2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

BP Wind Energy has filed right-of-way (ROW) applications with the Bureau of Land Management (BLM) and Bureau of Reclamation (Reclamation) for the development and operation of a wind farm in Mohave County, and an interconnection request with Western Area Power Administration (Western) for a transmission line interconnection so the generated power can be sold and used to satisfy demand for electrical power. Western has also applied to BLM for ROW agreements for the project's Switchyard, which (if approved) would be constructed, owned, and operated by Western. As a result, the proposed agency actions are for BLM and Reclamation to grant ROWs and for Western to approve the interconnection request. This chapter describes the proposed action, the Mohave County Wind Farm Project (Project) as proposed by BP Wind Energy, and the alternatives being considered.

Some Project components can be specified based on identified needs, such as the size of the operations and maintenance building, the width of interior access roads, or the need for pad-mounted transformers at the base of the turbines. However, various options are being considered for some Project components, such as the color of the turbines and the transmission line interconnection point and associated switchyard location.

The Project components, including those with variable options, are described in this chapter. Describing and analyzing the component options that comprise the Project provides the decision maker the information needed to assess Project impacts regardless of which combination of options is selected.

Three action alternatives and the no-action alternative are evaluated in this Environmental Impact Statement (EIS). Alternative A represents the Project as BP Wind Energy proposes to build and operate it. Alternatives B and C would reduce the footprint of the Wind Farm Site, compared to Alternative A. Alternative D is the no-action alternative, in which ROW approvals and the interconnection request would not be granted, and the Project would not be constructed. Under all alternatives except Alternative D, Western would construct, own, operate, and maintain the Switchyard, and under all alternatives requiring a 345-kilovolt (kV) interconnection would replace the 345/230-kV transformer at Mead Substation.

Section 2.2 offers an overview of the site selection criteria used by BP Wind Energy to choose the White Hills area of Mohave County for the Project.

Section 2.3 describes the Project's conformance with BLM's Land Use Plan, and Section 2.4 describes the application of Best Management Practices (BMPs). Based on past experience with similar circumstances, BMPs are regarded as those practices (including techniques, methods, processes, and activities) that have been demonstrated to be the most efficient and effective approach to achieve desired results. Section 2.5 describes the Project, including construction of the proposed wind farm, operations and maintenance, and decommissioning of the Project when it is no longer cost effective to operate. Section 2.6 describes the alternatives. Sections 2.7 and 2.8 address project design requirements and bonding. A description of the alternatives that were considered but eliminated from detailed study in this EIS is described in Section 2.9 and a summarized comparison of the alternatives and options is offered in Section 2.10.

2.2 SITE SELECTION PROCESS

There are four key siting criteria required to make a wind farm project economically and technically feasible and practical. These include the potential for a high quality wind resource, available land, access to suitable transmission facilities, and few known environmental issues.

2.2.1 High Quality Wind Resource

The siting of large-scale wind energy facilities is constrained by the need for a location with sufficient wind speeds (in the range of 9 to 56 miles per hour [mph]) on a regular basis throughout the year given current turbine technologies. The lack of a suitable wind resource would prevent a project from producing energy at a cost that is competitive with that of alternative projects in the region.

In selecting a potential wind farm site, BP Wind Energy focused on the northwest quarter of Arizona where wind speeds are unusually high and consistent relative to those generally in the rest of the state and the region. The side slopes of the White Hills in Mohave County, Arizona provide a unique combination of sufficient wind resource, the presence of suitable transmission access, good physical access, and relatively few anticipated environmental constraints, including low residential population density (Germain 2010).

This region is not as well exposed to broad-scale energetic upper-level wind flows as are many of the other regions being developed for wind energy production throughout the United States. However, there are mesoscale[1] circulations driven by regional thermal contrasts that do produce sufficient wind flow for a project of this magnitude. The Colorado River Valley appears to enhance one of these patterns with a primary up-valley flow from the south and a secondary drainage flow from the north-northeast. Therefore terrain features with good exposure to this flow pattern make it an attractive candidate location (Germain 2010).

BP Wind Energy began monitoring the wind resource of the Project site in 2003 through the installation of two meteorological towers (met towers) authorized through ROW grants from the BLM; additional met towers were installed in later years. Data from these met towers validate that the wind resource is indeed of high quality with sufficient wind speeds on a regular basis.

2.2.2 Available Land

A large area of land must be available for a large-scale wind energy project. Land owners and/or public/Federal land managers must be willing to negotiate leases or other authorizations to allow the use of the land for wind turbines and associated facilities. While various existing land uses may be compatible with a wind farm on the same site or an adjacent site, it is important that the proposed site itself does not have conflicting land uses such as dense urban development, mining development, wilderness areas, wilderness study areas, national parks and monuments, or national conservation areas and other uses not related to ground use, such as, low-level aviation flight paths, and military radar coverage.

Land in the Project Area is undeveloped, as is much of the surrounding land. Some land uses in the vicinity have historically included or currently include dispersed residential development, livestock grazing, dispersed recreation (particularly on the BLM-administered and Lake Mead National Recreation Area-administered [NRA] lands), and mining. Industrial-scale wind farm projects are generally considered consistent with these land uses. In addition, the Project Area has good access with a major highway (US 93) within about 3 miles of the Project site and existing dirt roads passing through portions

[1] Pertains to meteorological phenomena, such as wind circulation, that range in size from a few miles to about 100 miles in horizontal extent.

of the site. In contrast, many of the mountain ranges in the region did not offer suitable physical access from a civil engineering perspective.

Federal and private lands within the vicinity of the Project Area were suggested as alternative locations for the Project but were eliminated as potential siting areas because they failed to meet the siting criteria. The Project Area itself was modified from a larger area in response to public comment and other possible environmental issues. The areas eliminated from further analysis are described further in Section 2.9.

2.2.3 Suitable Transmission

Large-scale wind energy facilities must be located within a reasonable distance of an interconnection point on a transmission line with sufficient capacity to allow for the economical delivery of power to customers on the regional electrical grid. A reasonable distance is determined in part by the capital cost of transmission line construction.

Two high-voltage transmission lines with available capacity to transmit power from the proposed wind farm pass through the Project site. These are Western's 345-kV Liberty-Mead transmission line and Western's 500-kV Mead-Phoenix transmission line.

2.2.4 Environmental Issues

Large scale wind energy projects are ideally located in areas that avoid significant environmental issues such as major bird migration pathways, areas of particularly sensitive habitats, areas rich in cultural resources, areas highly sensitive to visual intrusions, or conflicting activities such as airports or low-level military training routes.

BP Wind Energy began conducting preliminary environmental studies of the BLM-managed portions of the Wind Farm Site in 2007, with particular attention to biological resource concerns (bats, birds, special status species, and wetlands). A baseline ecological study of the BLM-managed portions of the Wind Farm Site did not identify particularly sensitive environmental features or habitats in the study area.

Some environmental sensitivities may not be fully understood at the site selection stage because siting occurs before public and agency scoping and because some environmental concerns are subjective rather than quantifiable. While concerns for visual effects have been raised through the National Environmental Policy Act (NEPA) process, the siting process considered that the relatively light existing development (residential and recreational) in the vicinity would limit the number of persons who would see the Project on a routine basis and that the visual management classification of the public land allowed for maximum modifications.

2.3 CONFORMANCE WITH KINGMAN RESOURCE MANAGEMENT PLAN AND BUREAU OF RECLAMATION DIRECTIVES AND STANDARDS

The generation and transmission of electricity are among those uses for which ROW may be issued under the Federal Land Policy Management Act (FLPMA). In addition, the Project must comply with BLM's existing Land Use Plan for the Project Area. The Kingman Resource Management Plan (RMP) (BLM 1993) shows the Project Area is allocated for grazing, dispersed recreation (including some off-highway vehicle use on existing roads and trails), and a utility corridor that coincides with the existing transmission lines in the area. The BLM reviewed its Kingman RMP (BLM 1993) approved by the Record of Decision dated March 7, 1995 (BLM 1995) and determined that wind energy development was not disallowed or addressed in the RMP. When an RMP is silent on an issue, BLM guidance provides that BLM review the broad and programmatic goals and objectives in the RMP to determine if a project is in conformance with the RMP. The original application was initially in conflict with RMP Decision LR13 because a portion of the application included land within the Mead-Phoenix one-mile-wide power

transmission line corridor. This corridor was established for long distance infrastructure needs, but does provide for short transmission facilities, such as grid tie-in transmission lines. Although access roads and collector systems are proposed within the utility corridor, BP Wind Energy voluntarily agreed not to build turbines within the utility corridor, thus avoiding a conflict with the RMP. Based on this review, BLM determined that the Project contributes to meeting the goals and objectives in the RMP, is not inconsistent with the RMP, and is therefore in conformance with the RMP and no amendment is needed to the RMP (see consistency review in Appendix A). The Project evaluated in this EIS is also consistent with the President's Energy Policy Act of 2005; Advanced Energy Initiative of 2006; and the BLM Instruction Memorandum No. 2009-043, *Wind Energy Development Policy* (BLM 2008a). Reclamation has determined that the Project is in conformance with Reclamation Directives and Standards for Land Use Authorizations (LND 08-01).

2.4 BEST MANAGEMENT PRACTICES

Construction of the Project would be subject to BLM's BMPs, which are designed to guide project planning, construction activities, and development of facilities to minimize environmental and operational impacts. BMPs include standards associated with overall project management, surface disturbance, facilities design, erosion control, revegetation and other mitigation, hazardous materials, project monitoring and responsibilities for environmental inspection. The Project would develop wind energy resources in compliance with the BMPs that were evaluated in the *Final Programmatic Environmental Impact Statement for Wind Energy Development on BLM-Administered Lands in the Western United States (*Final Wind Energy PEIS [BLM 2005a]). Project construction and operations would incorporate the BMPs as stated in Attachment A of the *Record of Decision for the Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments* (BLM 2005b); these BMPs are included as Appendix B of this EIS.

2.5 PROPOSED ACTION

As introduced in Chapter 1 of this EIS, the Project is proposed in the White Hills of Mohave County about 40 miles northwest of Kingman, Arizona. The Wind Farm Site includes about 38,099 acres of public land managed by the BLM and 8,960 acres of land managed by Reclamation; additional land would be needed for access to the Project site (estimated at about 75 acres) and a power distribution line within the access road ROW. In response to the application to use this land for the proposed Project, the BLM segregated these public lands from appropriation under the public land laws including the mining law, but excluding the mineral leasing or materials acts, for a period of two years beginning March 2, 2012 when the segregation notice was published in the Federal Register.

The Project's energy generating capacity would be dependent on the turbine type, placement and number of turbines within approved corridors, and the transmission line selected. The power generation capacity is proposed to be 425 megawatts (MW) if the Project interconnects to the 345-kV Liberty-Mead transmission line, and 500 MW if the Project interconnects to the 500-kV Mead-Phoenix transmission line. Power generated by the Project would enter the regional electrical grid through a proposed interconnection with one of two existing transmission lines crossing the Project Area.

The Project's life-cycle includes site preparation and pre-construction activities, construction of all Project components, post-construction activities, operation and maintenance of the facility, and decommissioning. A detailed description of each of these phases is provided in the following sections.

2.5.1 Site Preparation and Pre-Construction Activities

During final design, detailed plans would be developed to further guide site preparation, construction, and post-construction phases. This may include, but is not limited to, a weed management plan; transportation and traffic plan (which also would address the transport of equipment); a Health, Safety, Security, and

Environment (HSSE) plan (including emergency response and waste management); facility security plan; spill prevention plan; and reclamation plan. These plans, along with the Site and Grading Plan (which would incorporate flagging plans and construction drawings), and an updated Plan of Development would be reviewed with appropriate agencies with jurisdictional or technical expertise or regulatory responsibilities, including but not limited to BLM, Reclamation, Western, and Mohave County.

Before construction can commence, a licensed surveyor or professional engineer would perform a site survey to stake out the exact location of the wind turbines, interior roads, electrical lines, substation areas, and other major Project features. If Project features or construction activities are determined to extend beyond the corridors that were surveyed for cultural and biological resource concerns, no construction would begin until environmental clearances are completed. Locations of sensitive resources would be flagged or clearly marked in and around the Project work area to identify any possible conflicts or to distinguish areas to be avoided and/or areas requiring cultural resource, biological, paleontology, or weed monitoring.

Prior to the site survey, a geotechnical investigation would be conducted and would include standard penetration test borings at six proposed turbine sites to visually characterize the soils and to obtain samples for laboratory testing. Suitable geotechnical investigation equipment would be used for the geotechnical investigation, such as a small vehicle or all-terrain vehicle (ATV)-mounted drill rig. The rig would bore to the engineer's required depths, and a backhoe would be used to identify the subsurface soil and rock types and strength properties by sampling and lab testing. The turbine borings would be approximately 6 inches in diameter and would be extended to a depth of 50 to 65 feet to adequately determine the quality/character of the bedrock. The boring would not be as deep if suitable foundation characteristics are identified at a shallower depth. Soil samples would be collected and laboratory tests of the samples would be conducted. The geotechnical investigation for support of the preliminary roadway design would include collection of a series of eight bulk soil samples from depths of approximately 1 to 2 feet at locations across the Project site. In-situ electrical resistivity tests and bulk samples for thermal resistivity testing would be performed at the six turbine boring sites and at the proposed substation location. Electrical resistivity testing measures how well the soil conducts electricity. This is primarily used in the design of the grounding grids, which are used to dissipate electricity into the ground. Thermal resistivity testing measures how well heat is dissipated into the soil. This is primarily used in the design of the underground collection circuits to ensure the heat generated by the cables does exceed the cable's specification. All test pits and soil boring locations would be back-filled after the soil samples are obtained and rehabilitated if the Project is not constructed.

If required, additional geotechnical investigations would be performed to further identify subsurface conditions, which would dictate much of the design specifications of the roads, foundations, underground trenching, and electrical grounding systems. Testing also would be completed to measure the soil's electrical properties to ensure proper grounding system design. At this time additional test borings and soil testing would be conducted. One boring would be completed per turbine location, plus approximately three borings at the substation and operations and maintenance (O&M) building. In addition, approximately 20 to 40 soil samples would be taken along the road/collection corridors. The process would be largely the same as described above, but for the samples along the primary access road from US 93 and interior roads, a small backhoe or shovel would be used to dig a sample test pit a few feet deep to obtain soil samples and then the test pits would be refilled.

About one week prior to the start of construction at any given site, an environmental inspector and agency inspectors/monitors (which may include agency staff and/or contracted environmental monitors), the construction contractor, and any subcontractors would conduct a walk-over of areas to be affected, or potentially affected, by proposed construction activities. These pre-construction walk-overs would occur regularly and are intended to identify and mark sensitive resources to avoid, limits of clearing, location of

drainage features (e.g., culverts, ditches), and the layout for sedimentation and erosion control measures. Upon identifying and marking these features, specific construction procedures would be reviewed, and any modifications to construction methods or locations would be agreed upon before construction activities begin. Relevant agency representatives would be consulted or included on these walk-overs, as needed. A Compliance and Monitoring Plan that includes a discussion of these activities shall be prepared.

Regardless of when personnel join the construction team and begin work at the construction site, supervisors and work crews would go through orientation and training that would include Project safety rules, environmental and cultural awareness and compliance programs, and minimization of construction waste. An internal pre-construction conference would be held with agency representatives, BP Wind Energy, contractors, and consultants to review grants, stipulations, and the Plan of Development to highlight guidelines and mitigation measures. BMPs that would be implemented during site preparation and pre-construction activities are listed in Appendix B.

Site preparation work may include clearing (removing vegetation from the land), grading (leveling or smoothing and possibly compacting to a desired or horizontal gradient, typically done with a bulldozer), and blasting (using an explosive device to fracture and/or dislodge rock or other materials). Details regarding the equipment to be used during site preparation and pre-construction activities can be found in Appendix C. Sediment and erosion control measures would be implemented before any clearing and grading activities occur; these control measures would be in accordance with the Stormwater Pollution Prevention Plan (SWPPP) as well as BMPs (see Appendix B). The SWPPP is a plan for stormwater discharge that includes erosion prevention measures and sediment controls that, when implemented, will decrease soil erosion on a parcel of land and thereby decrease off-site nonpoint pollution. Areas to be cleared and graded would include the access road, laydown area, turbine and other facility locations, substation, switchyard, access routes within turbine corridors, and access to the transmission line corridor. Small areas around transmission line structure sites may also be cleared. Clearing would be performed only where necessary for construction or fire prevention and fuel management.

Bulldozers would typically be used to clear and grade land. Removed topsoil[2] bearing organic components would be used in reclamation that takes place during construction or stockpiled for Project reclamation, particularly to promote reseeding success in disturbed areas. Excavated waste rock and/or mineral soil underlying the topsoil would potentially be used for fill material where needed anywhere within the Project Area (such as to achieve desired grades or extend curve radii of roads).

It may be necessary to blast rock to achieve the necessary slope and gradient for interior roads or for foundation construction. If required, blasting would be conducted in accordance with a Blasting Plan prepared in advance of construction and approved by BLM and Reclamation. The Blasting Plan, which will identify blasting locations, safety protocol, and notification procedures when non-construction personnel or developed property may be within range of the noise or vibrations, would not be completed until the final engineering and design phase when geotechnical information is available. When completed, the Blasting Plan will be appended to the Project Plan of Development and made available on the BLM website and/or at the local BLM and Reclamation offices. Blasting would be pre-engineered with each location assessed for apparatus or structures in the vicinity to determine the suitability of that location for blasting. Procedures identified by the construction contractor for conducting such work, as well as applicable Federal and state regulations, would be followed. Explosives would only be used within times and at specified distances from sensitive wildlife or surface waters, as established by the BLM or other Federal and state agencies. Explosive material would be handled only by a licensed, state-approved

[2] Surface soil usually including the organic layer in which plants have most of their roots.

contractor that would have full responsibility for control and use of the material. The material would be transported to and from the Project site on an as needed basis in accordance with Occupational Safety and Health Administration's (OSHA's) regulations for surface transportation of explosives found in 29 Code of Federal Regulations (CFR) 1926.902.

2.5.2 Project Components and Construction

Construction is anticipated to begin after permitting is complete and purchasers of the Project's power are identified, and would take approximately 12 to 18 months. Table 2-1 outlines the construction activities and their anticipated duration.

Table 2-1 Proposed Construction Schedule (Approximate)

Facility	Start	Duration
Road Construction	Week 3	25 weeks
Substation Construction	Week 4	32 weeks
Transmission Line Installation	Week 6	20 weeks
Foundation Construction	Week 7	28 weeks
O&M Building Construction	Week 8	16 weeks
Collection Line Installation	Week 9	22 weeks
Turbine Generator Installation	Week 11	35 weeks
Turbine Commissioning	Week 15	35 weeks
Site Restoration	Week 50	8 weeks

The number of construction personnel on site is expected to range from 90 to 275 (during peak construction). The number and types of trucks needed in various stages of construction are included in Appendix C.

The components of the Wind Farm Site (as described in Table 2-2) would include wind turbines; foundations and pad-mounted transformers; electrical, communication, and distribution systems; interior access roads; substations; a switchyard; and ancillary facilities including an O&M building, temporary laydown/staging areas, mobile batch plants, and temporary and permanent met towers. The exact location of the wind turbines, roads, and transmission and distribution lines would be determined during final design following completion of wind resource data analyses and other environmental studies, including identification of construction constraints and sensitive cultural or natural resources to be avoided. However, proposed locations have been identified with buffers large enough to account for the anticipated minor adjustments in the placement of Project components during final design. The extremities of authorized disturbance areas would be flagged per the Plan of Development, Flagging Plan. Construction of the Project is anticipated to commence in 2012 or early 2013, with generation and delivery of electricity to the grid anticipated by 2013. Ideally, the wind farm would be developed in a single phase. However, depending on the market for the power and the negotiated power purchase agreement, the proposed Project could potentially be developed in phases. Should the Project need to be phased, plans would be coordinated with BLM and/or Reclamation to address treatment of temporary facilities and the reclamation schedule. Once completed, the wind energy facility is planned to operate year round for up to 30 years.

The key components that would comprise the Project are listed Table 2-2, which is followed by more detailed descriptions that are based on the Project Plan of Development (BP Wind Energy 2011) and coordination with the BP Wind Energy Project development team.

Table 2-2 Key Project Components, Quantities and Land Requirements

Components	Quantity and Land Requirement (if Applicable)	Purpose
Temporary Laydown/Staging Areas	Two areas (up to 20 acres per area)	Secure areas for temporary construction offices, construction vehicle parking, and equipment and construction materials storage
Temporary Concrete Batch Plants	Two areas (approximately 10-15 acres of new disturbance)	Facilities for mixing concrete needed in the construction phase
Wind Turbines	Up to 283	Generate power
Foundations and Pad-Mounted Transformers for the Wind Turbines	Up to 283 (foundations range from 50 to 60 feet wide and 8 to 10 feet deep)	Foundations support the turbines and transformers step up the voltage between the turbine and the electrical collection system
Electrical Collection System and Communications	Approximately 100 to 120 miles of 34.5-kilovolt collector lines (within interior roads disturbance area accounted for with roads)	Connect each turbine to the substation and provide for communications between the turbine and substation
Electrical Distribution Substations	Two (approximately 5 acres each)	Step up the voltage of the electrical collection system for delivery through a high-voltage transmission line
Overhead Transmission Line	Approximately 5 miles in length with 8 support structures per mile for 345-kilovolt or 500-kilovolt line	Connect with existing regional transmission line to deliver Project power to purchasing utility
Interconnection Switchyard	One (up to 37 acres)	Interface at the interconnection point between the proposed transmission line and an existing regional transmission line
Mead Substation Transformer Replacement (applicable with a 345-kV interconnection)	Not applicable (within existing Mead Substation)	To provide adequate equipment, the existing 345/230-kV transformer and associated equipment at Mead Substation would be replaced with two new 345/230 transformers and ancillary equipment if the Project is interconnected to the 345-kV transmission line
Operations and Maintenance Building	One (approximately 4 to 5 acres)	Employee facility for operation and maintenance of Project facilities and storage of supplies and maintenance equipment
Access Road	3 miles of access road linking the Wind Farm Site to US 93	Provide primary access to the Wind Farm Site from US 93
Interior Roads	About 106 to 113 miles within the Wind Farm Site	Provide internal access within the Wind Farm Site between facilities (turbines, substation, and operations and maintenance building)
Utility and Communication Lines	About 5 to 10 miles	Provide operational power and communication abilities for on-site facilities
Meteorological Towers	Up to three permanent and up to 10 additional temporary met towers (9 square feet for each tower)	Monitor wind

SOURCE: BP Wind Energy 2011

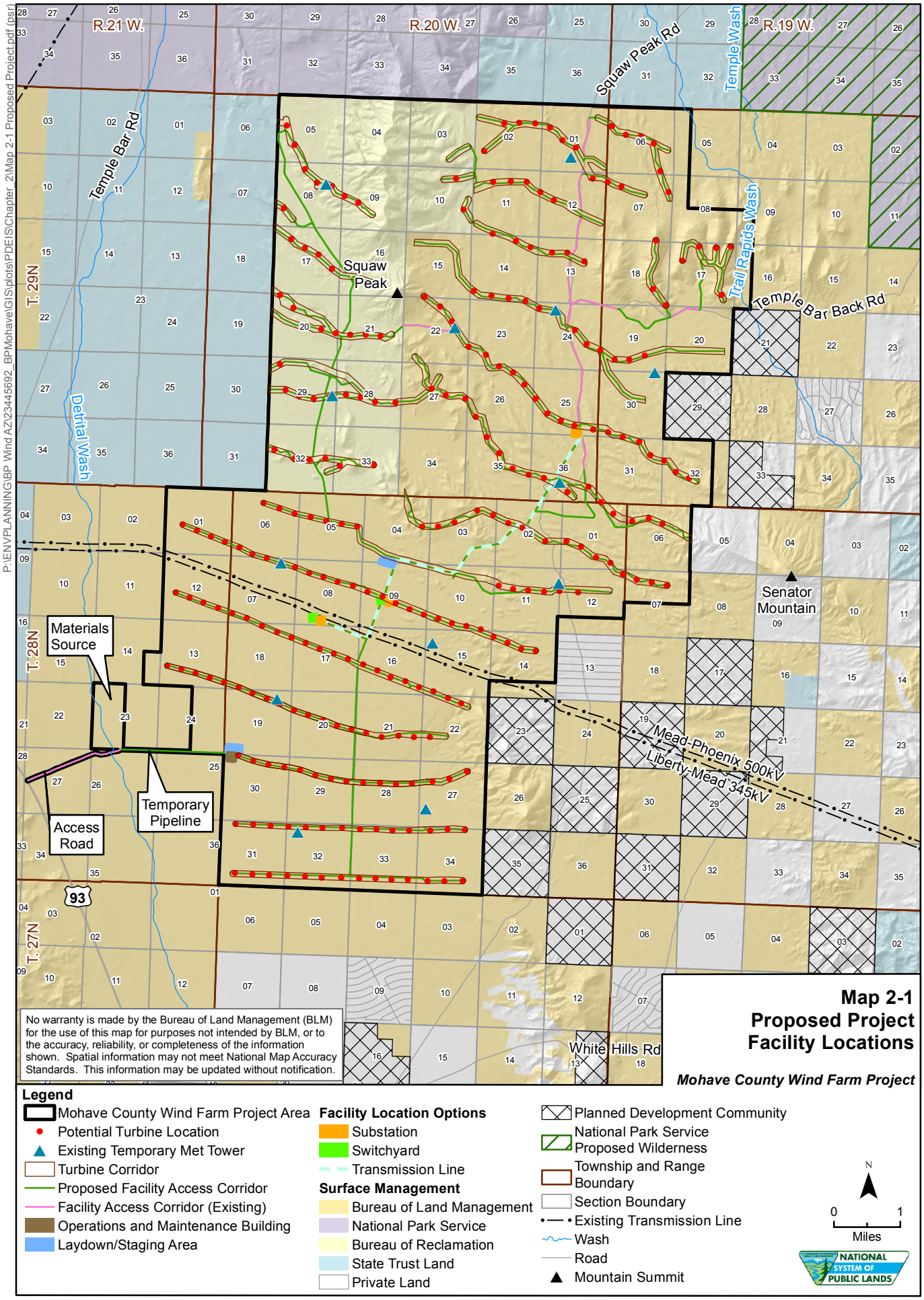
2.5.2.1 Temporary Laydown/Staging Areas

Secure laydown/staging areas (up to 20 acres per area) would be established for temporary construction offices, temporary construction facilities (e.g., portable toilet trailer, portable amenities trailer, and mobile concrete batch plant), and materials/supply storage (e.g., turbine components and fuel for construction equipment). Temporary construction trailers, construction offices, and vehicles may be parked within the boundary limits of the designated secure area or space, including adjacent to the Project laydown site where construction equipment and materials/supplies in transit are temporarily stored, assembled, or processed. The ancillary facilities and Project laydown site would be secured using an 8-foot-tall chain-link fence topped with barbed wire. A typical construction laydown area is shown in Figure 2-1.

Figure 2-1 Typical Construction Laydown Area

The location of the proposed staging areas would be strategically selected in an effort to avoid environmentally and culturally sensitive areas. The temporary construction facilities would be established in areas that are relatively flat, with the primary staging area near the site access point, adjacent to a proposed interior road. This would provide efficient access for materials and equipment being delivered to the staging area for disbursement to the proposed turbine sites. As shown in Map 2-1, two temporary laydown/staging areas have been identified in Township 28 North, Range 20 West with one location in Section 19 and the other straddling the section line between Sections 4 and 9.

Using bulldozers, the laydown/staging areas would be cleared of vegetation and topsoil to a depth of 8 to 12 inches and replaced with small gravel hauled by dual-train gravel hauler from the Materials Source at Detrital Wash Materials Pit (subject to a sales contract with BLM). Topsoil would be salvaged and stockpiled for use in site reclamation.



Map 2-1
Proposed Project Facility Locations

Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

P:\ENV\PLANNING\BP Wind AZ\23445692_BPMohave\GIS\plots\PDEIS\Chapter_2\Map 2-1 Proposed Project.pdf (psr)

All chemicals, fuel, and oil stored within these secured areas would be located in areas that provide for containment of spilled fluids in accordance with the Spill Prevention Control and Countermeasure (SPCC) Plan. Spill response kits containing items such as absorbent pads would be located on equipment and in the on-site temporary storage facilities to respond to accidental spills that may potentially occur. Construction personnel would be trained in spill response, the use of the spill response kits, and notification requirements. A chain-link fence approximately 8 feet in height would temporarily surround an area inside of the main laydown and staging areas to provide security for materials and equipment. If oil or grease is spilled or leaked from equipment, the contaminated soil would be removed and hauled to Silver State Disposal in Clark County, Nevada, which is an approved hazardous material dump. Used oil would be pumped into a truck and hauled to a recycling facility in Las Vegas, Nevada on an as needed basis.

Due to the nature of the material being stored, and activities taking place within the staging areas, stormwater runoff would be collected, conveyed, and/or stored in a manner compliant with industry standard BMPs and in compliance with a required SWPPP. For example, the sites may be graded to prevent runoff from entering natural washes. Following construction, the staging areas would be restored as near as practicable to prior conditions per the Plan of Development and Reclamation Plan. For example, this would include removal of devices used to anchor fences or other features to the ground, replacing gravel with topsoil, recontouring to natural conditions, and seeding the area to re-establish vegetation native to the area.

2.5.2.2 Temporary Concrete Batch Plants

This discussion of the operations associated with the temporary concrete batch plants includes the proposed mineral Materials Source to be used for materials used in the concrete mix, the batch plant facilities, the power source for batch plant operations, and the water source and quantities of water used.

Materials Source and Initial Processing

Source materials for batch plant operations are proposed to be obtained from mining the Materials Source, which is located in Section 23, Township 28 North, Range 21 West, near the proposed access road leading from US 93 to the Wind Farm Site. BP Wind Energy (or the batch plant contractor) would participate in a competitive sale to extract materials from the quarry and would be issued a sales contract if BLM accepts the bid.

The Materials Source (Detrital Wash Materials Pit) is a previously mined and highly disturbed area encompassing approximately 320 acres. Access to the processing and mining area would be via an existing dirt road connected to the primary access road to the Wind Farm Site. A surface disturbance area of approximately 10 to 15 acres may be required, dependent upon aggregate quality, depth, and consistency of the area. Sand and gravel would be mined in a quarry located in the banks and within the channel of the Detrital Wash. It is anticipated that approximately 120,000 to 210,000 cubic yards of material would be extracted with each of the action alternatives. Excavation would be limited to a depth of approximately 8 feet, with 60-foot long tapers[3] left in place at both the upstream and downstream ends of the excavated area. The remaining side slopes within the quarry would be contoured to a 3.5:1 or flatter slope. Mined material would be transported via haul truck to the processing area which would be located outside and above the ordinary high-water mark of the wash. In the processing area, material would be stockpiled and screened. A minor amount of crushing may be required, but the in-situ aggregate is generally the size desired for the Project. Oversized material would be stockpiled and crushed for future uses such as roadway or over-excavation backfill materials. The processing area would be located in an area of the leased site that has previously been used for processing activities.

[3] A convex type shape that narrows toward a point and is used to help control erosion.

Mobile Batch Plant Facilities

Processed material would be transported via haul truck to one of two mobile batch plants, depending on where foundation work is under way. A primary mobile concrete batch plant would be established within the main laydown/staging area during construction to supply high strength concrete for wind turbine foundations and ancillary facility footings/slabs, primarily within the central and southern portions of the Wind Farm Site. A second mobile batch plant would be established in the northern part of the Wind Farm Site to reduce the haul time to foundations constructed in the northern part of the site. Each concrete batch plant would require a flat area of up to 2 acres.

Temporary concrete batch plant facilities typically consist of loading bays, hoppers and mixing equipment, cement and admixture silos, concrete truck loading areas, aboveground water storage tanks, and bins for aggregate and clean sand storage. Figure 2-2 shows a typical batch plant facility. The height and color of the batch plant equipment would vary depending on the equipment ultimately selected. Generally, facilities would have heights ranging from 30 to 50 feet. A washout area would be located within the 20-acre laydown/staging area, with the concrete removed or covered by at least 3 feet of soil when the washout area is no longer needed. More typically, there also would be limited washout at each turbine location within defined limits of disturbance for the turbines (excavated foundation areas) and covered by as much as 8 to 10 feet of soil as part of the turbine foundation backfilling process. Specific locations and use of the washout areas would comply with provisions in the SWPPP.

Figure 2-2 Typical Temporary Concrete Batch Plant

Power Source and Equipment

Electrical power for the batch plants would be supplied by a distribution line to the site or by diesel generator. The proposed power source for the primary batch plant would be via a tap on an existing UniSource Energy line with a distribution line installed to extend from the tap, along the west side of US 93, on existing power poles, crossing US 93 (either underground or above ground), and then along the primary access road to the Wind Farm Site. Power for the secondary batch plant farther north within the Wind Farm Site would include the temporary use of a 500- to 750-kilowatt diesel generator and use number 2 fuel. The fuel would be stored in a 500-gallon on-site tank. Typical daily fuel usage for the

generator would range from 150 to 250 gallons. Containment to prevent/control potential spills would be in accordance with the SPCC Plan. Generator noise production varies by the model used, but should be less than 105 A-weighted decibels (dBA) (as measured at a distance of about 23 feet from the generator). A backup generator may be necessary, but it would only be put in operation if the primary generator is not functioning.

Production Needs

It is estimated that approximately 120,000 to 210,000 cubic yards of aggregate would be required for the turbine pad foundations, building foundations, and gravel for road surfaces. Aggregate and water are planned to be obtained from within the Wind Farm Site. Assuming eight aggregate and two water trucks are needed per day over a 26-week period, of a 5-day work week, 1,300 round trips would be required for aggregate and water trucks. The concrete would be mixed and hydrated at the batching plant, and concrete mixer trucks would make only one round trip per day. Approximately 10 concrete mixer trucks per day would be required to haul a full load of mixed concrete, and assuming a 26-week construction schedule, 1,300 round trips would be required for concrete delivery (see Appendix C for more details on vehicle trips and cumulative volumes of materials). The gravel and sand would be stored in bins located within the unloading/storage area, adjacent to the mixing plant. Cement and admixture materials would be stored in silos adjacent to the mixing plant, which would also provide protection from the weather. The storage facilities would not be moved during the course of construction; cement containers would be replaced or refilled as they are used. It is estimated that aggregate mining operations would continue for approximately 6 months during the 12- to 18-month Project construction period.

Each mobile batch plant would be capable of producing approximately 800 cubic yards of concrete per day, although the two batch plants may not be operated simultaneously. A total of approximately 180 tons of cement, 360 tons of sand, 810 tons of aggregate, and 25,000 gallons of water would be needed per day while mixing concrete at peak production (5 days per week for approximately 25 weeks) (Barr 2011). The batch plant would also require up to 1,500 gallons per hour to support operations such as truck washing and hydrating aggregate prior to mixing. These additional uses could consume between 3,000 and 15,000 gallons of water per day (assuming a maximum 10-hour work day); thus, it is expected that average daily water use at the batch plant would range from 28,000 to 40,000 gallons. Based on the 40,000-gallon daily water use estimate, cumulative water use to support the batch plant may be as much as 5.0 million gallons (15.3 acre-feet) over the life of the plant. It is anticipated that an additional 100,000 gallons of water would be needed per day, 5 days a week, for 39 weeks for dust control. This equates to a total usage of 19.5 million gallons of water, or 59.8 acre-feet. Combined water use for the batch plant and dust suppression would therefore reach approximately 75.2 acre-feet during construction.

Water Source

Water for dust control, batching water for concrete production, and other washing needs, would be obtained from three existing production wells at the Materials Source production site. Table 2-3 provides the capacity of the wells and expected use of the well water.

Table 2-3 Well Capacity and Anticipated Water Use for the Project

Well Capacity		Water Required for Construction of the Project			
		Activity	GPD	Weekly Requirement (5-day Work Week)	Total – 39* Weeks
Well 1 GPM	1,000	Dust control	100,000	500,000	19,500,000
Well 2 GPM	400	Cement Production	25,000	125,000	4,875,000
Well 3 GPM (not expected to be needed)	200	Truck washing, hydrating aggregate	15,000	75,000	2,925,000
Total GPD	2,304,000		140,000		
Total GPW (5 day work week)	115,200,000			700,000	
Total 39* weeks (5 day work week)	449,280,000				27,300,000

GPM – Gallons per minute
GPD – Gallons per day
GPW – Gallons per week
*39 weeks was used as maximum time for both dust control and cement production (rather than anticipated 25-week duration) to present a worst case scenario.

The wells owned by BLM near the Materials Source along Detrital Wash are permitted for industrial withdrawals. One of these wells, registration number 531378, has a permitted pumping rate of 60 gallons per minute. This well alone would be able to meet most of BP Wind Energy's construction water needs. Any water demands in addition to what well 531378 can supply would be met using the other industrial water supply wells permitted to BLM at the Materials Source. Water for production would be pumped from the wells, and a valve meter would be installed at each well to maintain overall usage during the course of mining activities. Water would be used for concrete production in the mobile batch plant. Water would be piped to the primary batch plant location near the primary access road. Surface-laid polypipe is typically used for this type of temporary water pipeline. Water would be transported via water trucks to the batch plant established in the northern portion of the Wind Farm Site.

Two clay-lined ponds, each approximately 5 feet deep and with a surface area of 60 feet by 60 feet, would be located at the Materials Source processing site, with each pond having a 100,000 gallon holding capacity. The ponds would be used for storage and recycling of wash water, and used to contain the fine particles washed from the sand. Also, during peak usage, water may be stored in the ponds. When the Materials Source is no longer in use, the ponds would be reclaimed to prior existing conditions to the extent possible.

Aboveground storage tanks would temporarily store the water needed at the northern concrete batch plant. The dimensions and capacity of the water storage tanks would be determined based on the equipment available to the batch plant provider. However, typical tank sizes are 10,000 to 20,000 gallons each, 15 feet tall, and 12 feet in diameter. It is anticipated that storage capacity for approximately 50,000 gallons would be required on site. Post-construction water needs would be minimal and primarily limited to the water used by fewer than 40 operations and maintenance personnel for drinking water, washing, and keeping the office space within the O&M building clean. These water needs are addressed in Section 2.5.2.9.

2.5.2.3 Wind Turbines

As shown in Figure 2-3, a wind turbine consists of three main components: (1) nacelle, (2) tower, and (3) rotor blades. The nacelle houses the generator and gearbox and supports the rotor and blades at the hub. The turbine tower supports and provides access to the nacelle. The turbine hubs would be between 262 feet (79 meters) and 295 feet (90 meters) above the ground depending on the turbine selected. The rotor diameter likely would be between 253 feet (77 meters) and 387 feet (118 meters). Therefore, each turbine would have a rotor "swept area" of 50,300 square feet to 117,600 square feet. At the top of their arc, the blades could be up to 492 feet (150 meters) above the ground.

BP Wind Energy may select turbines in the 1.5 to 3.0 MW range; these turbines may have slightly different hub heights and/or rotor diameters. Using a larger number of smaller MW turbines or a smaller number of larger MW turbines would not change the corridors in which the turbines are located, but it would affect the amount of space between turbines. The turbine size would not be expected to notably change the long-term or temporary ground disturbance for the project; a 1.5-MW turbine would be expected to result in about 1.85 acres of temporary ground disturbance per turbine but would require 283 turbines for the proposed Project footprint (approximately 524 acres total disturbance) compared with needing 167 3.0-MW turbines with approximately 2.5 acres of temporary ground disturbance per turbine (approximately 418 acres of total disturbance). Table 2-4 lists the characteristics of representative turbines of each of the respective size classes.

Figure 2-3 Wind Turbine Schematic

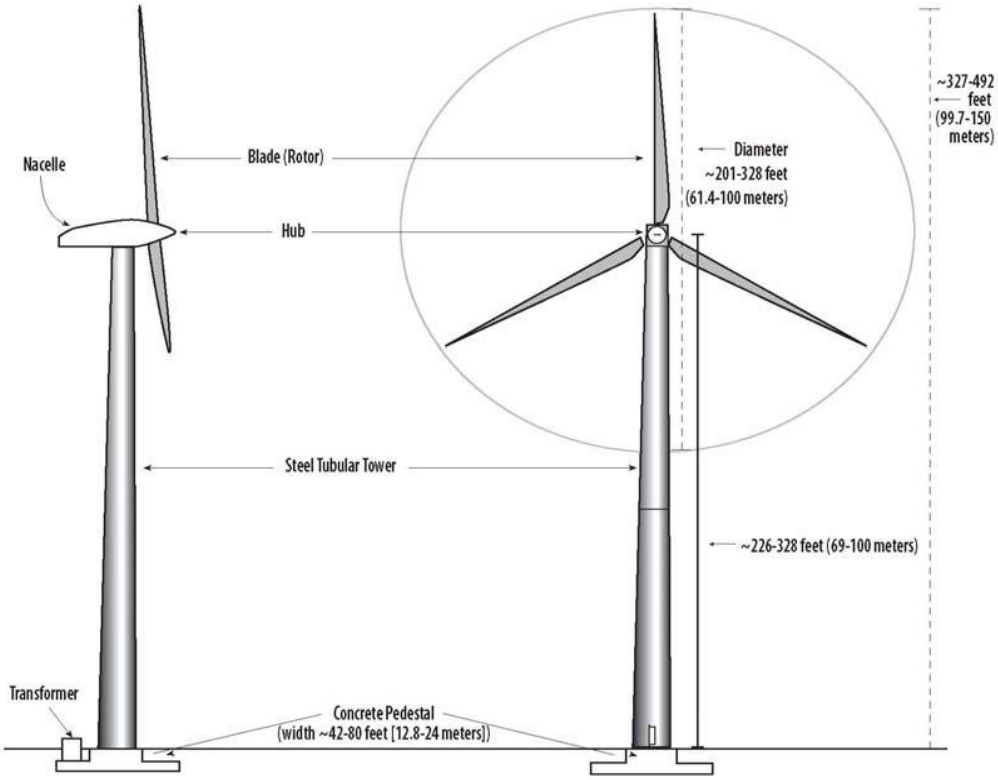


Table 2-4 Characteristics of Representative Turbine Types

Characteristic	Turbine			
	GE 1.5 MW	Vestas 1.8 MW	Vestas 3.0 MW	Siemens 2.3 MW
Nameplate capacity	1,500 kW	1,800 kW	3,000 kW	2,300 kW
Hub height	262 ft (80 m)	262 to 312 ft (80 to 95 m)	262 to 345 ft (80 to 105 m)	295 ft (90 m)
Rotor Diameter	256 ft (78 m)	328 ft (100 m)	295 ft (90 m)	371 ft (113 m)
Total height[1]	390 ft (119 m)	423 to 472 ft (129 to 144 m)	410 to 492 ft (125 to 150 m)	481 ft (146.5 m)
Cut-in wind speed[2]	6.7 mph (3 m/s)	8.9 mph (4 m/s)	8.9 mph (4 m/s)	8.9 mph (4 m/s)
Rated capacity wind speed[3]	26.4 mph (11.8 m/s)	26.8 mph (12 m/s)	33.6 mph (15 m/s)	26.8 mph (12/m/s)
Cut-out wind speed[4]	55 mph (25 m/s)	44.7 mph (20 m/s)	55 mph (25 m/s)	55 mph (25 m/s)
Maximum sustained wind speed[5]	Over 100 mph (45 m/s)	95 mph (42.5 m/s)	Over 95 mph (42.5 m/s)	95 mph (42.5 m/s)
Rotor speed	10.1 to 20.4 rpm	9.3 to 16.6 rpm	9.9 to 18.4 rpm	6 to 13 rpm

[1]Total height = the total turbine height from the ground to the tip of the blade in an upright position
[2]Cut-in wind speed = wind speed at which turbine begins operation
[3]Rated capacity wind speed = wind speed at which turbine reaches its rated capacity
[4]Cut-out wind speed = wind speed above which turbine shuts down operation
[5]Maximum sustained wind speed = wind speed up to which turbine is designed to withstand
kW = kilowatts
m = meters
mph = miles per hour
m/s = meters per second
rpm = revolutions per minute
SOURCES: Bureau of Land Management 2008c, BP Wind Energy 2011

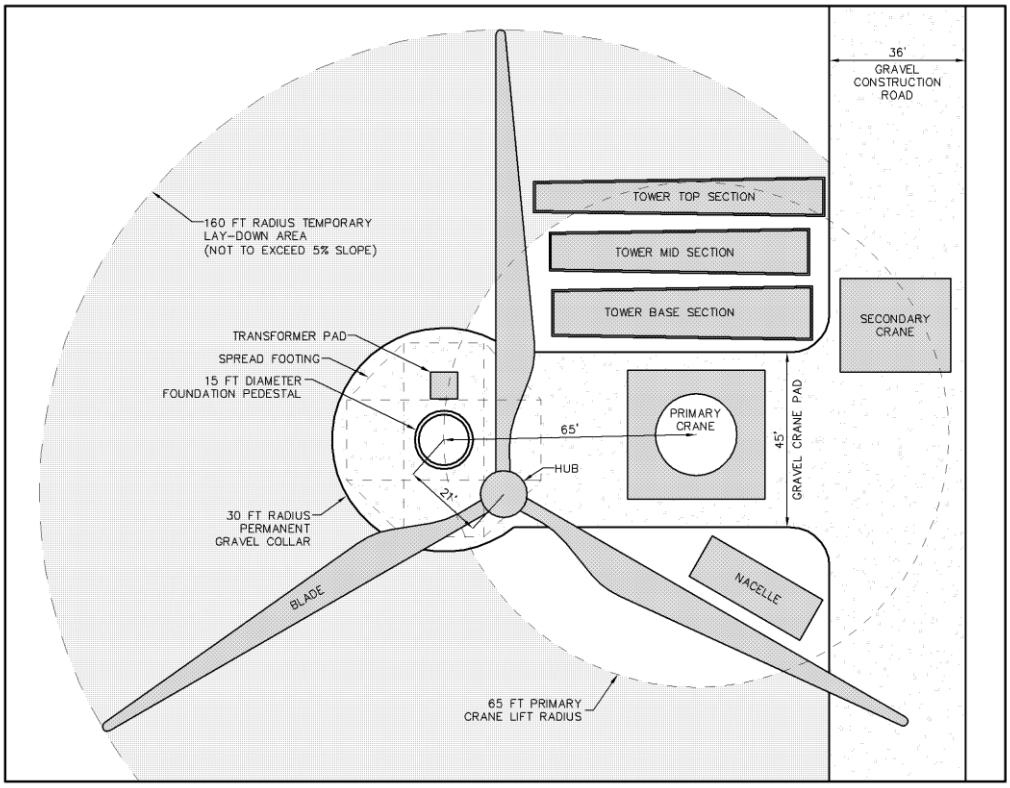
Turbine types are not selected until shortly before construction begins. In part, the additional data collected through met towers provides a better understanding of the wind resource and the type of turbine that may be best suited to the site. However, the primary reason is that the availability of turbine types varies and not all manufacturers have the ability to provide the machines at a specified time. Some turbines being considered include the 1.8 MW Vestas turbine currently being manufactured in the vicinity of Denver, Colorado, and the 2.3 MW Siemens Turbine currently being manufactured in Hutchinson, Kansas, but other turbines may be selected as well.

The tower components for the wind turbines would be delivered by truck to the site in three or four parts, depending on the wind turbine selected. Each turbine would require approximately 7 to 16 truckloads to deliver equipment and construction materials. Whenever possible, the delivery of turbine components would be scheduled so that they can be directly installed at each location, reducing the need for intermediate storage on site. When the trucks arrive at each site, the assist crane would remove the cargo and position it according to the predetermined lay-down configuration. Each turbine site would have a plan for the arrangement of major components before erection. Figure 2-4 provides an example of the construction layout for component staging and assembly. The typical temporary disturbance area for staging and assembly of the wind turbine is about 1.85 to 2.5 acres, with an area of about 0.065 acre per turbine of permanent disturbance for the life of the project. Site preparation and pre-construction activities are addressed in Section 2.5.1.

Wind turbines are positioned about three rotor widths (about 1,000 feet) apart from one another and each row of turbines is about 10 rotor diameters from the next row (about 0.5 mile) so that the wind energy can reconstitute to maximum power after passing through each row of turbines. For safety reasons, no turbine on public land would be positioned closer than 1.5 times the total height of the wind turbine to the ROW boundary. Based on the proposed range of total turbine heights, this equates to a safety setback of 585 to 738 feet from the ROW boundary. There are also setbacks that would be applicable if the Project were being built adjacent to an existing wind farm; in general, the BLM Wind Energy Policy (IM 2009-043)

would require that no turbine be positioned closer than five rotor-diameters from the center of the wind turbine to the ROW boundary. However, this setback rule would not apply to this Project because there are no wind farms adjacent to the application area.

Figure 2-4 Wind Turbine Generator Component Staging and Assembly



The wind turbines are equipped with sensors that monitor wind speed and direction. While the turbine blades may spin freely in low wind speeds, the turbine generators produce electricity when the wind reaches a pre-determined wind speed that can sustain the rotational movement. The turbines rotate to face the prevailing wind to maximize energy production. At around 30 mph, the turbines reach their maximum power output, which is between 1.5 to 3.0 MW, depending on the final turbine selection. In stronger winds, the turbines start to pitch out of the wind (which means the turbine blades may shift in rotation to capture less energy or what is known as “feathering”) and at a pre-determined cut-out wind speed, the turbines shut down to limit the amount of stresses on the turbine.

Each wind turbine generator contains approximately 50 gallons of glycol-water mix, 85 gallons of hydraulic oil, and 105 gallons of lubricating oil located in the nacelle. Leak detection and containment systems have been engineered into the design of the wind turbine generators and are addressed in the SPCC Plan. As a result, potential for accidental spills resulting from malfunction or breach of the generators is low.

Each wind turbine also contains a safety system that ensures automatic shutdown of the turbine in the event of any mechanical disorders, excessive vibration, grid electrical faults, or loss of grid power. If grid electrical faults or loss of grid power occurs, the turbines would automatically be brought back to service when the disorder has been remedied. For mechanical disorders, the turbines would remain shut down until the cause of the disorder has been identified and resolved by the Project O&M team. Additionally, the construction of each turbine base would include a buried copper cable grounding mat to discharge

electric energy into the earth when the wind turbine builds up an electrical charge through turbine operation, by being struck by lightning, or by equipment malfunction.

Because the turbines would exceed heights of 200 feet above ground level, the turbines would be marked or lighted per Federal Aviation Administration (FAA) Guidelines (FAA 2007). This would possibly entail placing red strobe lights on the nacelle of selected turbines to adequately warn aircraft pilots of the obstructions at night.

When turbines are painted bright white or light off-white, FAA night-time lighting requirements include the use of red, simultaneously flashing lights positioned on the outer perimeter of the wind turbine farm, each spaced no more than 0.5 statute mile from each other. The FAA determines which turbines would require nighttime lights, but it is anticipated that about half of the turbines would be marked by red strobe lights, particularly the turbines closest to the Project boundary or on high terrain.

When turbines are painted a color other than the industry standard of white or light off-white FAA requires that 100 percent of turbines within a wind farm be equipped with daytime white strobe lights, Daytime illumination would not be required for white or light off-white turbines (Patterson 2005).

The intensity of the nighttime flashing red lights is approximately 2,000 candelas (a measure of the intensity of light—roughly equivalent to a 1,666-watt bulb) and they flash about 22 times per minute with a flash duration between 100 and 2000 milliseconds. The lighting would be similar in appearance to a series of cell phone towers. The lights are designed to flash in unison and to concentrate the beam in the horizontal plane, thus minimizing light diffusion down to the ground.

Although turbines used in commercial, utility-scale wind farms are typically white or light off-white, they may be color treated to blend more effectively with the environmental setting. In rare cases, turbines are painted colors other than white or light off-white in order to contrast with the setting to call attention to potential safety hazards.

The FAA-required night-time lighting requirements would not change based on the turbine color. However, to comply with the FAA's aircraft safety lighting requirements, all turbines that are not white or light off-white (such as shadow gray, which is an option being considered for this Project) also would be marked with lights that flash white at 20,000 candela (roughly equivalent to a 16,666-watt bulb) during the day. Daytime white lights would have a flash rate of 60 flashes per minute with a flash duration of less than 10 milliseconds.

2.5.2.4 Foundations and Pad Mounted Transformers

The wind turbine base foundation anchors the turbine structure securely to the ground due to its size, weight, and configuration. The most common foundation design used for wind turbine installations within the United States is the mat foundation, which is proposed for this Project. A mat foundation is generally an octagon shape with dimensions ranging from 50 to 60 feet wide and 8 to 10 feet deep. A concrete pier on the top of the mat extends to the ground level. Foundations would be designed for ease of removal during decommissioning. Typically, the amount of soil material excavated for a mat foundation ranges between 655 to 1,045 cubic yards; the excavated soil is not all waste material because some of the soil is used to backfill over the concrete foundation. The amount of concrete material needed to construct a typical foundation is approximately 375 cubic yards, but could be as much as 600 cubic yards depending on the turbine selection (refer to Section 2.5.2.2 for more on the temporary concrete batch plant). Rebar is used for structural support with about two to three truckloads of steel (20 to 35 tons) used per turbine site.

Figure 2-5 shows a turbine foundation under construction. After the concrete has cured for about 30 days, the excavated soil is backfilled so that only the concrete pier on top of the mat remains visible. Topsoil would be reserved for rehabilitation and other excess soil from construction activities would be used where needed to achieve an appropriate grade for roads, to supplement the existing sub-base of roads, and/or to blend the road into the surroundings grades by widening curves and improving road prisms[4], as appropriate.

Figure 2-5 Typical Pouring of Turbine Foundation

Power from the turbines would be fed through insulated electric cables (meeting state/Federal standards) and a breaker panel at the turbine base inside the tower would be interconnected to a pad-mounted step-up transformer (see Figure 2-6). This 34.5-kV transformer is approximately 6 feet long by 6 feet wide and 6 feet high, and is placed adjacent to the concrete pier of each new turbine foundation to step up the voltage from the wind turbine (typically around 690 volts) to a capacity of 34.5 kV direct current, which is the voltage carried on the electrical collection system. The transformer foundation would be an approximately 6 foot-by-6-foot concrete pad placed over compacted soil or granular material. Each pad-mounted transformer would contain approximately 500 gallons of mineral oil used to cool the electrical components located within the box. Leak detection and containment systems have been engineered into the design of these transformers. As a result, potential for accidental spills resulting from malfunction or breach of the transformers is low, as addressed in the SPCC Plan.

[4] The area of the ground containing the road surface, cut slope, and fill slope.

Figure 2-6 Typical Pad-Mounted Transformer

2.5.2.5 Electrical Collection System and Communications

A power collection system would collect the energy generated by each wind turbine (increased in voltage through the pad-mounted transformer) and transmit the power to an electrical substation via 34.5-kV electric cables. Three cables, one for each electrical phase, plus a communication and ground cable would be buried in a trench in a manner that minimizes disturbance by putting the trench within the temporary interior road area that is wide enough to handle the large transport vehicles hauling turbine components and the cranes used to assemble the turbines. Using a back-hoe, the trench would be dug 3 or more feet deep and approximately 2 feet wide (see Figure 2-7). In some locations, particularly near the substation, multiple sets of cables could be installed in a joint trench to consolidate the cables from multiple corridors of turbines.

As part of the Plan of Development, trenching plans would be developed in cooperation with BLM and Reclamation, with input from appropriate regulatory agencies, to minimize the environmental effects that may occur with open trenches. This may include timing trenching to avoid leaving trenches open when heavy precipitation is anticipated, using wooden planks to establish wildlife escape ramps, and inspecting trenches left open overnight for animals that need to be removed prior to backfilling.

Figure 2-7 Typical Trench for Electrical Collection Cables

While collector lines connecting turbines within a row would typically be placed underground, the collector lines leading to the substation may be constructed aboveground on wood poles or tower structures to span terrain and environmentally and culturally sensitive areas (see Figure 2-8). When used, aboveground 34.5-kV wooden monopole or tower structures would generally be approximately 35 feet tall, direct embedded in the ground without concrete footings, and support three wires (one for each electrical phase) although it is possible that there would be two circuits (six wires) on one set of poles/towers, plus a fiber optical ground wire line at the top of the structure. The poles would span about 250 feet and generally resemble a power distribution line. The aboveground facilities would be built to Avian Power Line Interaction Committee standards to minimize potential impacts to raptors and other birds. If collector lines are placed aboveground, physical ground disturbance would generally be limited to the pole installation site where an auger would be used to dig the hole for the support structure, although vegetation clearing would be required for access to the pole sites. Structures would be grounded by installing grounding rods.

A Supervisory Control and Data Acquisition (SCADA) system would network underground fiber optic cables within the Wind Farm Site to allow for remote control monitoring of the turbines and communication between the wind turbines and the substation. The network of cables would be buried in the same trenches as the electrical collection system cables to minimize the impact to the environment. BP Wind Energy maintains a 24-hour-per-day, 7-days-per-week Remote Operations Center in Houston, Texas where each of the turbines and ancillary equipment can be monitored for faults, in addition to the monitoring available at the O&M building that would be staffed during business hours. All authorized personnel would be able to remotely operate the turbines.

Figure 2-8 Typical Structures for Aboveground Collector Lines

2.5.2.6 Electrical Distribution Substations

The energy generated by the turbines would be delivered via the electrical collector system to two new substations (either 345-kV or 500-kV), where transformers would further increase the voltage so that generated power can be transmitted via a high-voltage transmission line to the grid (see Figure 2-9). The single transmission line would connect the two substations and then would tie into the interconnection switchyard. The proposed switchyard is further discussed in Section 2.5.2.7.

Figure 2-9 Typical Substation

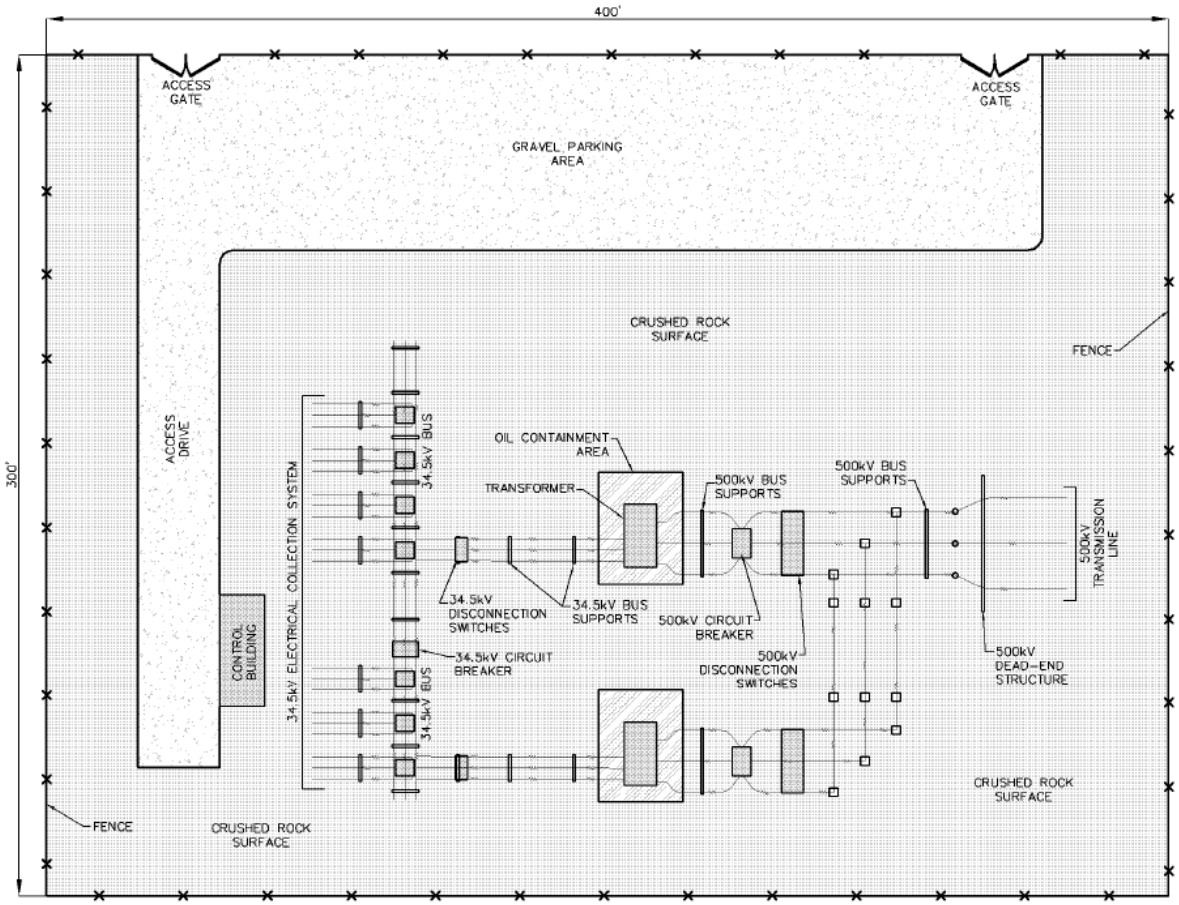
The locations of the proposed substations would be strategically selected in an effort to avoid environmentally and culturally sensitive areas. The facilities would be established in areas that are relatively flat, near the site access point, adjacent to a proposed interior road, and central to the proposed turbine sites. As shown in Map 2-1, one proposed substation location is in Section 25, Township 29 North, Range 20 West. The second substation is proposed to be located near the switchyard. One switchyard location has been identified for each transmission line being considered. If a 345kV switchyard is built, the location would be in Section 8 of Township 28 North, Range 20 West. If a 500kV switchyard is built, the location would be in Section 9 of Township 28 North, Range 20 West. Two

locations are proposed for the Switchyard because the two transmission lines are in parallel ROWs and the Switchyard should be located such that BP Wind Energy can avoid crossing one line to get to the other as a point of interconnection. Accordingly, a Switchyard site has been selected on both the north side and south side of the parallel lines.

Substation components (such as the buswork, transformers, breakers, control building, etc.) would typically have a maximum of height of around 35 feet with conductive components having uncovered, nonspecular[5] metal surfaces. The lightning protection masts (and potentially shield wires) would have heights closer to 75 feet. In addition, the slack span of the transmission line entering the substations would gradually rise to the height of the transmission line.

The two oil-filled transformers (see Figure 2-10) in the substations would each contain approximately 12,000 gallons of mineral oil for cooling and have a specifically designed containment system to minimize the risk of accidental fluid leak and discharges to the environment, as addressed in the SPCC Plan. No polychlorinated biphenyls (PCBs) would be used in transformers on this project.

Figure 2-10 Typical Substation Facility Layout



[5] Specular is the mirror-like reflection of light from a surface, in which light from a single incoming direction is reflected into a single outgoing direction. A nonspecular surface would diffuse the reflected light.

Site preparation for the substations is addressed in Section 2.5.1 and would be limited to approximately 5 acres per substation, include a copper grounding grid laid below grade in trenches around the substation site to protect equipment and personnel in the case of electrical malfunction or lightning strike. The grounding grid is typically at a depth of about 2 feet; it may be located deeper, but would not be at depths of more than 5 feet below ground level. The substation facilities would be graveled with approximately 500 cubic yards of crushed rock, and include a parking area. A small control building painted a neutral color with muted tones to blend with the environment would be located within the substation sites for electrical metering equipment. The substations would be surrounded by an 8-foot-high chain-link fence capped with three strands of barbed wire for security (see Section 2.5.2.11). The approximate dimensions of the fenced areas are anticipated to be 300 feet by 400 feet, although up to 5 acres for each substation site could be fenced.

Project limits of the substations and switchyard would be staked and flagged in accordance with the flagging plans (identified in the Plan of Development) to limit the area of disturbance. Following vegetation salvaging, staking, clearing, and removing and stockpiling the top 4 inches of available top soil material of the substation site, soil erosion control measures (which may include grading to avoid steep slopes, check dams, diversion dikes, silt fences, straw or hay bales, minimizing disturbance by staking the construction area, etc.) would be implemented in accordance with the required SWPPP. Both the substations and the switchyard at the interconnection point (discussed in Section 2.5.2.7) would be graded flat and compacted as needed to allow uniformity in foundation elevations and structure heights. Site work would include using a backhoe to excavate for foundations and dig trenches for below-grade conduit and other features, installing the grounding mat, and pouring foundations and slabs using concrete hauled from the batch plant. Foundation depths for the control building and equipment within the substation would vary based on the requirements of the detailed design, but trenches dug for the foundations of major equipment would typically be in the range of 5 to 8 feet deep. Foundations would be designed for ease of removal during decommissioning. Vertical steel support structures would be erected and electrical equipment would be installed. General components would include power transformers, circuit breakers, switchgear, voltage regulators, capacitors, air switches, arresters, and various monitoring instruments/equipment. Finally, the perimeter fence and the final layer of crushed rock surfacing would be installed, possibly with an underlayment to help prevent weeds. If needed, substation and switchyard maintenance to control weeds may include cultural, physical, biological, and/or chemical control methods, as approved by the BLM, and in accordance with the Weed Management Plan.

2.5.2.7 Overhead Transmission Line and Interconnection Switchyard

An overhead transmission line would carry the power from substation to substation to a switchyard where the power is transferred to the electrical power grid. The switchyard facility would be a graveled and fenced area up to 37 acres, with a parking area and electrical devices such as circuit breakers and air switches. Because switchyards do not change system voltage from one level to another, they do not have transformers on site; therefore, there is no risk of a leaking transformer. A relatively short microwave tower within the switchyard would provide communications to an existing line-of-site microwave tower located miles away. The telecommunications line to the O&M building would be extended to the switchyard to provide a redundant means of communication with the switchyard. System studies would determine the appropriate location for the interconnection with an existing transmission lines. The transmission line would be the same voltage as the power line to which it interconnects (that is, either 345-kV or 500-kV).

The structures proposed for the majority of the transmission line would be 345-kV or 500-kV steel or concrete monopole structures that are of a color suitable for the environment. The structures would be approximately 115 to 150 feet tall and span approximately 800 to 1,000 feet (see Figure 2-11 for typical overhead transmission line structure examples). The depth and diameter of holes dug for the transmission

poles foundations would depend on factors determined during detailed engineering, including geotechnical conditions and soil bearing capacity, but for this voltage would typically be about 20 feet in depth and about 3 feet in diameter. Excess soil material would be scattered in the area around the structures/poles. The poles generally would support three conductor phases and a ground wire.

Figure 2-11 Typical Overhead Transmission Line Structures

A 150- to 250-foot-wide corridor is generally required along the entire length of the transmission line route for structure installation and stringing purposes. However, due to the characteristically low-growing plant species present, vegetation clearance for the proposed transmission line would be minimal, along approved profiles, and removed in accordance with approved BLM guidelines. It is anticipated vegetation would be removed only for the access to the transmission line corridor and for a small areas around transmission line structure sites. Decisions regarding the quantity and height of the vegetation that needs to be removed would be in accordance with approved Plan of Development guidelines and a surveyor would stake the clearance limits in accordance with the Plan of Development flagging plans to help ensure the vegetation removal is minimized to that required for safe construction.

A 20-foot-wide road would be established along the entire length of the proposed transmission line for access. Construction access would consist of an at-grade road that would be restored to reduce the road to a 10-foot width for permanent operation and maintenance of the line upon completion of transmission line construction. Existing roads would be utilized when available to reduce potential impacts associated with the construction of a new road.

Materials and other components for the transmission line would be transported to the Project Area via tractor and semi-trailer and would be staged and assembled (if necessary) at the Project's main laydown/staging area. At the commencement of construction, material and components would be transported, as needed, from the staging area to the construction site. Foundations would be excavated by means of excavating equipment, and may require blasting to loosen the earth and rock. Excavated material would be crushed and used as backfill with excess fill spread around the site. The foundations may include a 20- to 30-foot steel rebar cage with mounting plate and anchor bolts that would be placed in the augured hole and backfilled with concrete transported from one of the temporary batch plants to the construction sites via truck. Transmission line poles would be lifted into place using a telescoping boom crane onto the cured foundations and bolted down with pneumatic wrenches. A grounding crew would

follow behind the pole assembly and erection crew installing the transmission line pole ground rods. Ground resistance would be measured; if the proper ground resistance is not initially achieved, additional ground rods would be installed until the acceptable ground resistance is obtained. Following placement of the poles, a guide wire would be used to string the conductors between the poles. The conductor line, which is approximately 1.0- to 1.5-inches in diameter and nonspecular to minimize reflections, is generally strung in sections (from point of intersection to point of intersection) and then tensioned at those same locations. For stringing a line of this type, most of the work would likely be done using truck mounted equipment; however, the contractor may elect to use helicopters for portions or all of the work.

Until all system studies are completed and negotiations for a power purchase agreement are further advanced to know which transmission line would best serve the power purchaser, the precise location of the interconnection switchyard cannot be determined. However, the general locations that are being studied for the switchyard are included on the maps in this chapter. One switchyard location has been identified for each transmission line being considered. If a 345kV switchyard is built, the location would be in Section 8 of Township 28 North, Range 20 West. If a 500kV switchyard is built, the location would be in Section 9 of Township 28 North, Range 20 West. Construction of the switchyard would generally be as described above for the substation, although the switchyard would not contain transformers so foundations could be less robust and oil spill protection features would not be required. The size of the switchyard would depend on whether the interconnection is to a 345-kV or 500-kV transmission line. The switchyard for a 345-kV interconnection would require approximately 12 acres for construction with the finished switchyard within an approximately 600-foot by 600-foot fenced area. The switchyard for a 500-kV interconnection would require about 37 acres for construction with the finished switchyard within an approximately 900-foot by 1500-foot fenced area. The length of transmission line to the switchyard would depend on the switchyard location, but would range from about 650 feet to 6 miles.

2.5.2.8 Transformer Replacement at Mead Substation

Depending upon the interconnection option selected, power system upgrades could be required. Under Western's Tariff, if interconnection requests result in the need for system upgrades to accommodate the additional power, the interconnecting party needs to finance any required upgrades. If the 345-kV interconnection is pursued, power system impact studies show that the additional power from Project generation would, under certain conditions, overload the existing 345/230 kV transformer at the Mead end of the Liberty-Mead 345-kV transmission line.

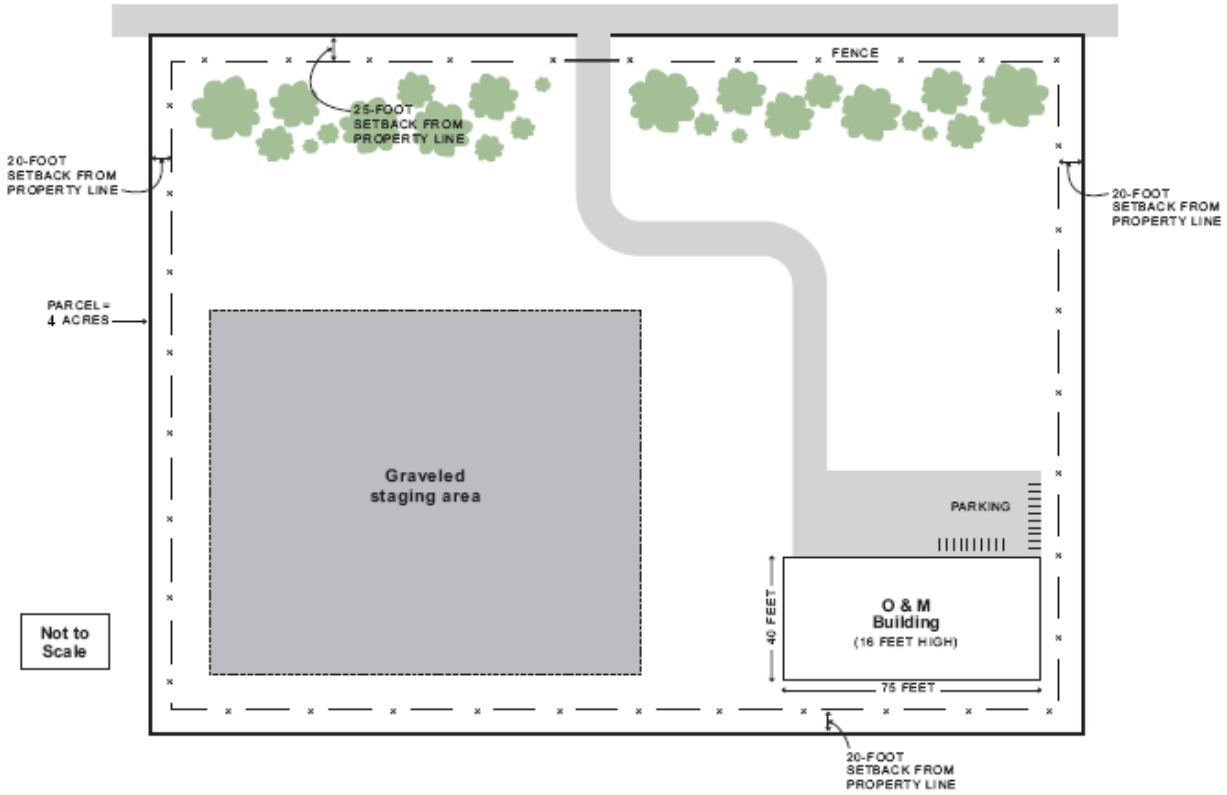
To resolve this overloading issue and maintain system reliability, Western would replace the existing transformer and its associated breakers and switches with two new 345/230-kV transformers and new breakers and switches. This work would all be accomplished within Western's existing Mead Substation located in the El Dorado Valley about three miles south of Boulder City, Nevada. Mead Substation is a relatively large Western substation originally constructed by Reclamation in 1967 and expanded several times since that date. The facility was transferred to Western in 1977 when the Department of Energy was created. The work would be confined to the previously developed and disturbed area within substation; no additional area would need to be disturbed. Existing concrete foundations and/or pads may need to be removed, and new ones constructed. The substation is an industrial area that has been graded and covered with a layer of aggregate, and is kept vegetation free. Mead Substation already contains equipment similar to what would be replaced and added, and a large number of transmission lines enter and exit the facility.

Western would operate and maintain the new transformer and related equipment as it currently does the existing equipment. Should the proposed project be decommissioned, the equipment at Mead Substation would be kept in service as part of the normal operation of the Liberty-Mead transmission line and the rest of the power system.

2.5.2.9 Operations and Maintenance Building

The O&M building would be used to store equipment and supplies required for operations and maintenance of the wind farm, house control functions such as the SCADA used to provide two-way communication with each wind turbine, and provide a facility where O&M personnel can prepare documentation of work done on wind farm facilities. The O&M building would be located within an approximately 4- to 5-acre fenced area that also includes a graveled parking lot (see Figure 2-12).

Figure 2-12 Typical O&M Facility Layout



The O&M building would be a composite panel steel building, approximately 60-feet by 100-feet in size and approximately 16-feet high, with the roof and side panels painted a color to blend with the environment. The telecommunications and electrical services for the O&M building would be from local providers, or electrical power possibly could be supported by a rooftop solar system and battery backup. If the proposed distribution line to support batch plant operations is established, the power would be extended to the O&M building for the operations and maintenance stage. Telecommunication and/or data lines would be installed on the distribution line support structures to the O&M building unless BLM prefers that communication lines be buried. External lighting would be minimal with downward directed lighting. The surrounding chain-link fence would be 8 feet high and topped with barbed wire (refer to Section 2.5.2.12); a roll-away gate within the fence would be operated by O&M personnel.

A well, comparable in capacity and design to a residential well (typically 10- to 15-gallons per minute), would be drilled to provide potable water to the O&M building for domestic water supplies. The depth of the well is difficult to forecast; while the well may be as deep as 1,200 feet, this depth is not anticipated. All necessary entitlements and permits would be acquired prior to construction and permit requirements would be followed during construction. The desired capacity of the well would be to deliver up to 5,000 gallons per day, but a lesser capacity would be adequate because actual water use during operations

is expected to be about 100 gallons per day (or 36,500 gallons per year, and 912,500 gallons over the life of the project). If water use were as much as 5,000 gallons per day (a typically limit for residential wells), this conservative amount would equate to a maximum of up to 1.825 million gallons of water per year, and 45.625 million gallons over the life of the project. Pending any other guidance from BLM, after decommissioning the Project, the well would be capped below ground level, with the ground above the cap refilled.

Similarly, a septic system comparable in capacity and design to a residential system would be installed for the O&M building in accordance with applicable permits.

Limited quantities of lubricants, cleaners, and detergents would be stored near and within the O&M building, including a minimum of two 55-gallon drums of oil for continuing maintenance of the wind turbines. Waste fluids would be stored in accordance with applicable regulations at the O&M building for short periods of time during Project operations. BMPs incorporated into the design of the O&M facility, including containment areas and warning signs, would minimize the risk of accidental spill or release of hazardous materials at the facility. No risk to health and safety or the environment is anticipated. No fuel would be stored on site, as described in the SPCC Plan.

During morning briefings and at various times during the day, approximately 30 employees could be using the O&M building. The O&M building would be staffed during typical business hours, although there may be occasions when employees would work on weekends as well. Because turbines can be operated from the Remote Operations Center in Houston, Texas, there is no need to have personnel on site 24 hours per day.

Site preparation for the O&M building would include surveying, staking, clearing, and grading, as described in Section 2.5.1. Excess excavated soils would be used as fill for roads or other related project needs. The drainage plan would be designed in accordance with BMPs and the required SWPPP. An approximately 1- to 3-foot-wide concrete-filled trench would provide a foundation for the 60-foot by 100-foot composite panel building, and beams would be put in place to form the floor. The panel building would be erected on the foundation. Telecommunications and electrical lines would also be connected to the building.

The O&M building would be located near the location where the primary access road enters the Wind Farm Site along the Section 19/20 line in Township 28 North, Range 20 West.

2.5.2.10 Access Roads

As shown in Map 2-1, access to the Wind Farm Site from US 93 is an extension of a road leading to the Materials Source along Detrital Wash, which was used during road construction along US 93 (located approximately 6.5 miles northwest of White Hills Road). The distance from US 93 to the Wind Farm Site would be about 3 miles. This primary access route would be upgraded to be 30- to 40-feet wide (plus a drainage area on each side) to accommodate the oversized vehicles for equipment and the cranes needed for construction. Improvements to US 93 (such as a turn lane or widened shoulders) that may be required would be coordinated with the Arizona Department of Transportation (ADOT) and developed in accordance with the department's permitting process.

Interior roads within the Wind Farm Site would consist of both new roads and upgrades to existing 2-track roads. Interior roads for access within the Wind Farm Site would have a construction-phase width of 36 feet with allowances to accommodate corners and grade changes. Approximately 80 to 84 miles of new road would be constructed and approximately 8 miles of existing roads would be improved on BLM-administered public lands, and approximately 17 to 21 miles of new roads would be constructed on

Reclamation-administered lands. Interior roads would connect the wind turbines, substations, switchyard, and O&M facility.

During construction, the temporary disturbance width for the roads would generally be 36 feet, but could be up to 56 feet. This includes the 36-foot-wide construction-phase road (16-foot wide road with 10-foot wide shoulders) and up to 10 additional feet on both sides of the road being cleared or graded where needed to accommodate corners, grade changes, and drainage. Site preparation and pre-construction activities are addressed in Section 2.5.1. The limits of new and improved roads would be marked by flagging or survey stakes to prevent unnecessary disturbance, as addressed in the Plan of Development Flagging Plan. Existing resource roads would be utilized as much as possible, in an effort to reduce potential impacts associated with the construction of a new road.

Road specifications would be determined during final engineering design. Each turbine manufacturer has different road design requirements that address design elements such as maximum grade and minimal turning radius at corners. Once a turbine manufacturer is selected, the Transportation Plan, Appendix C – Transportation and Traffic Plan (transportation plan) would be modified to describe the transport of large equipment, considering the specific object sizes, weights, origin, destination, and unique handling requirements. The transportation plan also would include traffic control measures (such as informational signs, flaggers when equipment may result in blocked throughways, and the use of traffic cones) to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. The transportation plan, as well as engineering design and plan sheets for the roadways (in the Site and Grading Plan), would be submitted to BLM and Reclamation for approval before the agencies issue a notice to proceed with construction. The transportation plan also would be submitted to ADOT for review and approval. A field review with proposed routes marked with lath and flagging, as described in the Plan of Development, would be completed to help ensure roadway design does not compromise the safety of the traveling public or sensitive environmental and cultural resources.

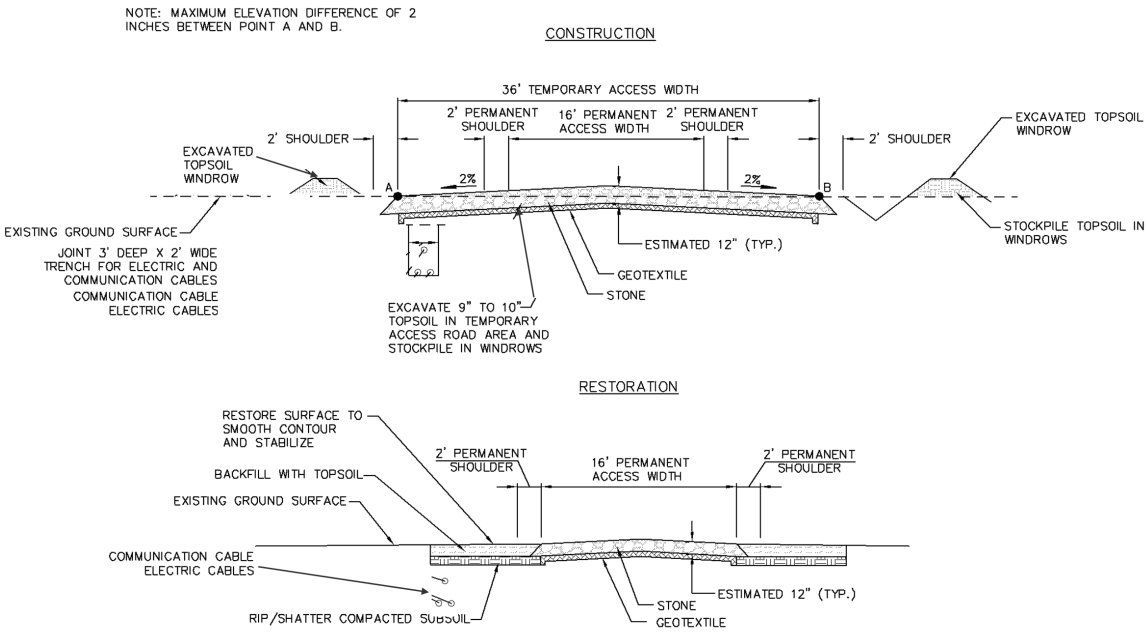
Temporary construction roads would generally consist of 12 to 18 inches of gravel base over compacted native sub-base material. A geogrid or geotextile material may be used in areas of poor subgrade soils as soil reinforcement and/or to reduce the gravel base thickness requirement.

Along the proposed roadway path, the highpoints would be pushed into the low points to minimize overall cut and fill required. This is needed to establish roads with an appropriate grade (typically not exceeding 9 percent, but certain roads could be steeper if within BLM construction standards) for transporting the equipment within the Project Area. Crossings at low spots or drainage courses would be at-grade with no culverts or extensive fill, unless needed due to threat of a wash out. Any material used to upgrade roads would be compacted to 80 percent or greater as required for soil stability using a typical roller to a compaction proof roll of 25 ton axle weight. Intersections between the main access road through the Project Area and the access to the rows of turbines would be widened to provide a turning radius of 130 to 150 feet to allow trucks and tractor semi-trailers to maneuver into and out of the construction area.

During site operations, roads would be inspected monthly and after heavy rain fall. Periodic grading and placement of gravel would potentially be required to maintain road quality. To minimize airborne dust, road maintenance would be scheduled during times of low or no wind, and would be suspended when wind speeds exceed 22 mph, based on available meteorological data. A third-party compliance inspector would coordinate with BLM and/or Reclamation to review maintenance activities occurring onsite, and to halt those activities should non-compliance be observed. Speed limits of 25 mph would be posted and required of all operation and maintenance personnel and enforced by site management to minimize airborne dust and erosion of roads. In general, water would be used to control dust, but palliatives that are pre-approved by BLM and/or Reclamation may be used in high traffic or controlled areas.

As discussed in Section 2.5.3 regarding post-construction activities, following the completion of wind turbine construction, the construction road width of 36 feet would be reduced to a 16-foot service road with 2-foot shoulders on either side for a total width of 20 feet (see Figure 2-13). These 20-foot-wide corridors would represent the long-term disturbance for new interior roads in the Project site with the temporary disturbance for construction access extending to 8 feet on either side of the permanent road shoulders. Permanent turnaround areas, encompassing approximately 2 acres each for a 200-foot-wide turnaround of 30 feet in width, would be positioned at the end of each turbine row.

Figure 2-13 Typical Access Road Cross Sections



A 20-foot-wide road for construction also would be established to allow access along the length of the proposed transmission line. This access would consist of an at-grade road that would be restored, in accordance with BMPs, to reduce the road to a 10-foot width for permanent operation and maintenance of the line upon completion of transmission line construction.

2.5.2.11 Meteorological Towers

Thirteen temporary meteorological wind monitoring towers (met towers, see Figure 2-14) equipped with sensors to measure wind speed and direction, temperature, and pressure have been constructed within the Project Area boundary to collect data to determine the wind resources available at the site (see Map 2-1 for existing and proposed met tower locations). Wind data have been recorded at various heights up to 197 feet on the temporary meteorological towers. SODAR (SOnic Detection And Ranging), a meteorological instrument used to measure the scattering of sound waves by atmospheric turbulence, has been deployed on site. SODAR systems measure wind speed at various heights above the ground, and the thermodynamic structure of the lower layer of the atmosphere. Separate NEPA documentation was prepared prior to the construction of the temporary met towers and installation of the SODAR unit. To verify production performance of the selected turbine, power curve testing (to graph how much power—in watts or kilowatts—a wind turbine will produce at any given wind speed) may be necessary, which would require the construction of an additional 10 temporary met towers. The met towers used for power curve testing may be installed as early as 3 to 6 months prior to construction. These temporary met towers

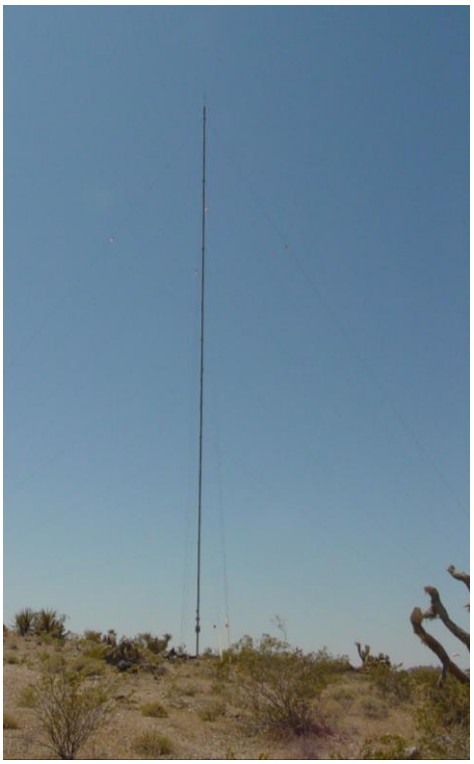
would be approximately 262 to 295 feet in height and have a guy-wire system for support; the BLM would require avian species diverters on the met towers guy-wire system. Wind data would be collected up to the turbine hub height on these met towers. The towers would temporarily require up to 1.6 acres (per tower) for installation and placement of the guying system, and leave no permanent disturbance. Most met towers used for power curve testing would be expected to be within the turbine corridors and accessible by the Project's interior roads, but there is the potential need for placing a met tower outside of a corridor, which would require new access. The access routes would be approximately 10 feet wide to accommodate a four-wheel-drive vehicle to access the site for installation and monitoring of the installed equipment. Access roads would be sited to minimize disturbance and, to the extent possible, would utilize existing tracks and roads. If outside the previously approved corridors or disturbance areas, additional biological and cultural clearances would be required to secure additional approval from BLM and/or Reclamation. The temporary towers for power curve testing would be designed and constructed in a manner consistent with industry standards, and approved under an amendment to the ROW applications filed with BLM and Reclamation.

The met tower structures are gray, and made of light-weight, galvanized steel tubing that slides together without bolts or clamps. The tubes are made from a combination of 10-, 5-, and 0.5-foot sections. Each tower would be transported in three pieces and assembled on site. The sections would be assembled horizontally on the ground and then tilted up using a ginpole and winch; no fencing, utilities, welding, cranes, concrete work (including permanent foundations), grading, or road building would be required.

The met towers rest on a 3-foot by 3-foot steel base plate. The total occupied area would be approximately 9 square feet for each tower. Land requirements include a 20-foot permanent radius for monitoring and repair and a 150-foot radius temporary work area. Towers would be installed over a 5-day period by a crew of four to six people using a four-wheel-drive vehicle. Access to each met tower would be via an approximately 10-foot-wide cross-country access route from the nearest existing road. Existing four-wheel-drive tracks or roads would be used when available. Access for maintenance and repairs would be provided by four-wheel-drive truck or foot. Temporary met towers, except for those required for the purpose of power performance testing, would typically be removed just prior to starting construction on the turbine foundations. Temporary met towers required for power performance testing would be removed within 12 months following commercial operation of the Project. Ground disturbance from temporary met towers located in areas that are not disturbed by turbine construction or other Project elements would be reclaimed after the towers were removed.

Two to three permanent met towers would be constructed within the Project Area to remain throughout the life of the Project. While specific locations for the permanent met towers would be sited during final design, it is anticipated that they would be placed within turbine corridors, likely near the perimeter of the Project. These un-guyed (i.e., no stability wire) lattice structures would be approximately 279 feet tall (or at least as tall as the hub height of the turbines selected to be installed), designed in a manner consistent with industry standards, and appear similar to a radio tower (see Figure 2-14). Wind data would be collected up to the turbine hub height on these permanent meteorological towers. The sloped lattice of the structures would make it difficult for birds to perch on these towers. The permanent met towers would require a red strobe light for nighttime marking, which is required by FAA because they would be more than 200 feet tall. The permanent met towers would be used to monitor wind resources and to document the capacity of wind power that could be generated.

Figure 2-14 Temporary and Permanent Meteorological Towers



2.5.2.12 Other Construction Considerations

Construction Waste

Clearing and disposing of trash, debris, and shrub/scrub on those portions of the site where construction would occur would be performed at the end of each work day through all stages of construction unless held for later use in reclamation. Existing vegetation is sparse in most locations, and clearing would be performed only where necessary. Excavations made by clearing activities would be backfilled as soon as practical (e.g., after cable infrastructure is tested or when turbine foundations have cured) with compacted earth/aggregate available on site. Disposal of non-hazardous cuttings and debris would be in an approved facility designed to handle such waste or at the direction of the BLM/Reclamation-authorized officer, which may include using vegetative cuttings as mulch in the Project Area during the reclamation phase. Site cleanup would be performed on a continuous basis.

Traffic

The number of construction personnel on site is expected to range from 90 to 275 (during peak construction). Construction traffic is expected to usually be around 120 trips[6] per day into and out of the site, and peak at approximately 190 trips per day during the construction period (based on 140 construction personnel vehicles leaving and entering the Project site and 50 delivery trucks entering and leaving). This is likely to be the maximum amount of trips and would only occur for no more than three to six months. Personal vehicles of construction personnel would be parked at the main staging area for the site. From this point, interior roads for construction access would be used only by delivery trucks

[6] One trip is defined as a round trip (that is a vehicle exiting the last public roadway, US 93, entering into the project site, and then returning back to the public roadway).

and on-site construction vehicles; employee personal vehicles would not be driven throughout the Project site. Vehicles would be required to operate within the speed limit of 25 mph.

Construction traffic would be predominantly during weekdays, but some weekend and evening work may be required during peak construction periods. Most work done at night would be to take advantage of lower wind conditions or cooler temperatures.

Site Security

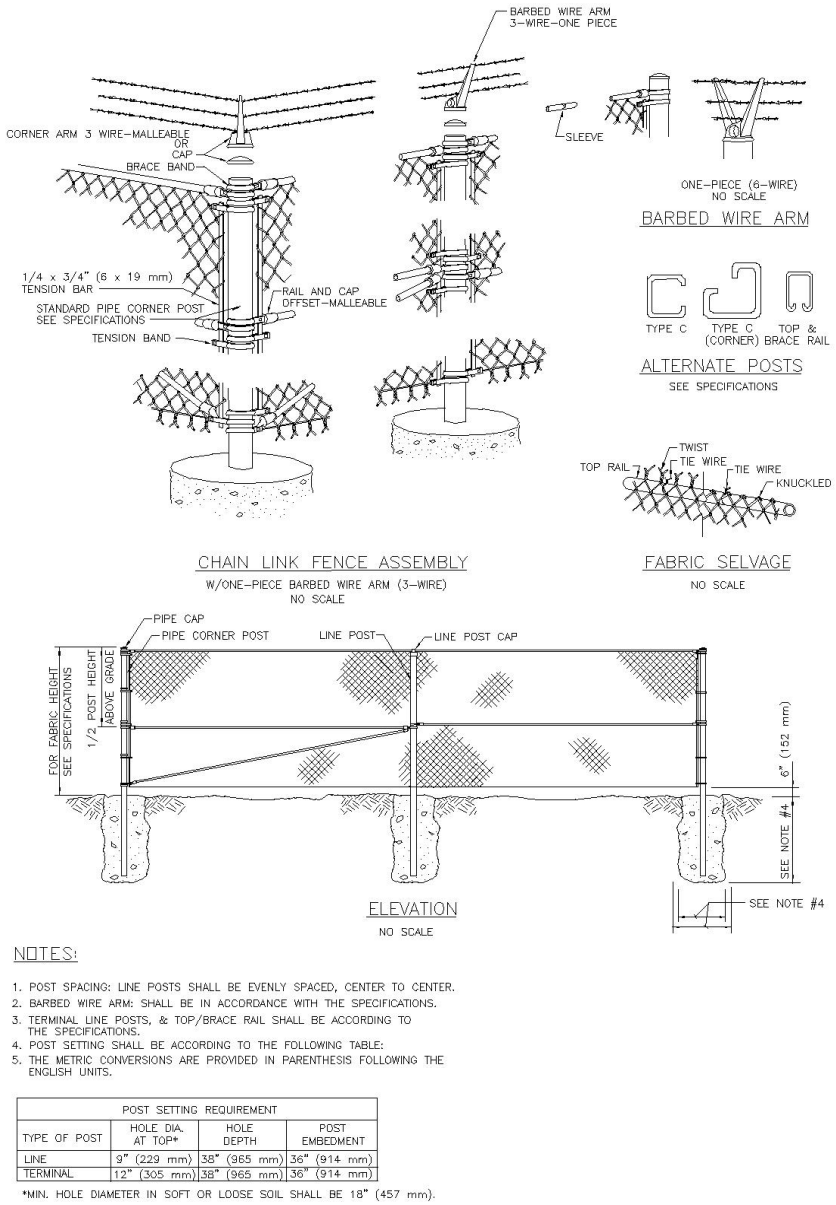
The HSSE Plan would be developed prior to the construction stage of the Project to address health and safety risks and requirements. As the Project moves into the operational stage, the components of the HSSE Plan would be modified to adapt to O&M activities.

BP Wind Energy would post safety and warning signs informing the public of construction activities where the road(s) enters the Project Area from a public road. During construction, access to the site would be monitored and controlled, so as to prevent public access during such times when it would not be safe for public on-road or off-road use within the Project Area. During non-construction hours a security guard would patrol the Project Area to prevent or minimize the threat of unauthorized dumping via use of the new roads, vandalism, theft of property, and incidents that could affect public health and safety. Within the Project Area recreational off-road vehicle use would be restricted during construction. Recreational off-road vehicle use outside of construction areas is likely to remain unchanged from the present situation, except for restrictions at the substation, switchyard, and O&M building, and during maintenance activities if safety considerations require temporary restriction(s).

Gates to chain link fenced areas, including the substations, switchyard, select lay down yards, and O&M area, would remain open during construction hours in working areas and would be locked at night or during non-construction hours. Gates or cattle guards would be installed where openings are needed within fences, and the road may also be physically gated during non-construction hours. During non-construction hours, gates would be closed and a security guard would patrol the site area. Temporary warning fences or barricades (consisting of warning tape, barricades, plastic mesh, and/or warning signs) would be erected in areas where public safety risks could exist and where site personnel would not be available to control public access (such as excavated foundation holes and electrical collection system trenches). Fences would be installed around laydown areas, areas deemed hazardous, or areas where security or theft are of concern, and would be removed at the completion of the construction period. BP Wind Energy would coordinate the fencing activities and locations with the BLM and/or Reclamation, as appropriate. A permanent chain-link fence would be installed around the Project O&M building, substations, and switchyard for safety. Temporary fencing around unfinished turbine bases would be designed to warn people of the potential danger. Excavations would be fenced with high visibility plastic mesh.

As illustrated in Figure 2-15, permanent fences would generally be chain-link fence, treated to minimize reflections off the metal, 8 feet in height, and topped with barbed wire where appropriate for safety and security. An auger would be used to dig 9- to 12-inch-diameter holes to a depth of about 38 inches for fence posts with the dirt excavated from the hole used to backfill the hole and secure the fence post (see post installation notes on Figure 2-15).

Figure 2-15 Fencing Diagram



NOTES:

1. POST SPACING: LINE POSTS SHALL BE EVENLY SPACED, CENTER TO CENTER.
2. BARBED WIRE ARM: SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
3. TERMINAL LINE POSTS, & TOP/BRACE RAIL SHALL BE ACCORDING TO THE SPECIFICATIONS.
4. POST SETTING SHALL BE ACCORDING TO THE FOLLOWING TABLE:
5. THE METRIC CONVERSIONS ARE PROVIDED IN PARENTHESIS FOLLOWING THE ENGLISH UNITS.

POST SETTING REQUIREMENT			
TYPE OF POST	HOLE DIA. AT TOP*	HOLE DEPTH	POST EMBEDMENT
LINE	9" (229 mm)	38" (965 mm)	36" (914 mm)
TERMINAL	12" (305 mm)	38" (965 mm)	36" (914 mm)

*MIN. HOLE DIAMETER IN SOFT OR LOOSE SOIL SHALL BE 18" (457 mm).

2.5.3 Post-Construction

A Reclamation Plan, would be developed and would include general restoration procedures and monitoring and reporting procedures, including two years of post-construction monitoring for bird and bat fatality. Temporarily disturbed areas would be returned to original conditions, to the extent feasible. Trash and construction debris would be removed and properly disposed of off-site in appropriate landfills. Vegetative cuttings may be properly disposed of off-site or used as mulch in the Project Area during the reclamation phase. An appropriate weed-free seed mixture suitable for the arid desert environment would be identified in the Reclamation Plan. Healthy native plants salvaged during the clearing activities would be transplanted to disturbed areas in accordance with the Reclamation Plan. To the extent feasible, this would include transplanting salvaged plants directly into earlier phases of construction that are ready for reclamation efforts. Fill material used around foundations or roads would be compacted to 80 percent or

greater as required for soil stability. No soil stability problems are anticipated from the Project construction.

Temporary facilities (such as the batch plant and laydown/staging areas) would be removed as soon as practical following construction and the sites where these features were located would be reclaimed. Post-construction activities to assist with the reclamation and revegetation of the construction work areas would be completed within one year of completing construction of the Project and would include:

- Re-grade site to pre-construction contours. After foundations are poured and concrete cures to engineered strength (approximately 30 days), soils moved from foundation areas would be replaced. Excess fill (excluding removed topsoil) would be packed around foundation bases or elsewhere in the Project, such as fill material for interior roads to increase elevations and widen corners.
- Strip and segregate vegetation and topsoil where grading would occur to conserve the existing seedbank. Natural vegetation shall be cleared or trimmed only when necessary to provide suitable access for construction, and O&M of the proposed wind farm facility. Where vegetation needs to be trimmed and/or removed for construction, but not for actual operations, it may be clipped or sheared at ground level to help facilitate resprouting.
- Store cut vegetation at the edge of the construction work areas, and respread during or after final grading to provide a mulch to trap seeds, shade seedlings, and conserve water for the revegetation of the construction work area.
- Redistribute topsoil evenly across the surface of the construction work area after construction is complete.
- Loosen soil surfaces that have become encrusted or compacted during construction, as determined necessary and practical to encourage plant growth and prepare the seed bed by providing soil amendments, if needed.
- Imprint disturbed soils with equipment that would create indentations to catch seeds and water, aiding in the natural revegetation of the construction work area.

During reclamation of temporary road beds, aggregate materials would be removed and transported offsite for the separation of salvageable material. Once the aggregate base is removed, the ground would be decompacted and restored to pre-existing conditions and contours. The remaining 16-foot-wide on-site service roads would be regraded smooth with low spots and ruts filled in with the reusable gravel base material.

Restoration procedures would be followed per the Reclamation Plan proposed by BP Wind Energy and approved by BLM and Reclamation. A restoration punch-list would be developed to encompass the various Project restoration requirements from the NEPA process and Project permitting requirements. Construction activities would not be deemed complete until the regulatory agencies with jurisdiction over the Project have acknowledged that the restoration activities have been adequately implemented and desired results have been achieved.

2.5.4 Operation and Maintenance

2.5.4.1 Final Testing

The functionality of the wind turbines and safety systems would be tested to ensure they operate in accordance with the manufacturer's specification before the turbines are commissioned for operation. After the 345-kV or 500-kV overhead transmission line is installed and interconnected with the turbines'

34.5-kV system, these components of the Project would be energized by closing the breaker to allow voltage/electricity onto the line or portion of facility. Energization would start at the point of interconnection and eventually be energized all the way to the turbines. In general, the transmission line would be energized, then the substations, then the collection system, then the pad mounted transformers at each turbine, and then finally the turbines. At each stage testing would be performed to ensure the equipment has been installed correctly. When all systems have been tested and are operating properly, the Project would be commissioned for commercial operation and sale of energy.

2.5.4.2 Site Operation and Maintenance Procedures

Because wind farm facilities are comprised of many individual wind turbine generators, O&M activities would not affect the entire wind farm's operation. Annual maintenance would be conducted on a turbine-by-turbine basis and would not affect performance of the wind farm.

BP Wind Energy also would schedule annual maintenance for the wind farm during the season with the lowest expected wind resource (typically summer) in order to minimize impacts on the performance of the facility.

The operational staff would maintain the turbines, including routine maintenance, long-term maintenance, and emergency work. In all cases, the facility staff would be responsible for arranging needed repairs either through internal resources or with the aid of additional contractor support.

Routine wind turbine maintenance and service would occur every six months commencing after the first six months that the Project is in service. This includes the following activities:

- Hydraulic pressure checks
- Accumulators' nitrogen recharge
- Oil level checks on all operating parts
- Visual checks for leaks
- Grease all bearings on moving parts
- Check all bolt torques
- General clean-up within the wind turbine
- Perform any additional modifications/replacements needed

The oil in the gearbox is normally changed every 18 months or after lab analysis of the lube oil indicates that the oil must be changed. Routine maintenance is generally completed by climbing the tower using the internal ladder and doing the work with normal hand tools and electrical testing equipment.

Long-term maintenance may include replacement/rebuilding and cleaning larger components such as generators and gearboxes, testing electrical components, and refurbishing blades. Emergency work also may be required as the result of a system or component failure. Certain unplanned work such as blade repairs or repairs to other large components may require the use of a crane to complete the work. If necessary, a crane would be brought in on trucks and assembled at the turbine site such that the permanent 16-foot wide road (20-foot wide with shoulders/ditches) would be sufficient for site access, and the 10-foot wide shoulders would not need to be reinstalled.

BP Wind Energy and its contractors would demonstrate due diligence and timeliness in the repair, replacement, or removal of inoperative turbines.

During the Project operations period, roads would be specifically inspected for erosion, blockage of culverts, and damaged cattle guards twice annually; identified problems would be addressed to correct the concern. In addition, road conditions would be inspected after heavy rain fall. Roads would be inspected monthly and periodic grading or replacement of gravel may be required to maintain road quality. Road maintenance would be scheduled when wind speeds are less than 22 mph to minimize airborne dust. To limit airborne dust and the erosion of roads, speed limits of 25 mph would be posted and required of all O&M personnel. Because roads used in operations and maintenance would be graveled, traffic would be very limited, and speed limits would be low, the need for dust suppression is not anticipated. During the operation phase of the project, public access to the Project site would be monitored at certain access points to provide for the safety of the public in and around the operating equipment.

Long-term dispersed recreational use throughout the Project Area would continue to be allowed. Off-road vehicle use and recreational access to the Project Area is likely to remain unchanged from the present situation, except for restrictions at the substation, switchyard, and O&M building, which will be areas located outside roadways. Public access in the Project Area may be temporarily restricted during maintenance activities on roads or facilities, when warranted for public safety reasons. Access also may be restricted (i.e., closed to public vehicle travel), upon approval by BLM and/or Reclamation, in areas where reclamation efforts have been undertaken and public access into those areas would diminish the reclamation efforts.

The transmission line ROW would be cleared, as needed, to ensure that vegetation does not come within the safe operating distance of the transmission line. Given the vegetation in the area, this clearing work would likely occur rarely during the life of the Project. Substation and switchyard maintenance may include an underlayment, physical or biological methods, or treating crushed rock surfaces with herbicides to control weeds, if approved by the BLM and/or Reclamation. In general, unless there are un-planned events, maintenance would only consist of routine services that would require only normal access to the Project site.

2.5.5 Decommissioning

The Project is anticipated to have a lifetime of up to 30 years after which it may no longer be cost effective to continue operations. The Project would be decommissioned, and the existing equipment removed. At that time, a Decommissioning Plan would be provided to BLM and Reclamation for review and approval, and would address the procedures described in this section.

The goal of Project decommissioning is to remove the installed power generation equipment and return the site to a condition as close to a pre-construction state as feasible. The major activities required for the decommissioning are as follows:

- Remove wind turbines and met towers
- Remove electrical system
- Structural foundations would be removed in accordance with a BLM- and/or Reclamation-approved decommissioning plan
- Remove roads not desired for other purposes
- Re-grade and recontour the disturbed area
- Revegetate

The most noticeable decommissioning activity to the public would be the removal of the wind turbines and met towers. The disassembly and removal of this equipment, including the large components that make up a wind turbine, would essentially be the reverse order of the installation activities. The rotor (hub and blades) as well as the met towers would be removed from the top down with the help of a smaller crane. Once the turbine rotors have been removed and disassembled into loose parts, it would be placed directly onto a truck bed and taken off the site. This approach would limit the need for clearing an area around the turbine base to just enough area to set down the rotor.

BLM and Reclamation would be consulted at the time of decommissioning to determine if it is desired to remove the cables buried between each turbine, or leave them in place. Removal of the cables would likely cause some environmental impact that would need to be mitigated, but leaving them in place could impact future uses of the site. If it is decided that the cables should be removed, an appropriate technique in use at the time of decommissioning would be used. This potentially may include opening the trench to pull the cables out or using a mechanical device to cut the cables and pull the cables from beneath the soils. Trenches to access the cable would then be filled with native soil, compacted, and revegetated.

Once the Project and transmission line are de-energized, the substations, steel structures, and control building would be disassembled and removed from the site along with all foundations and other concrete features. Unless Western identifies an alternate use for the switchyard, it would be deenergized and decommissioned as well. The fence and fence posts would be removed. The gravel placed at Project facilities would be removed and replaced with native rock, if surface rock is prevalent in the immediate area. BLM and Reclamation would be consulted to determine if the buried substation grounding grid should be removed or left in place. Assuming the transmission line no longer serves a purpose for the site, it would be disassembled and removed with the foundations. The tower structures would then be disassembled and removed. The areas around the poles, including interior roads for access, would be reclaimed to the satisfaction of BLM and/or Reclamation.

The O&M building would be removed.

Foundations of the wind turbines, met towers, substation components, and transmission line structures would be removed in accordance with a BLM- and/or Reclamation-approved decommissioning plan. Fully removing the wind turbine foundations would require major excavation/disturbance at each tower site, as well as additional truck haul-away traffic. This could contribute to environmental impacts to native plants and wildlife, as well as a potential temporary reduction in air quality resulting from additional dust and truck emissions. Because the foundations are composed of non-leaching/natural elements that should not present a hazard to the environment and because of the extent of excavation required to remove deep foundations, removal of the sections of the foundations below 36 inches from the ground surface would cause greater environmental impacts than leaving them in place. Therefore, it is proposed that these portions of the foundations would not be removed. Shallow foundations, like that for the O&M building and substation/switchyard components, would be removed in their entirety. All concrete and steel debris would be removed from the site. Voids left by the removed concrete foundations would be filled with native material and restored to original grade.

To facilitate the various uses for the property, BLM and Reclamation may choose to leave the roads in place. If the roads are retained, maintenance of the roads would become the responsibility of BLM and/or Reclamation. Improvements to the access road that extend into the US 93 ROW would be coordinated with ADOT to determine if the improvements should be retained or reclaimed. When the necessary equipment and materials have been removed from an area and the road to that area is no longer needed, it would be reclaimed. For areas where equipment or materials are removed, those areas would be re-graded back to pre-construction contours (if possible).

2.6 ALTERNATIVES

Alternatives to the Project are developed to provide decision makers with a clear basis for choice by showing consideration of different and reasonable paths for accomplishing BLM's purpose and need (BLM 2008b). Four alternatives are considered in this EIS. Alternative A is the proposed action identified by BP Wind Energy. To respond to scoping comments and to reduce disturbance-related impacts, BLM has identified two additional action alternatives for analysis. Alternative B reduces the Wind Farm Site footprint and has fewer turbines than Alternative A to reduce visual and noise impacts primarily on Lake Mead NRA and secondly on private property. Alternative C also reduces the Wind Farm Site footprint and has fewer turbines than Alternative A to reduce visual and noise impacts primarily on private property and secondly on Lake Mead NRA. Alternative D is the no-action alternative in which the Project would not be built.

Within the Project, there are options available related to certain project components that are considered in the analysis. Any of the options identified in the description of the project components and discussed in Section 2.6.1 could be selected to identify variations of the proposed action alternatives and still satisfy the purpose and need.

2.6.1 Project Feature Options

Table 2-5 summarizes the project feature options. A description of each of the options follows Table 2-5. Alternative A, which is described in Section 2.6.2, includes white turbines, but either option for the transmission line interconnection and collector lines. Alternatives B and C, described in Sections 2.6.3 and 2.6.4, include consideration of all of these options.

Table 2-5 Project Feature Options

Project Feature	Option 1	Option 2
Turbine Color	White	Shadow gray
Transmission Line Interconnection	345-kV Liberty-Mead on site	500-kV Mead-Phoenix on site
Collector Lines	All below ground	Partly below ground, partly aboveground

Turbine Color

Two turbine color options have been identified for consideration. Turbines may be a shade of white with a non-reflective matte or satin finish and only require night-time marking with red strobes on selected turbines to satisfy FAA requirements for flight safety. The other proposed option would be to install turbines with a shadow gray color. In addition to night-time lighting, the shadow gray turbines would also be marked during the day with synchronized white strobe lights on each turbine. While white or light off-white turbines are the industry standard, they tend to contrast with the landscape. Consequently, gray turbines are being analyzed to assess if a different color turbine would blend in better and reduce visual impacts sufficiently to offset the daytime lighting requirements.

Transmission Line Interconnection Location

System studies indicate that two high-voltage transmission lines passing through the Project Area have the capacity to carry the power that would be generated by the proposed wind farm. These include the 345-kV Liberty-Mead line and the 500-kV Mead-Phoenix line and are shown on the maps of the alternatives described in Sections 2.6.2 through 2.6.4. Each of these transmission lines offers an option for tying the project into the electrical grid and each optional line would influence the location of the switchyard for the interconnection. Approximately 5 miles of transmission line within the Wind Farm Site would be needed from the substation, where wind turbine output voltage would be stepped up to the

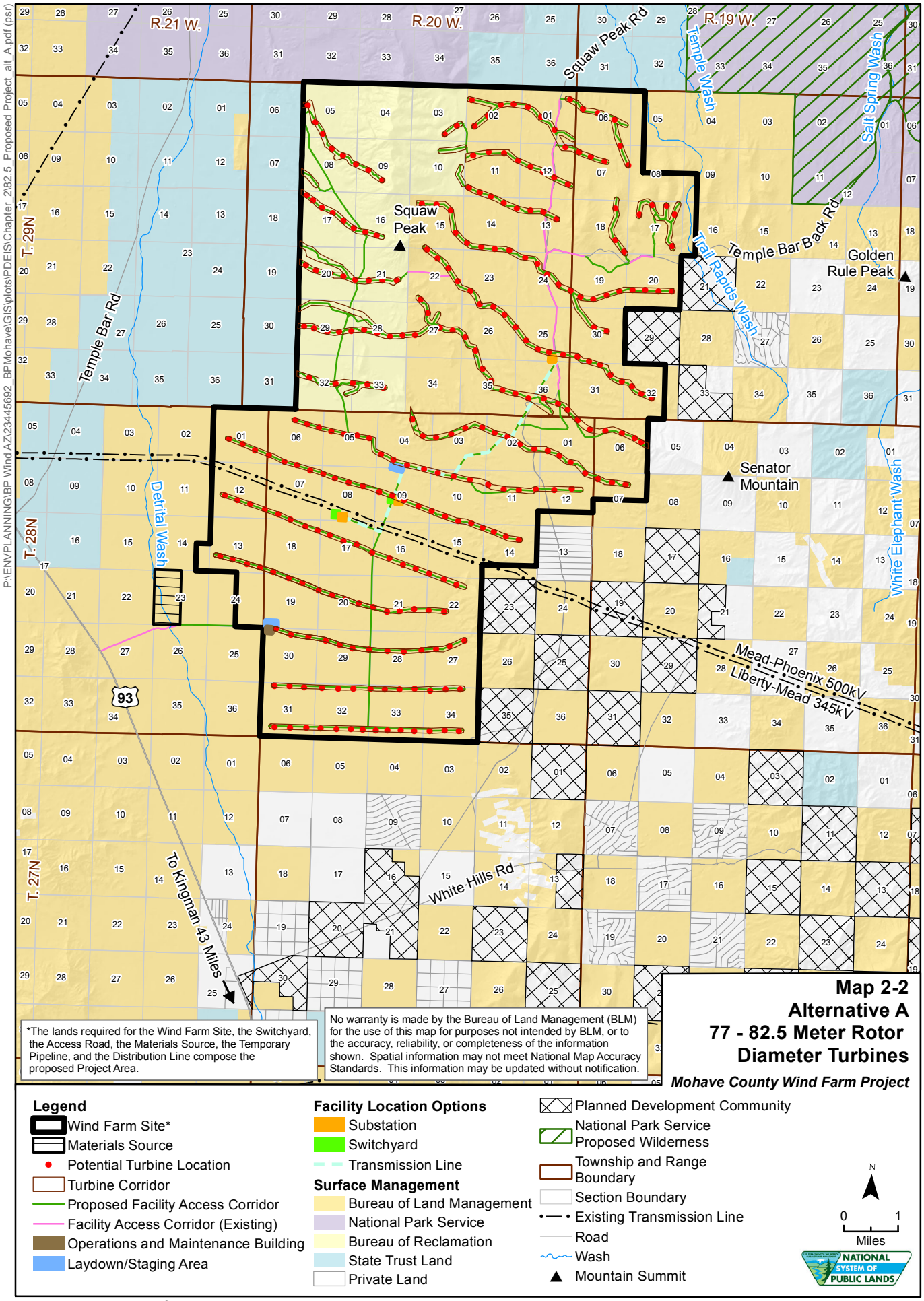
transmission-level voltage, to the switchyard where the Project would be interconnected to the existing transmission lines.

Collector Lines

Two collector line options have been identified. One option is to bury all of the collector lines underground in trenches located within the temporary (construction phase) interior roads. The second option is to bury most of the collector lines, particularly those that link the turbines within a row to one another, and to place no more than about 15 miles of collector lines aboveground on poles that are about 35 feet tall. Aboveground structures would be used to span sensitive environmental and cultural features and steep terrain, and may also be used where multiple collection circuits would otherwise run in parallel. Temporary disturbance for aboveground support structures would be within the area disturbed for temporary roads; collectively, permanent disturbance associated with aboveground structures is estimated at about 0.25 acre for the entire Project. On-site engineering and other construction constraints will ultimately determine whether aboveground or underground collector lines are built in many instances.

2.6.2 Alternative A – Proposed Action

Maps 2-2, 2-3, and 2-4 illustrate the location of key features for Alternative A, each map corresponding to a particular physical turbine size based on rotor diameter. The Wind Farm Site would encompass approximately 38,099 acres of public land managed by the BLM and approximately 8,960 acres of land managed by Reclamation. As with all action alternatives, Project features within the Wind Farm Site would include turbines aligned within corridors, roads, an operations and maintenance building, two temporary laydown/staging areas (with temporary batch plant operations), two substations, and a switchyard. The number of turbines constructed would vary depending on the turbine type that is installed, but Alternative A proposes more turbines than the other alternatives. As shown in Table 2-6, Alternative A could support development of 203 to 283 turbines, depending on turbine size chosen. The turbine layouts shown in Maps 2-2, 2-3 and 2-4 show a representative layout of the turbines, based on rotor diameter, within the corridors that might be considered with Alternative A. The specific turbine count and layout would be determined through micro-siting, which may include analysis of the physical constraints of the landscape, the strength of the wind resource, and geotechnical testing results, among other factors; micro-siting would occur as part of the Plan of Development. Flexibility to place turbines within the corridors would be necessary in order to address specific engineering and environmental constraints identified through this EIS and during BLM's and Reclamation's review of construction plans prior to issuance of notices to proceed with construction. All action alternatives would include an approximately 3-mile primary access road between the Wind Farm Site and US 93 and the temporary use of the existing Detrital Wash Materials Pit as source material for the base material of roads and for concrete needed for foundations. All action alternatives also would include two to three permanent met towers within the Project Area that would remain for the life of the Project. The existing water wells in the immediate vicinity of this Materials Source would provide temporary construction-phase water for batch plant operations and dust suppression with all action alternatives. The temporary pipeline for transporting water to the southern laydown area and the distribution line supplying power for batch plant operations (and possibly the operations and maintenance building) would be within the primary access road ROW between US 93 and the Wind Farm Site. Site preparation, project components, construction activities, post-construction activities, operations and maintenance, and decommissioning of the Project are described in Section 2.5.



Map 2-2
Alternative A
77 - 82.5 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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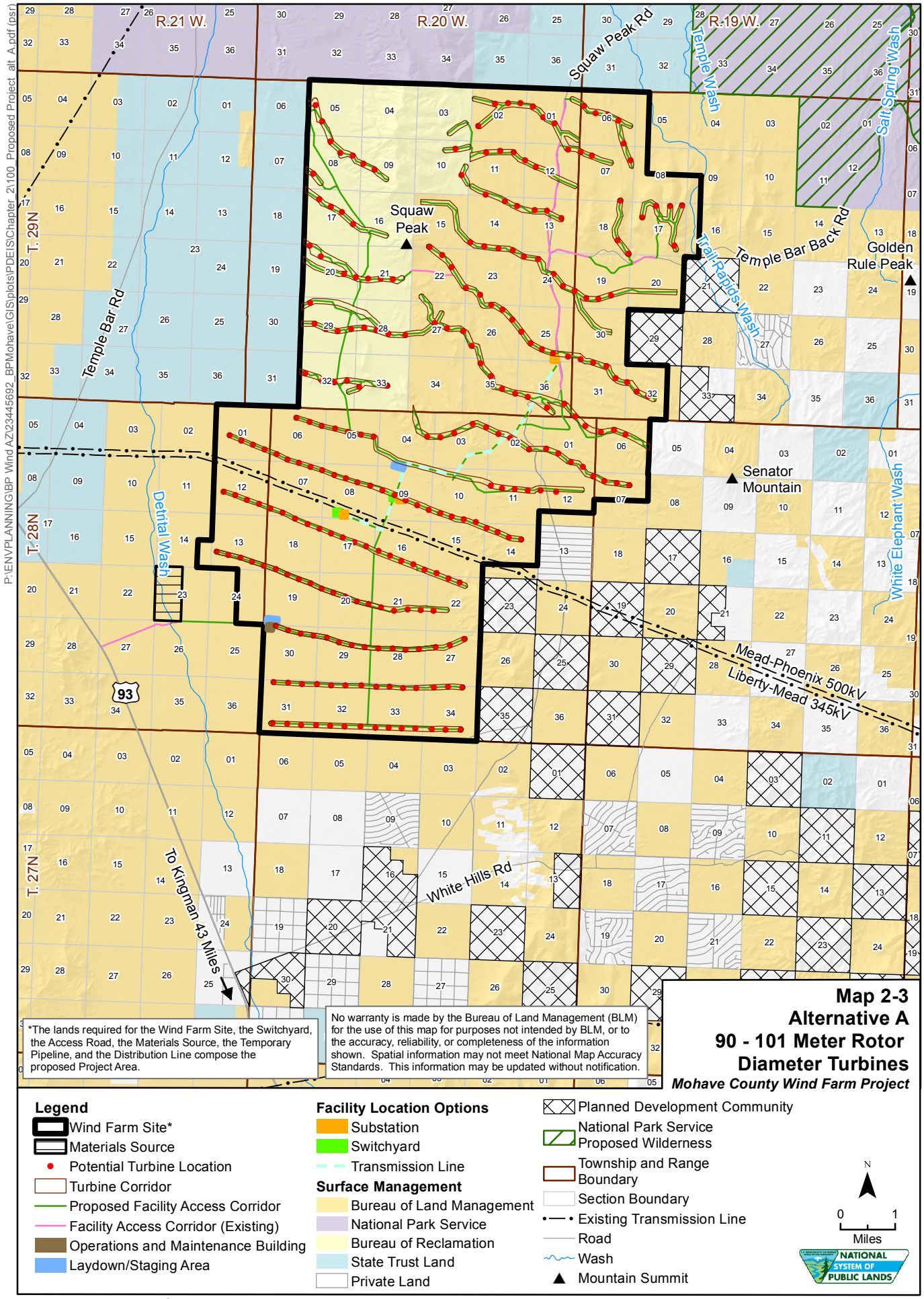
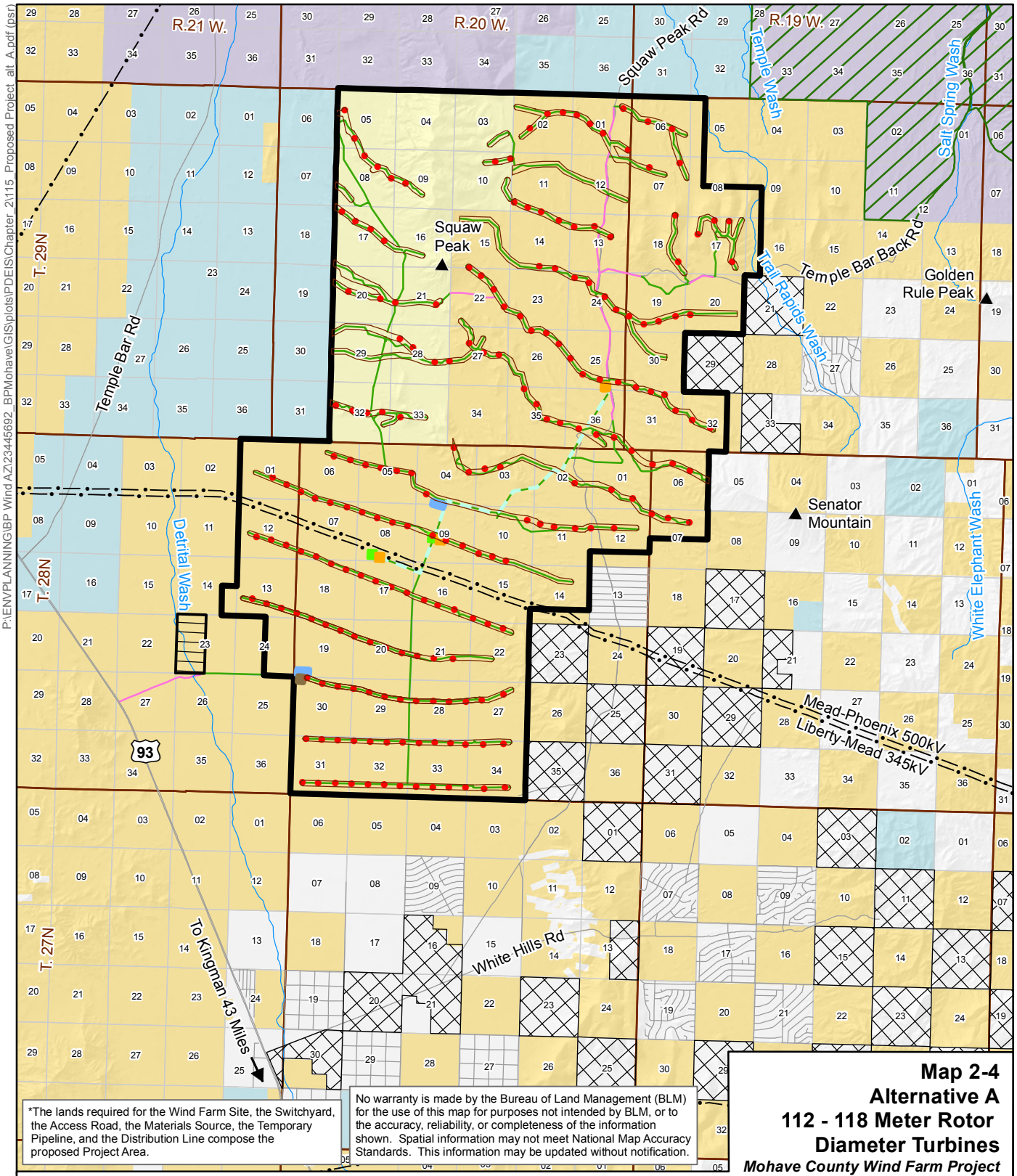


Map 2-3
Alternative A
90 - 101 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)



*The lands required for the Wind Farm Site, the Switchyard, the Access Road, the Materials Source, the Temporary Pipeline, and the Distribution Line compose the proposed Project Area.

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Map 2-4
Alternative A
112 - 118 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Legend
- Wind Farm Site*
- Materials Source
- Potential Turbine Location
- Turbine Corridor
- Proposed Facility Access Corridor
- Facility Access Corridor (Existing)
- Operations and Maintenance Building
- Laydown/Staging Area

Facility Location Options
- Substation
- Switchyard
- Transmission Line

Surface Management
- Bureau of Land Management
- National Park Service
- Bureau of Reclamation
- State Trust Land
- Private Land
- Planned Development Community
- National Park Service Proposed Wilderness
- Township and Range Boundary
- Section Boundary
- Existing Transmission Line
- Road
- Wash
- Mountain Summit

N

0 1 Miles

NATIONAL SYSTEM OF PUBLIC LANDS

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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Table 2-6 Range of Turbine Types, Turbine Counts, and Power Production by Alternative

Alternatives (acreage)	Turbine Rotor Diameter (meters)	Per Turbine Electrical Output (MW)	Number of Turbine Positions [1]	Power Production (MW) [2]
Alternative A				
38,099 on BLM; 8,960 on Reclamation	77 to 82.5	1.5	283	425
	90 to 101	1.6 to 2.0	255	408 to 500
	112 to 118	2.3 to 3.0	203	467 to 500
Alternative B				
30,872 on BLM; 3,848 on Reclamation	77 to 82.5	1.5	208	312
	90 to 101	1.6 to 3.0	194	310 to 500
	112 to 118	2.3 to 3.0	153	352 to 459[3]
Alternative C				
30,178 on BLM; 5,124 on Reclamation	77 to 82.5	1.5	208	312
	90 to 101	1.6 to 3.0	194	310 to 500
	112 to 118	2.3 to 3.0	154	354 to 462[3]

NOTES:

[1] Number of turbines positions is approximate and subject to minor changes as project moves through detailed design and into construction.

[2] Greater than 500 MWs total project generating capacity is physically possible for some turbine models, but the project would not exceed 500 MW as that is the maximum output sought per the project's transmission interconnection applications.

[3] If the Project interconnects to the 500-kV Mead-Phoenix transmission line, a 500 MW nameplate capacity would be achieved by using a combination of turbine types with certain corridors using a turbine model with high MW capacity but a smaller rotor diameter that can be spaced more closely together. Therefore, the maximum number of turbines would be within the range of 153-194 turbines.

While the various Project feature options of transmission line interconnection and collector lines could be considered with Alternative A, BP Wind Energy would prefer to install industry-standard non-reflective white or light off-white turbines. Future studies would determine the best solution for the collector lines, but BP Wind Energy anticipates a combination of underground and aboveground collector lines would be most suitable to handle topographic and geologic constraints. The preferred options for an interconnection cannot be firmly identified until more progress is made in determining which utility is interested in purchasing the power generated by the plant. In addition, the 500-kV Mead-Phoenix line has the potential to be converted to direct current upon approval by the owners (or "participants") involved with that line (of which Western is one). Converting the line to direct current could entail negative operational and financial impacts on the Project proponent and other power generators interconnected to this line. For example, conversion to direct current would isolate the interconnecting power project and force the project to interconnect with another transmission line in order to move the power generated to the market, which could include a new generation tie line and replacement of the transformer and switchyard equipment if the new interconnection were at a different voltage. In the case of the Mohave Wind Farm Project, sufficient capacity on the 345-kV line would not likely be available at that time, "stranding" the power generated from the project, and making the project financially unviable if it were connected to the 500-kV line and operation was converted to direct current.

With Alternative A, BLM and Reclamation would grant ROWs to BP Wind Energy. BLM would grant a ROW to Western for the switchyard. Western would grant the request for interconnection to the 345-kV line or the Mead-Phoenix participants would grant interconnection with the 500-kV line, with Western designing, constructing, owning, and maintaining the switchyard in either case. Project components, activities, and associated ground disturbance impacts for Alternative A are summarized within Table 2-7. The analysis of this alternative is included in Chapter 4 of this EIS.

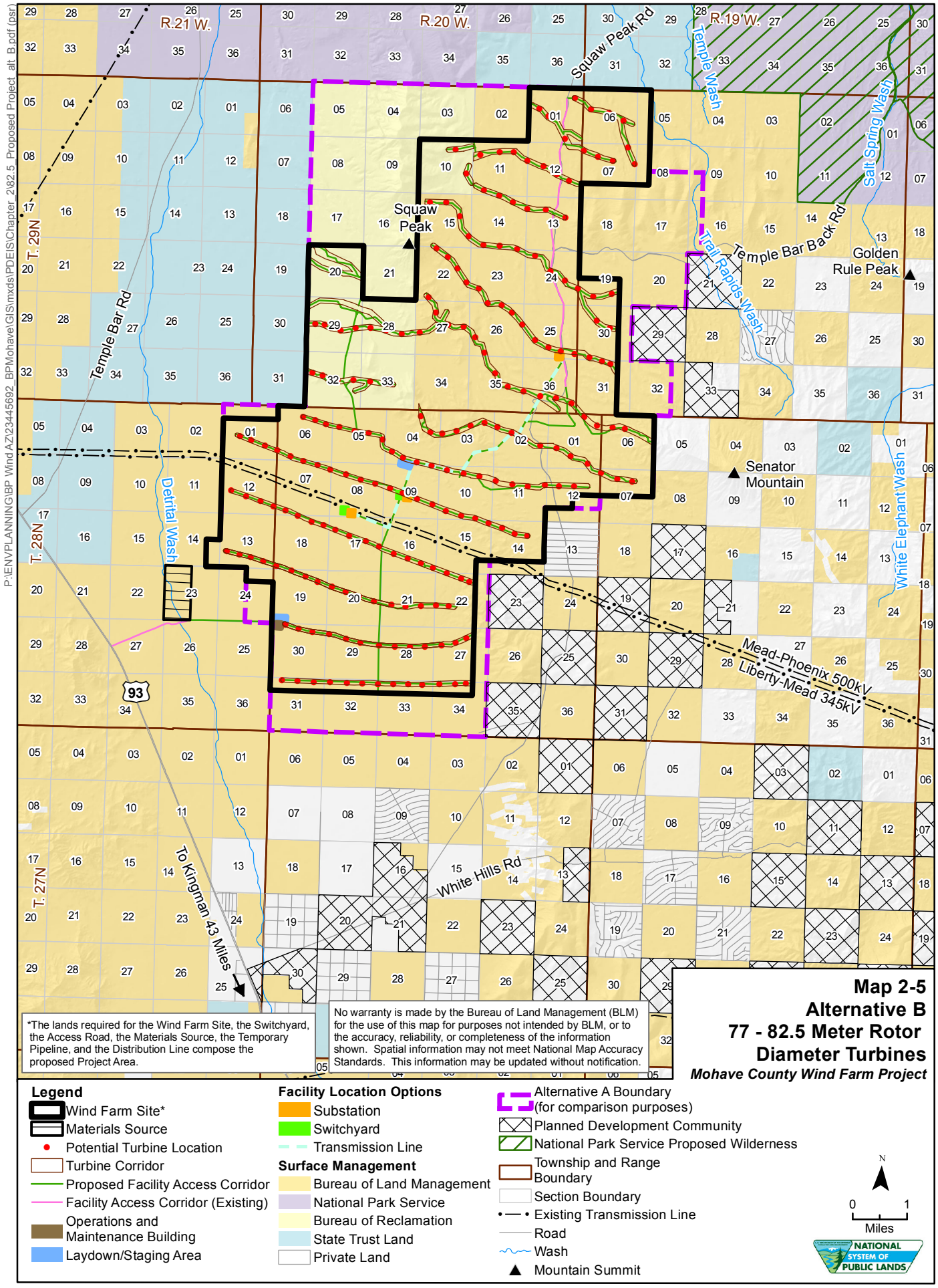
Alternative A would meet BLM's purpose and need for the Project by allowing the use of Federal land to help meet projected renewable energy demands, thus providing BLM the opportunity to help increase renewable energy production on public land in compliance with the BLM's Wind Energy Development Policy. This alternative also supports the proposed actions needed by Reclamation and Western for the implementation of the Project by allowing the use of Reclamation-administered Federal land for renewable energy development and offering capacity on Western's transmission system or facilities to support transmission (of renewable energy) on the Mead-Phoenix line.

2.6.3 Alternative B

Through project scoping and ongoing development of the Project, concerns have been identified by Lake Mead NRA, a unit of the National Park Service (NPS) and a cooperating agency on this Project. Lake Mead NRA staff expressed concern about potential visual and noise impacts from turbines located in proximity to NPS and surrounding lands. In particular, views from Lake Mead NRA and along Temple Bar Road, which passes through State Trust land west of the Wind Farm Site providing access to the recreation area, were a concern as well as turbine-related noise exceeding an hourly equivalent sound level of 35 decibels (dBA L_{eq}) within the Lake Mead NRA boundaries. The NPS lands nearest to the proposed Wind Farm Site are open for back-country camping as well as other recreational activities such as sight-seeing, wildlife watching, and hunting.

During scoping, comments received from the public expressed concern for noise, particularly on residents nearby and recreational users of the area; impacts on views; and, any potential effects on property values.

In response to these concerns, BLM developed Alternative B, as illustrated on Maps 2-5, 2-6, and 2-7, each map corresponding to a particular physical turbine size. While Alternative B may not fully address all concerns for visual and noise impacts, Alternative B offers a Wind Farm Site that is approximately 12,339 acres smaller than Alternative A. The Wind Farm Site would encompass approximately 30,872 acres of public land managed by the BLM and approximately 3,848 acres of land managed by Reclamation. The number of turbines constructed would vary depending on the turbine type that is installed, but Alternative B could support development of 153-208 turbines (see Table 2-6). The turbine layouts shown in Maps 2-5, 2-6 and 2-7 show a representative layout of the turbines, based on rotor diameter, within the corridors that might be considered with Alternative B. The specific turbine count and layout would be determined through micro-siting, which may include analysis of the physical constraints of the landscape, the strength of the wind resource, geotechnical testing results, among other factors. Flexibility to place turbines within the corridors would be necessary in order to address specific engineering and environmental constraints identified through this EIS and during BLM's and Reclamation's review of construction plans prior to issuance of notices to proceed with construction. Compared with Alternative A, turbine corridors on Reclamation land would either be eliminated (from Township 29 North, Range 20 West, Sections 3, 5, 8, 9, 16, 17, 20, and 21) or shortened (Section 10), resulting in the fewest number of turbines on Reclamation-administered land of the action alternatives. Certain turbine corridors on BLM also would be eliminated (from Township 29 North, Range 19 West, Sections 17-18, and Township 28 North, Range 20 West, Sections 31-34) or shortened (Township 29 north, Range 20 West, Section 2; Township 29 North, Range 19 West, Sections 19-20, 31-32; and Township 28 North, Range 19 West, Section 6; and Township 28 North, Range 20 West, Section 22 and 27). Shortened or eliminated turbine corridors on the eastern side of the Wind Farm Site would increase the distance between the private lands and the nearest turbine; shortened corridors generally would reduce the turbine count, although it may just change the spacing within the corridor. Other Project features would be comparable to those identified with Alternative A and as described in Section 2.5. All Project feature options (turbine color, transmission line interconnection, and collector lines) would be considered as suitable options for Alternative B.



Map 2-5
Alternative B
77 - 82.5 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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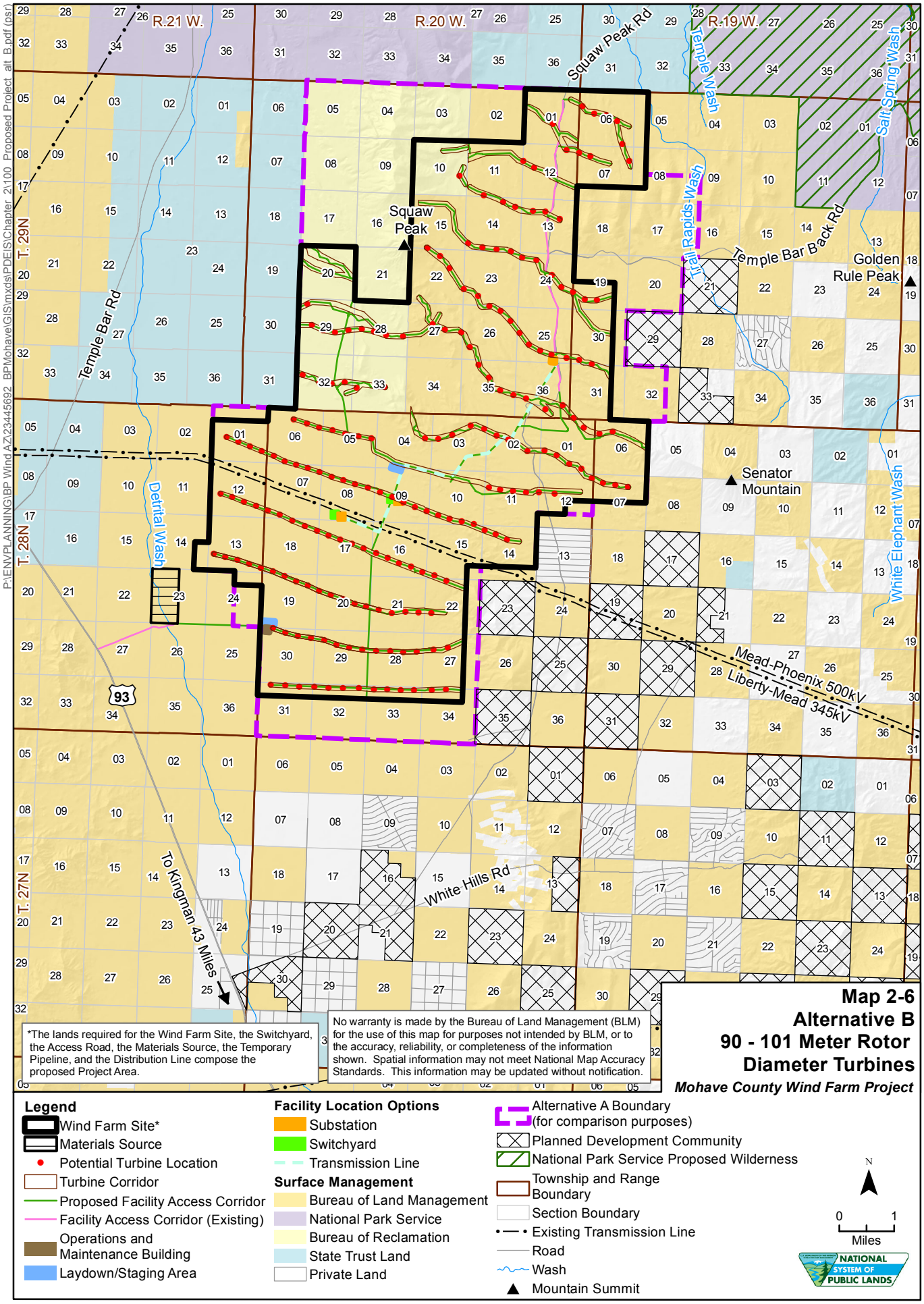
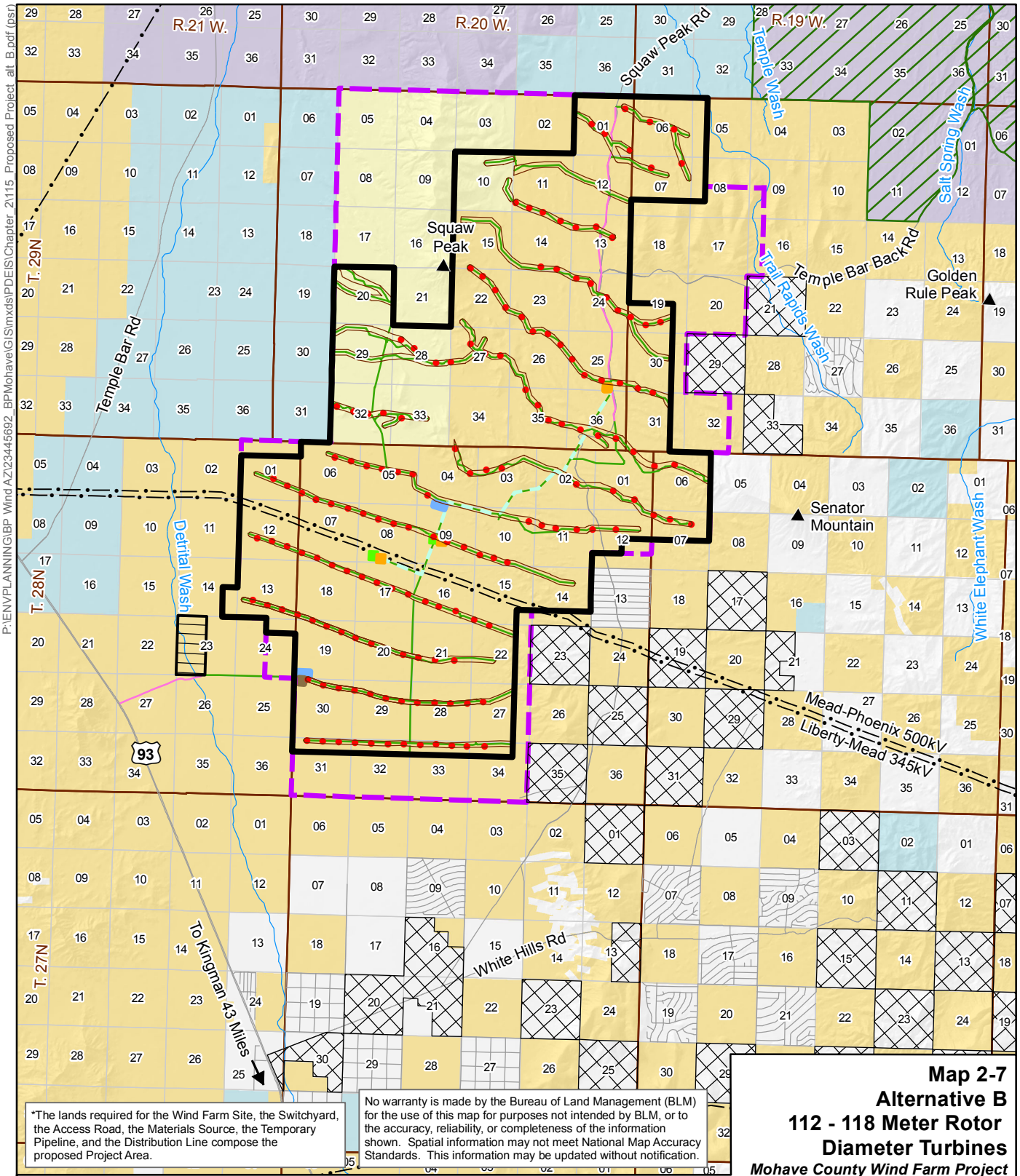


Map 2-6
Alternative B
90 - 101 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)



*The lands required for the Wind Farm Site, the Switchyard, the Access Road, the Materials Source, the Temporary Pipeline, and the Distribution Line compose the proposed Project Area.

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Map 2-7
Alternative B
112 - 118 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Legend
- Wind Farm Site*
- Materials Source
- Potential Turbine Location
- Turbine Corridor
- Proposed Facility Access Corridor
- Facility Access Corridor (Existing)
- Operations and Maintenance Building
- Laydown/Staging Area

Facility Location Options
- Substation
- Switchyard
- Transmission Line

Surface Management
- Bureau of Land Management
- National Park Service
- Bureau of Reclamation
- State Trust Land
- Private Land

- Alternative A Boundary (for comparison purposes)
- Planned Development Community
- National Park Service Proposed Wilderness
- Township and Range Boundary
- Section Boundary
- Existing Transmission Line
- Road
- Wash
- Mountain Summit

N
0 1 Miles

NATIONAL SYSTEM OF PUBLIC LANDS

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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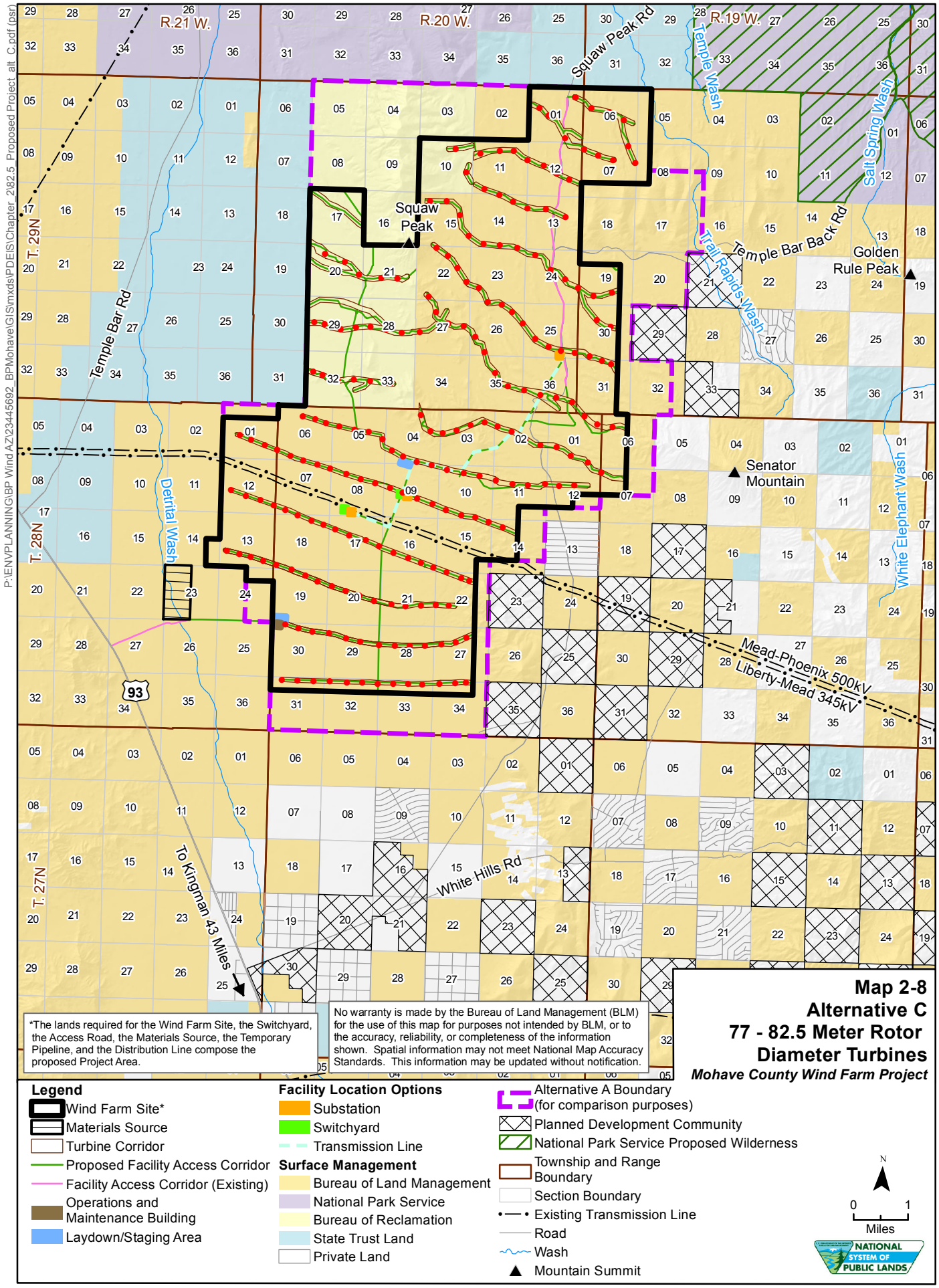
With a smaller footprint than Alternative A, Alternative B presents greater challenges associated with achieving the nameplate capacity per the interconnection agreements. While it is preferable to have a single turbine type (size and manufacturer) throughout the wind farm for uniformity of equipment, parts, and maintenance processes during the operations phase, one option (to achieve nameplate capacity if a smaller turbine is used) would be to have one or more turbine corridors filled by a larger generation capacity turbine than in the balance of the wind farm. Alternatively, the turbines in certain corridors could be squeezed more closely together as long as they retain the manufacturer's spacing requirements. While tighter spacing may reduce the generation efficiency of an individual turbine, the added turbines may collectively help to achieve the nameplate capacity rating. However, 208 turbines would remain the maximum number of turbines installed with Alternative B. The Project would still be required to meet the 425 MW or 500 MW interconnection requirements.

With Alternative B, BLM and Reclamation would grant ROWs to BP Wind Energy. BLM would grant a ROW to Western for the switchyard. Western would grant the request for interconnection to the 345-kV line or the Mead-Phoenix participants would grant interconnection with the 500-kV line, with Western designing, constructing, owning, and maintaining the switchyard in either case. Project components, activities, and associated ground disturbance impacts for Alternative B are summarized in Table 2-7.

Alternative B would meet BLM's purpose and need by allowing the use of Federal lands to help meet the projected energy demands. Alternative B supports the proposed actions needed by Reclamation and Western for the implementation of the Project by allowing the use of Reclamation-administered Federal land for renewable energy development and offering capacity on Western's transmission system or facilities to support transmission (of renewable energy) on the Mead-Phoenix line.

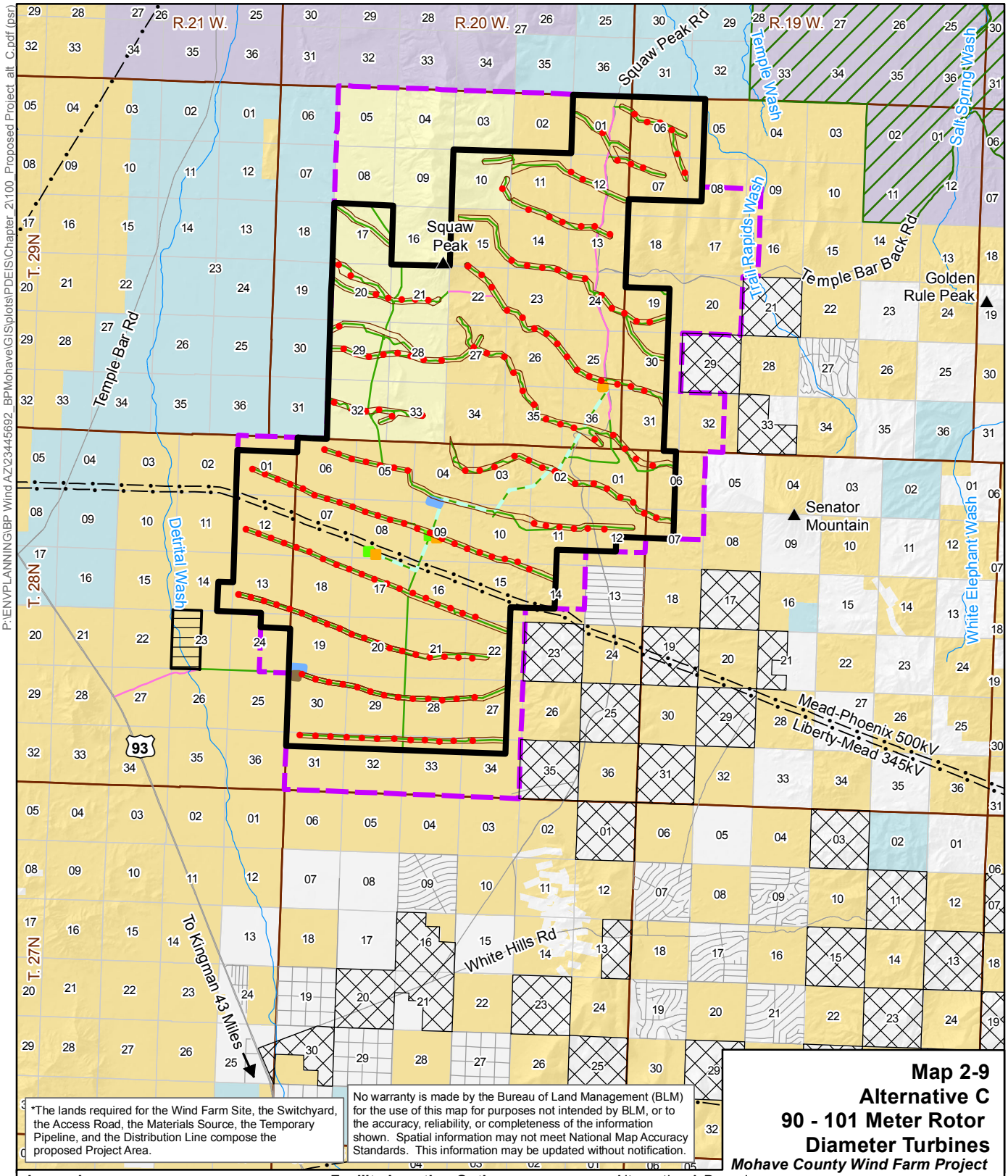
2.6.4 Alternative C

Like Alternative B, BLM developed Alternative C to respond to concerns primarily identified by private land owners/residents and Lake Mead NRA. Alternative C is illustrated on Maps 2-8, 2-9, and 2-10 and is also a reduced footprint alternative. The Wind Farm Site would encompass approximately 30,178 acres of public land managed by the BLM and approximately 5,124 acres of land managed by Reclamation. As shown in Table 2-6, the number of turbines constructed would vary depending on the turbine type that is installed, but Alternative C could support development of 154-208 turbines, and no more than 208 turbines would be installed with this alternative. The turbine layouts shown in Maps 2-8, 2-9 and 2-10 show a representative layout of the turbines, based on rotor diameter, within the corridors that might be considered with Alternative C. The specific turbine count and layout would be determined through micro-siting, which may include analysis of the physical constraints of the landscape, the strength of the wind resource, geotechnical testing results, among other factors. Flexibility to place turbines within the corridors would be necessary in order to address specific engineering and environmental constraints identified through this EIS and during BLM's and Reclamation's review of construction plans prior to issuance of notices to proceed with construction. Alternative C differs from Alternative B in that there would be one additional turbine corridor on Reclamation-administered land (in Township 29 North, Range 20 West, Sections 20-21), but the corridors on BLM-administered land shortened on the eastern side of the Wind Farm Site under Alternative B would be shortened even further to provide greater separation between the private lands and the nearest turbines. Other Project features would be comparable to those identified with Alternative A and as described in Section 2.5. All Project features options (turbine color, transmission line interconnection, and collector lines) would be considered as suitable options for Alternative C. Like Alternative B, methods to achieve the nameplate capacity with Alternative C could include use of more than one turbine type and alteration of the turbine spacing to generate the 425 or 500 MW of power needed to satisfy the interconnection request, while staying within the turbine corridors identified in the reduced land area. The Project would still be required to meet the 425 MW or 500 MW interconnection requirements.



Map 2-8
Alternative C
77 - 82.5 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)



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Map 2-9
Alternative C
90 - 101 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Legend
- Wind Farm Site*
- Materials Source
- Potential Turbine Location
- Turbine Corridor
- Proposed Facility Access Corridor
- Facility Access Corridor (Existing)
- Operations and Maintenance Building
- Laydown/Staging Area

Facility Location Options
- Facility Location Options
- Switchyard
- Transmission Line

Surface Management
- Bureau of Land Management
- National Park Service
- Bureau of Reclamation
- State Trust Land
- Private Land

- Alternative A Boundary (for comparison purposes)
- Planned Development Community
- National Park Service Proposed Wilderness
- Township and Range Boundary
- Section Boundary
- Existing Transmission Line
- Road
- Wash
- Mountain Summit

N

0 1 Miles

NATIONAL SYSTEM OF PUBLIC LANDS

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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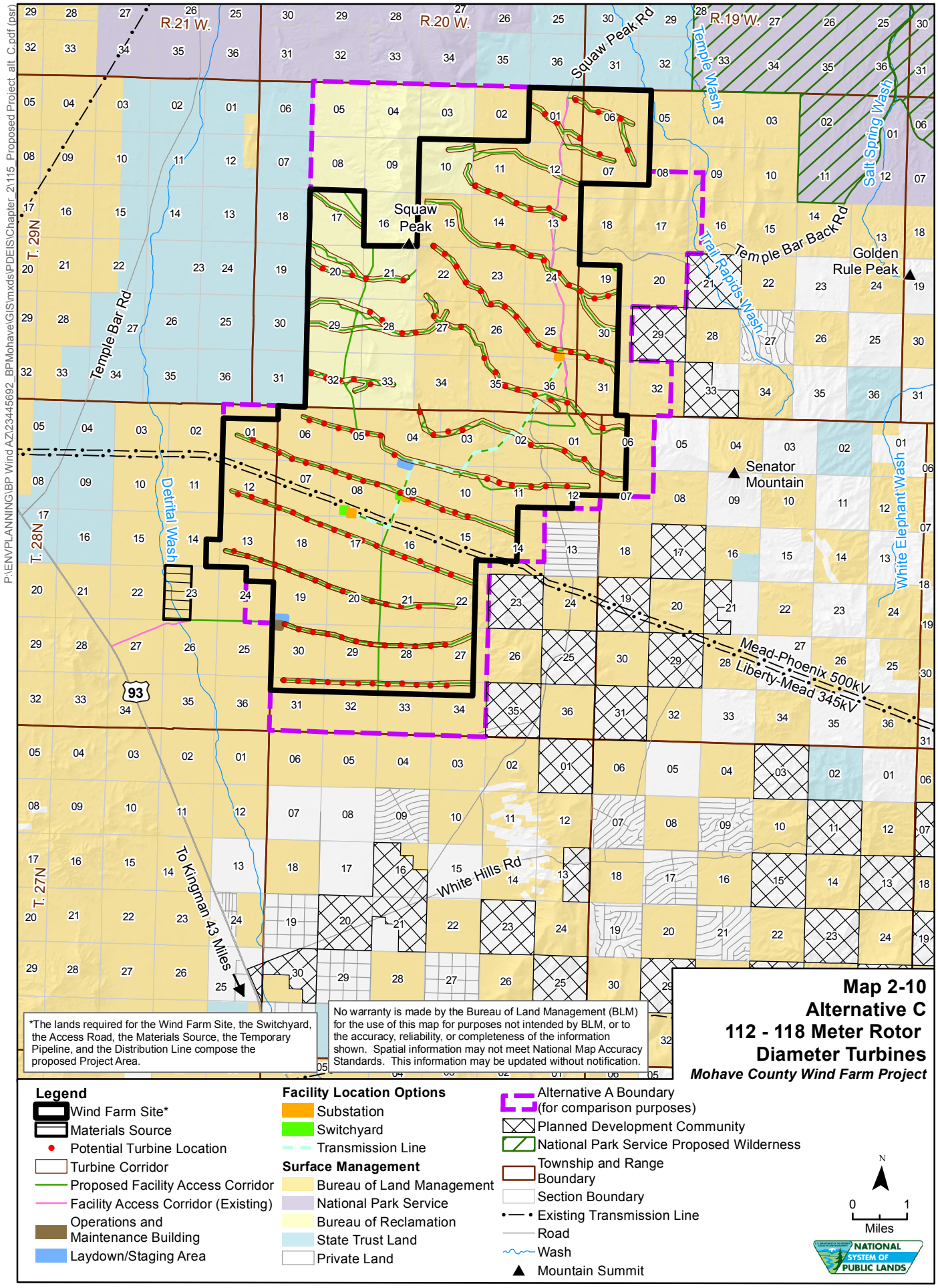

*The lands required for the Wind Farm Site, the Switchyard, the Access Road, the Materials Source, the Temporary Pipeline, and the Distribution Line compose the proposed Project Area.

No warranty is made by the Bureau of Land Management (BLM) for the use of this map for purposes not intended by BLM, or to the accuracy, reliability, or completeness of the information shown. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notification.

Map 2-10
Alternative C
112 - 118 Meter Rotor Diameter Turbines
Mohave County Wind Farm Project

Legend
- Wind Farm Site*
- Materials Source
- Potential Turbine Location
- Turbine Corridor
- Proposed Facility Access Corridor
- Facility Access Corridor (Existing)
- Operations and Maintenance Building
- Laydown/Staging Area

Facility Location Options
- Substation
- Switchyard
- Transmission Line

Surface Management
- Bureau of Land Management
- National Park Service
- Bureau of Reclamation
- State Trust Land
- Private Land

- Alternative A Boundary (for comparison purposes)
- Planned Development Community
- National Park Service Proposed Wilderness
- Township and Range Boundary
- Section Boundary
- Existing Transmission Line
- Road
- Wash
- Mountain Summit

N
0 1 Miles

NATIONAL SYSTEM OF PUBLIC LANDS

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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Like Alternatives A and B, BLM and Reclamation would grant ROWs to BP Wind Energy with Alternative C. BLM would grant a ROW to Western for the switchyard. Western would grant the request for interconnection to the 345-kV line or the Mead-Phoenix participants would grant interconnection with the 500-kV line, with Western designing, constructing, owning, and maintaining the switchyard in either case. Project components, activities, and associated ground disturbance impacts for Alternative C are summarized in Table 2-7.

Alternative C would meet BLM's purpose and need by allowing the use of Federal land to help meet projected energy demands. Alternative C supports the proposed actions needed by Reclamation and Western for the implementation of the Project by allowing the use of Reclamation-administered Federal land for renewable energy development and offering capacity on Western's transmission system or facilities to support transmission (of renewable energy) on the Mead-Phoenix line.

Table 2-7 Anticipated Maximum Ground Disturbance for Alternatives A-C

Project Components	Impact Area	Alternative A Proponent's Proposed Action (Acres of Impact)				Alternative B (Acres of Impact)				Alternative C (Acres of Impact)			
		BLM		Reclamation		BLM		Reclamation		BLM		Reclamation	
		Temp.	Long-term	Temp.	Long-term	Temp.	Long-term	Temp.	Long-term	Temp.	Long-term	Temp.	Long-term
Two temporary Laydown/Staging Areas and associated facilities such as parking area and temporary concrete batch plant	Collectively up to 20 acres	20	0	0	0	20	0	0	0	20	0	0	0
Wind turbines, including pad-mounted transformer	1.85 to 2.5 acres temporary disturbance per turbine; 0.065 acres long-term disturbance per turbine for life of Project	483	15	78	2	392	12	33	1	376	11	48	2
Two Substations	Up to 5 acres per substation	10	10	0	0	10	10	0	0	10	10	0	0
Transmission Line to Switchyard Interconnecting to Mead-Phoenix 500-kV line or Interconnecting to Liberty-Mead 345-kV line	Temporary disturbance is based on 8 support structures per mile with a 100-foot radius per pole; long-term disturbance through life of Project is based on 8 structures per mile with a 6-foot radius per structure	29	0.1	0	0	29	0.1	0	0	29	0.1	0	0
Switchyard for an interconnection to Liberty-Mead 345-kV line	Up to 12 acres for construction; fenced area of approximately 600x600 feet	12	8	0	0	12	8	0	0	12	8	0	0
Switchyard for an interconnection to Mead-Phoenix 500-kV line	Up to 37 acres for construction; fenced area of approximately 900x1500 feet	37	31	0	0	37	31	0	0	37	31	0	0
Operations and Maintenance Building and associated facilities such as parking	Up to 5 acres	5	5	0	0	5	5	0	0	5	5	0	0
Improvements to Existing Roads, including collector line trenches and any utility or communication lines to the O&M building	56-foot-width maximum development area for 36-foot temporary roads; 20-foot width for permanent roads (through life of Project; assumes existing road width of 20 feet or 2.5 acres of existing disturbance per mile)	20	0 new (previous disturbed)	0	0	18	0 new (previous disturbed)	0	0	18	0 new (previous disturbed)	0	0
Development of Access Road from US 93 to Wind Farm Site	56-foot-width temporary development area; 36-foot-width for permanent road (through life of Project)	31	19	0	0	31	19	0	0	31	19	0	0
Development of Interior Roads for access within the Wind Farm Site, including collector line, utility lines, communication lines, and crane paths	56-foot-width maximum development area for 36-foot temporary roads; 20-foot width for permanent roads (through life of Project)	540	185	176	62	485	163	81	29	463	155	95	33
Temporary Met Towers (assumes 23 total – 13 have been established but there could potentially be up to 10 pre-construction power curve testing temporary met towers, if required)	1.6 acres temporary disturbance; 0.03 acre long-term disturbance through life of Project	30.4	0	6.4	0	30.4	0	6.4	0	30.4	0	6.4	0
Permanent Met Towers (assumes up to 3)	1.6 acres temporary disturbance; 0.03 acre long-term disturbance through life of Project	3.2	1.6	0.06	0.03	3.2	1.6	0.06	0.03	3.2	1.6	0.06	0.03
TOTAL GROUND DISTURBANCE		**1,214**	**275**	**260**	**64**	**1,066**	**250**	**120**	**30**	**1,029**	**241**	**149**	**35**

2.6.5 Alternative D – No Action

Alternative D is the no action alternative, which provides a baseline against which action alternatives can be compared. Alternative D includes an analysis of effects from not developing the Project. Under Alternative D the Project, including the wind farm and all associated components and facilities, would not be built. Alternative D assumes that no actions associated with the Project would occur, and no ROWs or interconnections would be granted. The BLM-administered public lands would continue to be managed in accordance with the Kingman RMP and the Reclamation-administered lands would continue to be managed by Reclamation. The need would not be met for the agencies to respond to BP Wind Energy North America's application to develop the wind farm and to interconnect with Western's transmission system, through the established application processes of both agencies. Capacity on Western's transmission lines would remain available for other projects.

Alternative D would not respond to the purpose and need to increase renewable energy production on public lands by the year 2015 per the Energy Policy Act (EPAct); support BLM's Wind Energy Development Policy for increasing renewable energy production on BLM-administered public lands; or respond to the projected demand for energy described in the EPAct. However, taking no action on the Project would not preclude the opportunity to satisfy the purpose and need through other renewable energy projects.

2.7 PROJECT DESIGN REFINEMENTS

Surface disturbance locations and acreages identified in this EIS are based on a preliminary level of engineering and represent a reasonable maximum disturbance amount anticipated for construction, operation, maintenance, and decommissioning of the Project, including all ancillary facilities. However, due to possible Project refinement during construction, locations for turbines, roads, buried cables, overhead electric lines, and other Project features and alignments may change slightly to enhance safety, minimize environmental disturbance, and better accommodate on-the-ground situations. This may also result in changes to the acreages of anticipated disturbance. The estimated areas of disturbance presented in this EIS are conservative and are listed as the estimated maximum size, thus generally covering more acres than would be required for the proposed facilities. This serves to disclose a greater degree of environmental impact than is likely to occur. However, variances may also include ground disturbance beyond the specific areas identified for the EIS analysis.

A variance process would be used to approve refinements outside the parameters of the analysis in this EIS. Where work is required outside the turbine corridors, road corridors, utility corridors, or other specifically evaluated areas of ground disturbance, additional evaluation would be performed for biological and cultural resources to ensure the refinements would not result in an adverse effect after the application of appropriate BMPs or other mitigation measures. Location of the workspace, date, and survey results would be documented and forwarded to the BLM, Reclamation, and Mohave County, as appropriate. In cases where no state or Federally protected species or cultural resources are found, work would proceed upon approval of the variance. In cases where protected species or cultural resources are found, the applicable agencies would provide direction prior to disturbance in that area. As-built drawings would be provided to the BLM/Reclamation at the end of the Project's construction phase.

If Project design refinements required project features beyond the areas defined in this EIS, additional actions to comply with environmental regulations likely would be required. "Refinements" involve three levels of approval depending on the degree of change and who is delegated for approving the variance request. Level 1 and 2 variances would be used as an amendment to the Plan of Development. Level 3 variances would require an amendment to the BLM and/or Reclamation grant.

A Level 1 variance is a minor field adjustment within the approved Project Area ROW and possibly on linear rights-of-way off the Project Area that conforms to the Plan of Development and use authorization stipulations. These variances can be handled in the field by the BLM/Reclamation third party Environmental Inspector(s) in consultation with the Contractor. Such adjustments, although usually minor, require a variance request, and a variance request form would be used to provide documentation. The BLM/Reclamation Inspector(s) would also inform BP Wind Energy and BLM/Reclamation Authorized Officers and/or Project Manager of these minor changes by including them in his/her weekly progress reports.

Examples of Level 1 minor field adjustments or refinements may include the following:

- locating erosion control devices (would also require modification of the SWPPP);
- locating temporary fences inside authorized work areas;
- relocating ditch plugs and wildlife escape ramps in cable trenches from points designated in the Plan of Development;
- disposing of debris off-site in an approved manner at an approved site;
- permitting waterbars to be extended (off the area designated for a cable trench or a transmission line) into native vegetation "one dozer length" (this includes providing permission for construction equipment to work outside designated work areas);
- allowing rubber-tired vehicles to use additional designated access roads (in addition to those approved in BLM approval documents) where improvements would not be necessary;
- and temporarily piling turbine parts or other assemblies outside areas designated in the Plan of Development but within an authorized area.

Level 2 refinements or variances involve a deviation exceeding field decision authority of the BLM/ Reclamation third party Environmental Inspector(s) and requires approval by the BLM/Reclamation Authorized Officer or designated representative. The deviation generally involves Project changes affecting an area outside of previously approved work areas, but within corridors previously surveyed for cultural resources and sensitive species. Such variance requests typically require review of supplemental documents, correspondence, and records provided by BLM / Reclamation third party Environmental Inspector(s) along with the request. Proposals outside of areas previously surveyed for cultural and biological resources would require surveys. Examples of Level 2 variances include, but are not limited to the following:

- shifting extra workspace along any off-Project Area linear ROW construction corridor a short distance within the previously surveyed corridor where overall disturbance type and acreage remains the same and no cultural, paleontological, or biological resources are affected;
- using additional extra workspace outside previously approved work areas, within/outside the Project Area or off-Project Area rights-of-way;
- permitting project work to be completed in raptor areas outside the construction window;
- moving culvert locations to better accommodate natural drainage;
- providing additional work space for topsoil and spoil material storage to prevent mixing;
- constructing a temporary fences on BLM-administered public land or Reclamation-administered Federal land (not designated in the Plan of Development);

- moving and permanently installing a range fence a specified number of feet laterally to avoid proposed construction and structures;
- shifting temporary workspace so it is on previously disturbed areas;
- modifying seed mixes specified in the Reclamation Plan (Appendix to the Plan of Development) due to unavailability;
- modifying and using an access road not designated in the Plan of Development for safety;
- and providing additional places to turn trucks around.

Level 3 variances or modifications involving the Project boundary or off-Project linear ROW would generate a ROW amendment.

2.8 BONDING

BP Wind Energy would post BLM-required security for the Project to ensure compliance with the terms and conditions of the ROW authorization and the requirements of applicable regulations. The amount of the security bond would be based on the number of turbines and site-specific and project-specific factors (BLM 2008a).

2.9 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

2.9.1 Alternative E – Use Land East of Current Wind Farm Site

In the initial stages of Project development, a Project location alternative involving approximately 44,860 acres of public land administered by the BLM and 4,360 acres of private land was considered for the construction of up to 333 wind turbines generating up to 500 MW of power. Alternative E, as shown on Map 2-11, would have included some of the land being addressed in Alternative A, but also included additional public and private land to the east. Public scoping meetings on this alternative were conducted in December 2009.

Comments received during scoping identified concerns for developing on and near private land in the Project Area (as defined by this alternative), including possible effects on property values, noise, and changes to the visual setting. Potential conflicts with existing mining claims were identified and preliminary environmental studies determined that the potential for adverse impacts on bats and birds were greatest in the eastern portion of Alternative E, which had been described as the "subsequent phases" area. There also were concerns for acquiring leases for the private land. Based on all of these considerations, the land previously identified for subsequent phases of development (including 13,522 acres of BLM-administered land and 4,360 acres private land) was eliminated from detailed consideration. Alternative E was eliminated from further analysis in this EIS.

2.9.2 Alternative F – Use 36,000 Acres of BLM-administered and Reclamation-administered Land

To achieve the desired capacity of generation following the elimination of the "subsequent phases" area associated with Alternative E, BP Wind Energy proposed to develop within an area consisting of 27,033 acres of public land managed by the BLM and 8,960 acres of land managed by Reclamation. This is now identified as Alternative F. To inform the public of the changed project footprint and to solicit comments on the change, additional public scoping meetings were held in August 2010 in the communities of Kingman, Dolan Springs, White Hills, and Peach Springs. The land area defining Alternative F continues to be part of Alternative A, the proposed action; however, Alternative A was expanded in size in the southern portion of the Project after another applicant withdrew its application to develop a solar energy project on adjacent BLM-administered lands. Consequently, while the land area of

Alternative F is still under consideration, no alternative footprints for the proposed Wind Farm Site currently match the footprint that was presented to the public during the August 2010 public scoping meetings (Map 2-11).

2.9.3 Alternative Locations that Failed to Satisfy Siting Criteria

Other alternative locations were suggested but were eliminated as potential siting areas because they failed to meet the siting criteria described in Section 2.2. For example, one suggestion was to move the Project south of Western's transmission lines or west of US 93, but constraints to a suitably sized area included drainage concerns associated with Detrital Wash, the Black Mountains Area of Critical Environmental Concern, developed private property, and an existing application for a solar project. The application for the solar project has since been withdrawn with some of the land previously included in the application for the solar project now included in the three action alternatives being considered. The land constraints associated with these alternative locations would not provide an adequate land area with sufficient wind speeds for developing an economically competitive wind project. Alternative sites that did not provide sufficient wind resources, sufficient amount of land, suitable transmission and physical access, and/or would have significantly impacted environmental resources or conflicted with existing land uses were eliminated from further analysis.

2.9.4 Interconnection to Moenkopi-El Dorado 500-kV Transmission Line

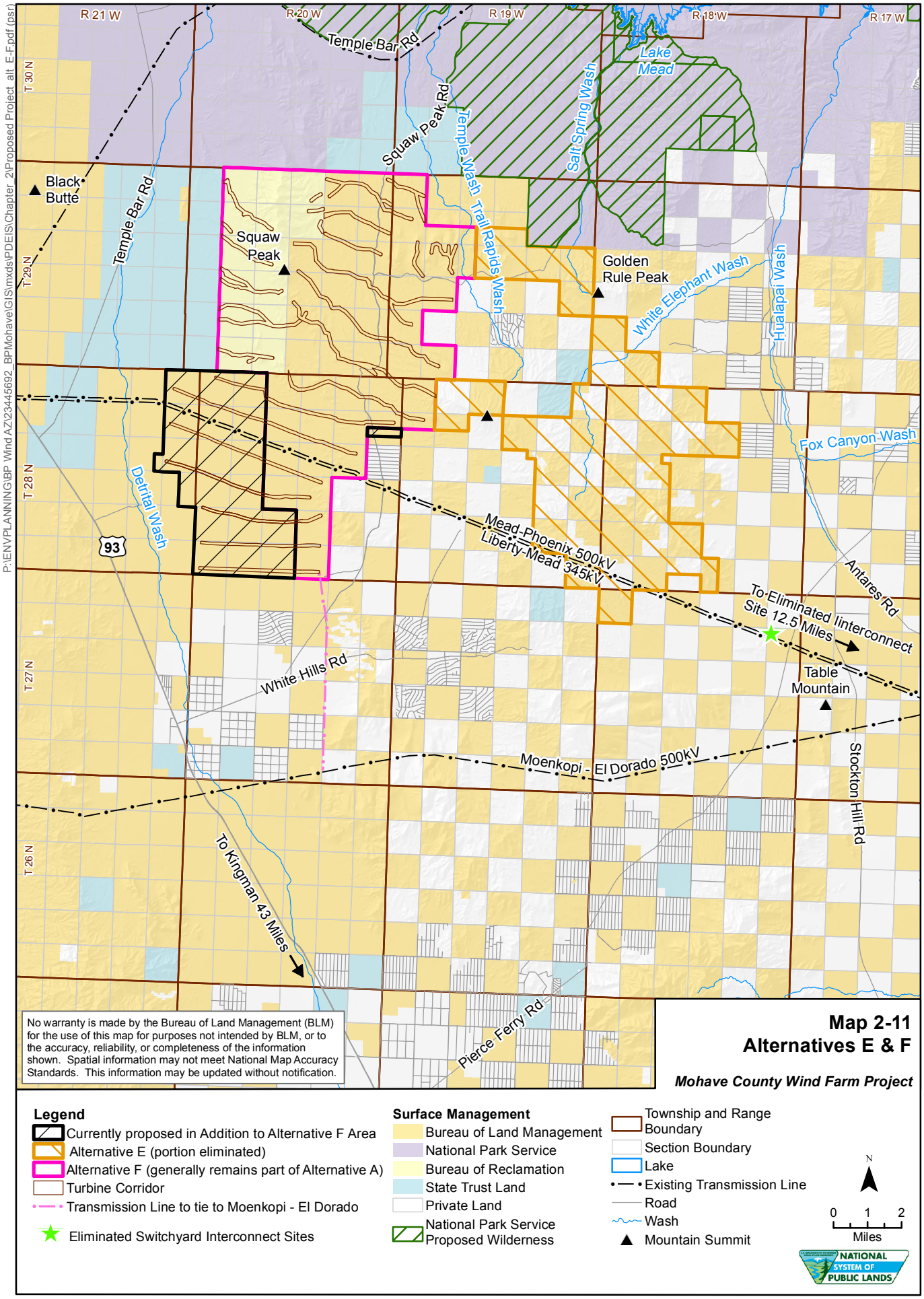
The Moenkopi-El Dorado 500-kV transmission line runs in an east-west direction and is located approximately 6 miles south of the proposed Wind Farm Site. An alternative to run transmission line parallel to a section line from the Wind Farm Site south to the transmission line and then building the switchyard in Township 27 North, Range 20 West, Section 35 along the Moenkopi-El Dorado transmission line was considered. This alternative was eliminated from detailed analysis because the Moenkopi-El Dorado transmission line currently does not have the capacity to accommodate an additional 425 to 500 MW of generated power.

2.9.5 Switchyard Locations Outside of the Wind Farm Site

Two alternative switchyard locations were considered for an interconnection with the Mead-Phoenix 500-kV transmission line. Both locations were east of the Wind Farm Site with one in Township 27 North, Range 18 West, Section 12 and the other in Township 26 North, Range 21 West, Section 10.These two interconnection points were considered during the preparation of the electrical system studies when a solar-powered generation facility was proposed for a location east of the Mohave County Wind Farm Project to determine if a shared interconnection point would provide greater stability to the electric power grid. Plans for the solar project currently are not being pursued so alternatives involving a shared interconnection point were eliminated from detailed analysis.

2.9.6 Distributed Generation and Energy Conservation

The feasibility of using residential and wholesale distributed generation, in conjunction with increased energy efficiency, was considered as an alternative to building the Project. This alternative was considered but eliminated from further analysis in this EIS for several reasons. First, the proposed Project location is remote and sparsely developed; therefore, this area does not have enough residential or commercial developments to generate the amount of power that could be produced by the proposed wind farm. Second, increasing energy efficiency would be beyond the ability of either BLM or BP Wind Energy to either enforce or monitor. Even with full energy efficiency compliance, the area would not conserve power at the same scale in which the proposed Project would produce power. Finally, this



Map 2-11
Alternatives E & F

Mohave County Wind Farm Project

Source:
Base Map: BLM 2009-2010, ALRIS 2007-2008, ESRI 2008, NHD 2008, Project Area Boundary and Facilities: BPWE North America 2011
Transmission Lines: Platts, A Division of the McGraw-Hill Companies, Inc. - POWERmap (Platts analytical database: 2009)

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alternative would not satisfy BLM's purpose and need for the Project to allow for the development of utility-scale wind energy resources to meet forecasted increased energy demands nor does it respond to BLM's purpose and need to consider an application for the authorized use of public land for a specific renewable energy technology.

2.9.7 Brownfields and Previously Disturbed Areas

Siting the Project in designated Brownfield areas, or other previously disturbed or marginal quality areas was considered as described in the site selection process in Section 2.2 of this EIS. However, the areas where large tracts of land and wind resources are sufficient to generate utility-scale wind farms capable of generating up to 500 MW of power in Arizona do not coincide with the Brownfields and previously disturbed or marginal lands identified as satisfying the criteria for the Restoration Design Energy Project (BLM 2010). While State land adjacent to the Project Area was nominated for consideration in the Restoration Design Energy Project, the land does not appear to be disturbed. In addition, moving the project from BLM to State land would not meet BLM's purpose and need to respond an application for the authorized use of public land for renewable energy development. In addition, no Brownfield sites have been identified within Mohave County or within BLM's Kingman Field Office jurisdiction. Therefore, an alternative to locate the Project in a Brownfield or on previously disturbed or marginal quality land in Mohave County would not be technically or economically feasible and this alternative was eliminated from detailed study in this EIS.

2.9.8 Reduced Footprint with Reduction in Capacity

The feasibility of reducing the Project's footprint and generating capacity was considered within the boundaries described in Alternatives B and C. This alternative is intended to respond to issues identified during agency scoping, primarily in connection with potential visual and noise impacts to recreation users, existing and planned residential areas, and the overall level of surface disturbance resulting from the Project. As explained in detail below, reducing the footprint based on a generating capacity to a minimum of 300 MW was eliminated from detailed analysis because the technical design of such an alternative would be substantially similar to Alternatives B and C, which are analyzed in the EIS; given the similarities in design of a reduced footprint to Alternatives B and C, the effects also would be substantially similar. Additionally, an alternative that focuses on potentially reducing the footprint of the project by focusing on a reduction in generating capacity to 300 MW would require the Applicant to reapply for interconnection with Western. Re-application could make the project infeasible due to added costs, delays, and uncertainties associated with the new application's assumption of a later position in the interconnection queue.

A reduced footprint alternative that focuses on a 300 MW limit for generation capacity would not necessarily produce a project that is smaller in footprint size than Alternatives B and C. The size of the footprint is dictated by the type of turbines selected (i.e., manufacturers' specifications of the different types of turbines vary). BP Wind Energy has not yet selected which turbines it will purchase. Restricting the maximum output of the Project to 300 MW may or may not reduce the footprint of the Project. (It is difficult to restrict electrical output in isolation as the criterion to analyze opportunities to reduce potential impacts to the environment.) As described in Chapter 1, the ultimate generating capacity of any project approved would depend upon the turbine or turbines selected, the transmission line, and the turbine corridors approved by BLM and Reclamation. Further, Table 2-6 provides a representation of the approximate maximum number of turbines that would fit within each alternative footprint accounting for the size of the turbine (MW capacity and rotor diameter).

The diameter of the rotor is the factor that most influences turbine layout and spacing requirements so that wake turbulence from one turbine does not diminish the power of the wind and the power generated by downwind turbines. Other considerations in turbine spacing and layout includes a combination of the

overall physical size of the turbine, the site constraints (physical setbacks, noise, land agreements, etc.), topographic complexity, the wind resource (wind speed, turbulence, wake effects, etc.), and the balancing of the generation efficiency of spaced-out turbines (while meeting manufacturer minimum spacing criteria so as not to cause damage to downwind turbines due to turbulence) and the need to keep turbines within a more compact area due to cost and available land considerations. The spacing is an optimization based on energy production, cost of construction, and not exceeding the engineering design thresholds of the turbine, which happens when turbines are not spaced far enough apart. All of these factors vary greatly from site to site, but also vary within an individual site causing spacing to potentially be different in different areas of a large wind farm (more than 100 MW). Spacing in predominant wind directions (between turbine corridors) can range from 5 to 12 rotor diameters and in non-predominant wind directions (within a turbine corridor) can range from 2.5 to 5 rotor diameters. It is uncommon to see modern wind farms with spacing less than 2.5 rotor diameters and most manufacturers will not allow it. For this Project, preliminary turbine spacing was generally 8 to 10 rotor diameters between the rows of turbines and 3.5 to 5 rotor diameters within the corridors. If 1.6 MW turbines are selected, 194 turbines would be needed to generate approximately 310 MW. If 2.3 MW turbines are selected, then 134 turbines would be needed to generate the same amount of capacity (310 MW). However, as indicated in Table 2-6, the rotor diameter with 1.6 MW turbines would be between 295 feet and 331 feet so the spacing between turbines within the corridor would be about 1,000 feet to 1,650 feet apart. The 194 turbines would occupy the same area as described in Alternative B or C. With 2.3 MW turbines, the rotor diameter would be between 367 feet and 387 feet and the spacing between turbines within the corridors would be about 1,300 feet to 1,900 feet. The 134 turbines needed could require the same land area as described in Alternative B or C. Under Alternatives B and C, a 1.6 MW turbine could be selected to reduce the capacity of the project to approximately 310 MW. However, the number of turbines required to produce 310 MW (194 turbines) would be greater than the number of turbines necessary to produce 352 MW of power (153 turbines) if 2.3 MW turbines were used in the same turbine corridors. In other words, a reduced footprint alternative that focuses on a 300 MW generation limit would provide for substantially similar designs as contemplated in Alternatives B and C, and therefore any such alternatives would likely have similar effects to Alternatives B and C.

Additionally, as described above in Section 1.3.1.3, BP Wind Energy's interconnection request filed under Western's tariff sets the minimum output from the project at 425 MW nameplate for the 345-kV transmission line. Any MW output below 425 MW would essentially be considered a new project, requiring a new interconnection application under Western's Large Generator Interconnection Procedure (LGIP) to reflect the smaller project capacity, and would cause BP Wind Energy to lose its place in the interconnection queue. Since there are several applications by other potential generation projects on Western's 345-kV transmission line (totaling 660 MW) and one other application for the 500-kV transmission line, the transmission lines might not have remaining capacity by the time a revised application could be considered, resulting in a major risk to the viability of the Project. A lack of transmission capacity would prevent the Project from connecting to the power grid without transmission system upgrades that cost dramatically more than those anticipated by BP Wind Energy when it initially decided to undertake development of the project.

2.10 SUMMARY OF EFFECTS FROM ALTERNATIVES

A summary of potential resource impacts for each of the three alternatives presented in this EIS is presented in the Executive Summary.