway 97 north of gravel pit looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 5b - Simulation View 2: Simulated view of project seen from Highway 97 north of gravel pit looking north illustrating appearance of gray turbine structures

Figure Vis 5c - Simulation View 2: Simulated view of project seen from Highway 97 north of gravel pit looking north illustrating appearance of brown turbine structures

Figure Vis 6a - Simulation View 3: Existing view looking south from Highway 97 at intersection with northern end of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 6b - Simulation View 3: Simulated view of project seen looking south from Highway 97 at intersection with northern end of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 6c - Simulation View 3: Simulated view of project seen looking south from Highway 97 at intersection with the northern end of Bettas Road illustrating the appearance of larger turbines

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•1/8/03•ccc

Figure Vis 7a - Simulation View 4: Existing view from Sagebrush Road looking north

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 7b - Simulation View 4: Simulated view of project seen from Sagebrush Road looking north

Figure Vis 8a - Simulation View 5: Existing view looking south from residence in Section 35 at upper end of Elk Springs Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 8b - Simulation View 5: Simulated view of project seen looking south from residence in Section 35 at upper end of Elk Springs Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 9a - Simulation View 6: Existing view looking north along northern portion of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 9b - Simulation View 6: Simulated view of project seen looking north from a viewpoint along northern portion of Bettas Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 10a - Simulation View 7: Existing view looking east from a viewpoint on the northern portion of Hidden Valley Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 10b - Simulation View 7: Simulated view of project seen looking east from a viewpoint on the northern portion of Hidden Valley Road

Figure Vis 11a - Simulation View 8: Existing view looking west from a viewpoint along Highway 10 at Hayward Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 11b - Simulation View 8: Simulated view of project seen looking west from a viewpoint along Highway 10 at Hayward Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 12a - Simulation View 9: Existing view looking east from a viewpoint along Highway 10 between Morrison Canyon and Swauk Creek

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 12b - Simulation View 9: Simulated view of project seen looking east from viewpoint along Highway 10 between Morrison Canyon and Swauk Creek

Figure Vis 13a - Simulation View 10: Existing view looking east from a viewpoint along Highway 10 west of Swauk Creek

Figure Vis 13b - Simulation View 10: Simulated view of project seen looking east from viewpoint along Highway 10 west of Swauk Creek

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 14a - Simulation View 11: Existing view looking north from a viewpoint along the John Wayne Trail at Taneum Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 14b - Simulation View 11: Simulated view of project seen looking north from a viewpoint along the John Wayne Trail at Taneum Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 15a - Simulation View 12: Existing view looking north from a viewpoint along Thorp Highway in the center of the community of Thorp

Figure Vis 15b - Simulation View 12: Simulated view of project seen looking north from a viewpoint along Thorp Highway in the center of the community of Thorp

Figure Vis 16a - Simulation View 13: Existing view looking east from a viewpoint along Highline Loop in Sunlight Waters

Figure Vis 16b - Simulation View 13: Simulated view of project seen looking east from a viewpoint along Highline Loop in Sunlight Waters

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 17a - Simulation View 14: Existing view looking northeast from a viewpoint along I-90 at Springwood Ranch

Figure Vis 17b - Simulation View 14: Simulated view of project seen looking northeast from a viewpoint along I-90 at Springwood Ranch – turbines painted gray

Figure Vis 17c - Simulation View 14: Simulated view of project seen looking northeast from a viewpoint along I-90 at Springwood Ranch – turbines painted brown

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 18a - Simulation View 15: Existing view looking northwest from a viewpoint along Lower Green Canyon Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

170365.C1.01_E112002002SFO•KVWEP photo SIMS•12/3/02•ccc

Figure Vis 18b - Simulation View 15: Simulated view of project seen looking northwest from a viewpoint along Lower Green Canyon Road

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 19a - Simulation View 16: Existing view looking northwest from a viewpoint in Reed Park in Ellensburg

KITTITAS VALLEY WIND ENERGY PROJECT

CH2MHILL

Figure Vis 19b - Simulation View 16: Simulated view of project seen looking northwest from a viewpoint in Reed Park in Ellensburg