Appendix A

Elements Common to All Action Alternatives

Appendix A Project Elements Common to All Action Alternatives

This appendix describes project elements that would be applied to all action alternatives considered in the analysis: Alternatives 1R, 2, 3, and 4 (discussed in Chapter 2.0). Details contained in the following sections are derived from the information provided by the Power Company of Wyoming (PCW) in the March 2009 Plan of Development (POD), December 2009 *PCW Response and Data on BLM Alternatives*, and April 2010 *Applicant Proposed Alternative and BLM Response Letter* as well as modifications that occurred through ongoing discussions with the applicant.

While the referenced documents outlined in this section serve as the basis for analysis in this document, micro-siting of turbine locations, roads, transmission lines, and support facilities has not been completed. The information provided for each alternative assumes the greatest potential for disturbance, and therefore it is assumed that impacts identified at the time of micro-siting would not exceed those described in this document.

Upon completion of this project-wide level National Environmental Policy Act (NEPA) analysis, PCW would then submit up to four separate PODs for the internal haul road, transmission line between the two sites, Sierra Madre development, and Chokecherry development. The site-specific POD proposals would be tiered to the analysis and decision described in the Record of Decision (ROD) associated with this project-wide level environmental impact statement (EIS). Right-of-Way (ROW) grants for these PODs must comply with the NEPA analysis and would include site-specific terms and conditions tiered back to the project-wide level EIS. Upon review of the individual PODs, additional NEPA analysis may be required prior to issuance of any ROW grants. The final turbine layout would adhere to the terms and conditions of the ROD and any ROW grants issued by the Bureau of Land Management (BLM).

Background

In March 2009, PCW submitted a revised POD to accompany the ROW applications for the Chokecherry Sierra Madre (CCSM) Wind Energy Project (PCW 2009a). The POD includes descriptions of and guidelines for the design, construction, operation, reclamation, and maintenance of the wind farm, access roads, electric gathering lines, transmission lines, and electric substations that would be constructed as part of the project.

Due to the technical nature of wind turbine layout siting, the BLM also requested that PCW provide technical data and develop a conceptual model of turbine layouts to show where turbines could potentially be sited for a set of BLM-provided alternatives and environmental constraints that the BLM may consider for further analysis. This information was presented to the BLM in December 2009 as the report entitled *PCW Response and Data on BLM Alternatives* (PCW 2009b).

As a result of ongoing discussions and additional information, PCW also submitted an *Applicant Proposed Alternative and BLM Response Letter* (PCW 2010a) in April 2010 that identifies an acceptable alternative to their original project concept, which was determined to be not in conformance with the Rawlins RMP (further discussed in Chapter 2.0). Additional communications between April and September 2010 clarified information and provided corrections to some information contained in the previously submitted materials. A revised preliminary *Transportation Management Plan* (PCW 2010b), received on August 30, 2010, supersedes transportation-related information previously presented in the March 2009 POD.

A.1 Environmental Constraints and Applicant Committed Measures

The environmental constraints and applicant committed measures (ACMs) discussed in Chapter 2.0 that would be applied to all action alternatives are detailed in **Appendix C**. In addition to the BLM's environmental constraints (**Table C-1**), ACMs (**Table C-2**), best management practices (BMPs;

Table C-3), and mitigation measures identified in the project-wide level NEPA analysis (**Table C-4**) described in **Appendix C**, additional constraints may come through development of a reclamation and monitoring plan (**Appendix D**), Programmatic Agreement (PA) for cultural and Native American resources (**Appendix E**), an Avian Protection Plan (APP; **Appendix J**), and a Biological Opinion (BO [**Appendix L**]). These documents have not yet been completed, and consultation with other regulatory agencies including the USFWS and the Wyoming SHPO is ongoing. However, environmental constraints that may come through development of each of these documents would be incorporated into the selected alternative. These constraints would then in turn be considered as stipulations of approval in the ROW grants.

A.2 Pre-construction Activities

Pre-construction activities apply to all components of the CCSM Wind Energy Project. These activities are on-going to attain a final layout and associated site-specific NEPA analysis. Activities include final siting of project features, conducting pre-construction surveys, acquiring all applicable permits and easements, and planning construction transportation.

A.2.1 Wind Potential

PCW has been monitoring the long-term wind resource and energy production potential at the CCSM sites since June 2007. Initially, 10 meteorological towers were installed in the Application Area at an elevation of approximately 196-262 feet (80-100 meters) above the ground to collect site-specific meteorological data. Additional meteorological towers (totaling 27 as of September 2010) have been installed within the Application Area. The collected information was interpreted to provide mean wind speed, annualized average wind speed, shear exponent, turbulence intensity, Weibull parameters, prevailing wind direction, and air density (see glossary). The results are presented in the March 2009 POD and used in the conceptual areas of development provided by PCW. **Figure A.3-1** displays wind potential within the Application Area.

A.2.2 Constructability Field Verification

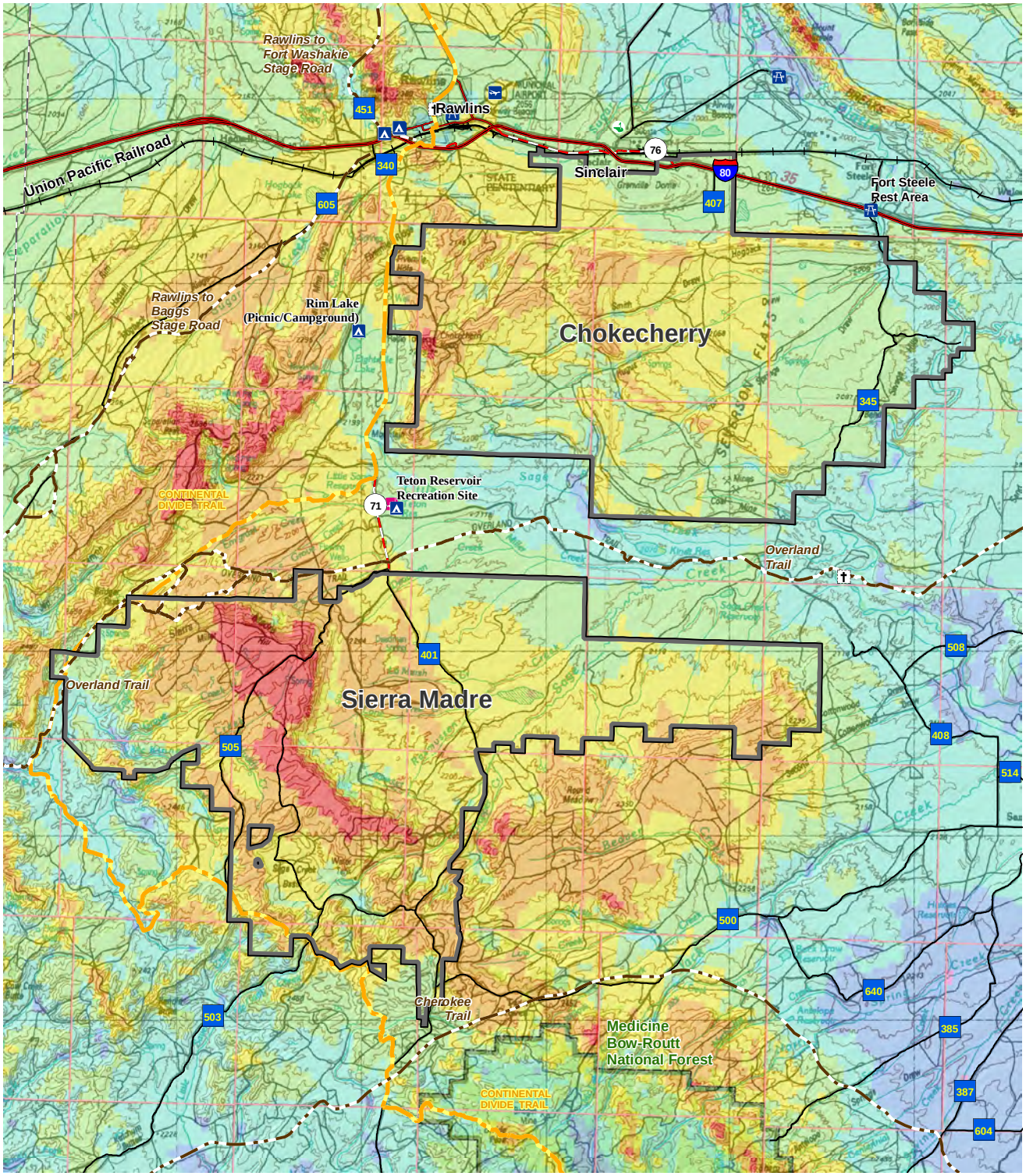
Using the meteorological data in combination with the site topography and environmental constraints, a wind model was developed to maximize wind potential in the conceptual WTG layout. PCW used an iterative process considering wind data and topography collected from the Application Area to develop a conceptual wind turbine generator (WTG) layout that possesses the design characteristics summarized in Section 1.5.

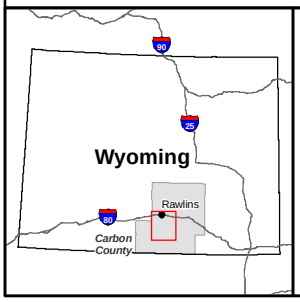
A.2.3 Pre-construction Surveys

Prior to construction, site surveying would be completed to mark the locations of the WTG towers, WTG pad boundaries, electric substations, transmission lines and tower locations, electrical collection cable centerlines, the operations and maintenance building, concrete batch plants, staging areas, and access and internal resource roads. Project surveyors would stake the limits of roads, WTG pads, and the center of each WTG and transmission line structure. Avoidance areas would be delineated, where applicable, to minimize resource disturbance.

A.2.4 Geotechnical Analyses

Some preliminary geotechnical testing, associated with the siting of meteorological towers, has been completed and is included in the March 2009 POD. Additional geotechnical investigations would commence once the BLM issues a ROD if the project were approved. Geotechnical testing would be used to obtain engineering data to finalize WTG layouts and design the WTG foundations. The following types of geotechnical exploration methods may be used: cone penetration testing, dilatometer testing, hollow-stem auger drilling, rock coring, and test pit excavations.





Legend

- Continental Divide Trail
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- National Forest
- Application Area

Wind Power Classification

- 1 - Poor
- 2 - Marginal
- 3 - Fair
- 4 - Good
- 5 - Excellent
- 6 - Outstanding
- 7 - Superb

Chokecherry and Sierra Madre Wind Energy Project

Figure A.3-1

Wind Potential within the Application Area

0 1 2 4 Miles
0 2 4 8 Kilometers
1:320,000
N

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A.2.5 Resource Surveys

Additional resource surveys would need to be completed based on final project design to support the site-specific NEPA analysis before any ROW grants could be authorized.

A.3 Project Facility Components and Construction Activities

All applicable standards developed by the American Wind Energy Association and National Environmental Services Center (NESC) for wind energy facilities and transmission lines would be adhered to during construction and installation of the project. The proposed project would use standard construction and operation procedures as used for other wind farm projects in the western U.S. These procedures, with minor modifications to allow for site-specific circumstances, are summarized in the following sections.

A.3.1 Construction Schedule and Set-up

Wind farm construction entails the following activities:

- Surveying and staking;
- Constructing the intermodal rail facility (IRF);
- Constructing access roads;
- Clearing and grading staging areas;
- Constructing operations and maintenance building;
- Constructing wind farm internal resource roads and WTG pads;
- Excavating foundations;
- Trenching for underground utilities;
- Constructing reinforced concrete foundations for WTG towers, transformer pads, substations, and batch plants;
- Erecting WTGs;
- Placing underground electrical and communications cables in trenches and backfilling;
- Constructing overhead electric collection lines;
- Constructing transmission lines;
- Electrically connecting transformers and WTGs;
- Testing and commissioning;
- Final road grading, controlling erosion, and site cleanup;
- Interim reclamation; and
- Reclamation success monitoring.

A.3.1.1 Construction Schedule and Phasing

The proposed project would require four years to construct. Construction would occur when climatic conditions are favorable; therefore, construction would be seasonal (April through October) and would not occur during winter months. As a result, construction would generally occur for six months during the year. Because of the uncertainty of weather and delivery of special materials required for the project, the construction schedule is subject to revisions; BLM approval would be obtained prior to making schedule revisions. The exact location and timing of construction activities would remain flexible throughout construction of the project to accommodate seasonal wildlife avoidance areas (see **Appendix C**). PCW

would work with the BLM to determine where and when seasonal wildlife avoidance areas would be implemented.

In order to meet PCW's objectives to construct the Miller Hill area of the Sierra Madre site first while accommodating the seasonal wildlife avoidance areas, construction of the project would occur over four years. During Year 1 of construction, the following project components would be constructed: IRF, operations and maintenance facility, internal access roads within the Application Area, staging areas and batch plants in the Application Area, the water extraction site, and main transmission line road and towers. In Year 2 of construction, turbines in the western portion of the Sierra Madre site would be completed and turbine pads in the northern portion of the Chokecherry site would be constructed as well as additional staging areas, batch plants, substations, and transmission line roads and towers. In Year 3 of construction, turbines in the western portion of the Chokecherry site would be completed and turbine pads in the eastern portion of the Chokecherry site would be constructed as well as additional staging areas, batch plants, substations, transmission line roads and towers, and transmission line stringing. In Year 4 of construction, turbines in the eastern portion of the Chokecherry site and in the eastern portion of the Sierra Madre site would be completed as well as additional batch plants and substations. While the eastern portion of Sierra Madre is scheduled for completion in the final year of construction, this area of the project is furthest from the grid interconnection and involves the fewest number of turbines, and would be consistent with PCW's objectives.

Construction of roads, facilities, electric collection system, and communication lines would occur simultaneously within each phase. Construction activities that require the use of a crane would only be conducted during daylight hours. All other construction activities would occur during day and night work shifts. The work area would be lighted at night with portable lighting powered by a diesel-fueled generator. Road and foundation construction would begin in April and continue until completed, until compaction cannot be achieved due to frozen soils, or until construction activities become unsafe due to weather conditions (anticipated in October). Site work would resume in the spring of the following year as conditions allow.

Phased Construction Sequence Mitigation

BLM's review of the applicant's approach to construct the project over four years with all internal access roads constructed in the first year indicated that more surface disturbance throughout the Application Area would in the first year because of the road development, but most access roads would not be needed until subsequent construction years. This would ultimately delay reclamation of these areas. As a result, the BLM has developed a mitigation measure (GEN-1 in **Table C-4** of **Appendix C**) that would limit surface disturbance to areas where turbines would be constructed within 12 months with a goal to mitigate impacts from surface disturbance to wildlife, soils, water, and vegetation (e.g., weeds). This approach would result in four ROW grants issued for the project: 1) internal haul road in Phase I; 2) transmission line between the two sites in Phase I; 3) Sierra Madre in Phase II; 4) Chokecherry in Phase III. Mitigation measure GEN-1 would apply to all alternatives.

The mitigation would increase the construction length by six months. A breakdown of components built in each construction year is shown in **Table A.3-1**.

Table A.3-1 Facility Development Associated with Phased Construction Sequence Mitigation

Facility	Unit	Phase I (Year 0)	Phase II (Year 1)	Phase II and Phase III (Year 2)	Phase III (Year 3)	Phase III (Year 4)	Post-construction (Year 1)
Support							
Staging Areas	Count	1	1	2	2	--	--
Substations	Count	--	2	2	1	--	--
Concrete Batch Plants	Count	--	1	2	2	--	--
O&M Building	Count	--	--	1	--	--	--
Intermodal Facility	Count	1	--	--	--	--	--
Water Extraction Site	Count	1	--	--	--	--	--
Transportation Network							
Internal Haul Road	Miles	8	20	6	--	--	--
Water Extraction Site Access Road	Miles	12	--	--	--	--	--
Resource Roads	Miles	--	76	107	105	--	--
WTG							
WTG Pads	Each	--	297	317	386	--	--
WTG Installation	Each	--		297	317	386	--
Transmission							
Connection to Sierra Madre	Miles	--	--	20	6	7	--
Reclamation	Area	--	Phase I	Phase II	Phase II and III Year 2)	Phase III (Year 3)	Phase III (Year 4)

A.3.1.2 Construction Work Force

The work force would peak in August during the first year of construction, with 1,189 workers. Construction employees would be hired locally to the extent that is practicable. Approximately 20 percent of the work force would be from within the daily commuting distance of the project, depending on the availability of skill sets, and the remainder of the work force would be non-local. The number of workers on site would vary during construction, depending on the activities that are underway. At least 29 trades in the construction, electrical, and equipment operation fields would be needed.

Construction would occur April through October, with peak construction activity occurring during the summer and early fall. The construction schedule during each phase would consist of a 6-day workweek (Monday through Saturday) with two, 10-hour shifts per day for the first year and one, 10-hour shift thereafter. Estimated construction manpower is displayed in **Table A.3-2**. Additional off-site construction manpower would be required in Year 1 for road improvements outside the Application Area necessary to access the Project.

Table A.3-2 Estimated Total Workers per Month in Each Construction Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total Annual Worker-Months
Year 1	0	0	0	82	125	221	713	1,189	1,002	653	1	1	**3,987**
Year 2	1	1	1	476	924	1,039	917	860	688	620	89	28	**5,644**
Year 3	28	28	28	408	696	782	754	744	700	573	117	56	**4,914**
Year 4	55	55	55	441	757	818	653	645	569	532	152	83	**4,815**
Project Total													**19,360**

[1]Estimate based on an average of 60 hrs/week/worker.

A.3.1.3 Site Fencing and Access

Fencing currently exists throughout the Application Area, and there are no modifications proposed to the current location of fencing, other than those that may be proposed as part of mitigation measures. Permanent fencing would be installed and maintained around electrical substations, and turbine tower access doors would be locked to limit public access. Temporary fencing would be installed around staging areas, storage yards, and excavations during construction to limit public access. Public access in the Application Area would remain unchanged; however, some areas may be restricted to protect public safety and for security during construction and decommissioning.

A.3.1.4 Clearing and Grading

Before construction activities commence, the area would need to be cleared of trees and shrubs using a standard bulldozer, grader, brush hog, or other similar earth-moving equipment to allow for movement of construction traffic, operation of construction machinery, and placement of excavated materials during construction. Brush hogging would be used whenever reasonably feasible, as this method generally leaves the root mass of vegetation intact and can help to maintain soil stability within the work area. Trees, brush, other woody material, and rocks would be placed in a designated area for later use in reclamation. Grading would require that topsoil be locally stockpiled in accordance with the BLM-approved reclamation plan and that affected areas be reseeded after construction is complete. Topsoil storage areas would generally be located within staging areas and alongside roadways during construction.

Clearing, grading, and other disturbance of soil and vegetation would be limited to the minimum area required for construction. In most areas, clearing or grading of the transmission line corridors would be significantly less than the proposed temporary work area limits to reduce the potential impacts to existing resources. In addition, efforts would be made to overlap ROW disturbance with previous disturbance areas to the extent possible.

A.3.1.5 Staging Areas

Staging and storage areas would be located throughout the Application Area during construction. All staging areas would be located on private property. All staging areas would be enclosed by 8-foot chain-link fence topped with barbed wire and accompanied by a locked gate for security. No slating would be used on the security fences.

Within a typical 40-acre staging area, approximately 1 acre would be allocated for construction trailers and employee parking. The remaining acreage would be used for additional vehicle and equipment parking and storage of construction materials.

A.3.1.6 Concrete Batch Plants and Construction Materials

Central mix concrete batch plants are proposed within the CCSM site. All batch plants would be located within staging areas on private property; therefore, there would be no additional surface disturbance. The batch plants would be constructed on a concrete pad that would be 20 feet wide by 20 feet long by 1 foot deep. However, the entire concrete mixing and batch plant operations would use an area approximately 500 feet by 270 feet (or approximately 3 acres).

Equipment and structures that would be part of the batch plant include silos for storage of rock, mixers (either tilt-up or horizontal), cement batchers, aggregate batchers, conveyors, radial stackers, aggregate bins, cement bins, heaters, chillers, batch plant controls, and dust collectors (to control fugitive dust emissions). The concrete batch plants would not be more than 50 feet in height. The maximum operation per day per batch plant is 54,000 cubic feet (ft^3).

Concrete consists of sand, aggregate, water, and cement. The sand, aggregate, and cement would be obtained from a permitted off-site commercial source, and would arrive into the IRF, be transloaded and then trucked to the site and stored separately. The sand and aggregate storage piles would have a maximum surface area of 20,000 square feet each. At peak concrete production, sand and aggregate would be transferred to each batch plant at a rate of 16,875 ft^3 per day. At peak concrete production, cement would be transferred to each batch plant at a rate of 4,320 ft^3 per day. Water requirements are discussed in the next section.

Table A.3-3 displays an estimate of the equipment operating hours, including trucks, bulldozers, graders, and cranes, required to construct the roadways, erect turbines, and install transmission lines. The March 2009 POD presents additional detail of the equipment that would likely be used during construction of the project.

A.3.1.7 Water Requirements

The Application Area east of the Continental Divide is within the North Platte River watershed, and the portion west of the Divide is within the Little Snake River watershed. PCW expects to obtain 90 to 100 percent of all construction water from sources within the North Platte River watershed. The amount of water sourced from the Little Snake River watershed is not expected to exceed 10 percent of the overall construction water.

There are three major uses for water in conjunction with the construction of the project: concrete batching, dust control, and road construction (compaction). Potable water for use by the workforce would be brought in from an off-site commercial source, in either 5-gallon containers or smaller bottles, and stored in staging areas.

PCW would contract with The Overland Trail Cattle Company LLC (TOTCO) to supply non-potable water for construction, dust control, and other uses. TOTCO owns extensive agricultural water rights in the vicinity of the Application Area, both in the North Platte River Watershed and the Little Snake River Watershed. Such agricultural rights consist of stock watering, storage, and irrigation rights. The rights vary from senior territorial rights in Lake Creek and the North Platte River, to more junior ground water rights scattered throughout the Application Area. The TOTCO water rights exceed the anticipated project needs.

During operation of the project, water use would consist of potable water for the operations and maintenance building and dust control. For potable water for permanent office facilities, PCW intends to contract with either the Town of Rawlins or the Town of Sinclair. Up to 30 acre-feet of water annually would be required for dust control and road maintenance; however, use of other dust control measures would reduce this water requirement. Operations and maintenance water sources would be the same as anticipated for construction – approximately 90 to 100 percent from the North Platte watershed and up to 10 percent from the Little Snake River watershed. PCW also may enter into contracts with Rawlins or Sinclair for non-potable water for construction, dust control, and other uses if water is available, subject to mutually acceptable agreements. The source of water for the cities of Rawlins and Sinclair also is the North Platte River Watershed.

PCW has estimated the amount of water to be used would be between 450 and 600 acre-feet over the four-year construction period. The amount of water used depends upon the final configuration of the project, most specifically the length of roads required.

Table A.3-3 Estimated Total Construction Equipment Operating Hours per Month in Each Construction Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total
Year 1	0	0	0	39,477	51,344	56,553	81,767	117,133	71,972	46,338	17	34	**464,635**
Year 2	59	59	59	95,355	141,017	152,449	137,973	127,686	96,950	71,016	2,062	2,113	**826,798**
Year 3	3,133	3,133	3,133	66,836	98,168	105,451	99,731	98,252	76,753	67,421	2,079	2,146	**626,236**
Year 4	5,025	5,025	5,025	64,058	77,994	98,955	79,782	78,480	54,721	47,915	6,792	6,842	**530,613**
Project Total													**2,448,283**

Currently, PCW is considering obtaining the construction water necessary for the Sierra Madre site via groundwater wells. TOTCO has irrigation wells just east of Miller Hill with sufficient permitted capacity to supply this phase of the project. TOTCO would use existing irrigation wells or drill a new temporary well. These waters are tributary to the North Platte River.

For the Chokecherry site, PCW is evaluating the possibility of obtaining water service from Rawlins or Sinclair. If this is not possible and water is supplied by TOTCO, TOTCO would most likely establish a new temporary point of diversion from the North Platte River within Section 3 of T20N, R85W. Other options might include diversion off Sage Creek or wells within the Chokecherry area, which would be tributary to the North Platte River.

If water were diverted from the North Platte River, an access point would be located along the proposed access road adjacent to the North Platte River in T20N, Range 85 West Section 3. A 20-foot-wide loop road approximately 350 feet in length (approximately 0.2 acre of surface disturbance) would be constructed between the proposed access road and the river to allow several water trucks to pull off the access road, fill on-vehicle tanks, and return to the access road without disrupting other traffic. This loop road would have the same design characteristics as the post-construction operations and maintenance roads described in Section A.3.3. Two raised water storage tanks would be located adjacent to the river with a pump inlet located in the river. A cage would be placed over the inlet to reduce sediment drawn into the tanks and to prevent entrapment of fish. Water would be pumped from the river into the tanks, and then drawn from the tanks into water trucks by gravity. This arrangement would allow water trucks to drive under the tanks to refill and then drive away from the water filling station with minimal disturbance to the river shoreline. Design of any extraction pipeline would conform to the Canada Department of Fisheries and Oceans *Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), provided by the BLM.

If water would be obtained from TOTCO, TOTCO would seek to obtain from the WSEO a Temporary Use Agreement in TOTCO's agricultural water rights as provided under W.S. 41-3-25 110 through 112. If TOTCO obtains a Temporary Use Agreement of its agricultural water rights, the quantity of water transferred shall not exceed the amount of water historically diverted under the existing use. Furthermore, the historic rate of diversion and the amount consumed would not exceed that under the existing use, and historic return flows would be maintained and returned within the same reach of the North Platte River as has historically occurred. Re-timing of return flows is not anticipated at this time as water would be diverted and used during the historic irrigation season (April to October). The applicant has committed to these measures; therefore, there would be no additional depletions to the North Platte and Little Snake River watersheds as a result of the Temporary Use Agreement. Also, as this would not be a new demand, there should be no potential for injury to other appropriators. PCW and TOTCO have not yet entered into a WSEO Temporary Water Use Agreement or other appropriate agreement. Such agreement would be executed by the parties and TOTCO would file for the appropriate WSEO permits prior to project development.

Daily consumption in a given year would likely be relatively constant during the period of use, with perhaps a slight reduction in the final month of construction as activities begin to curtail. Daily consumption patterns would depend upon the water source. For those sources capable of supporting larger flow rates, consumption would occur during the work day. For sources with restricted flow rates, consumption may occur continuously to charge temporary storage tanks that would then be depleted during the work day.

If the options for obtaining construction water from TOCO-permitted wells or from the Cities of Rawlins or Sinclair are not practical, then some or all of the construction water necessary for the project would be obtained from the direct flow rights in the North Platte River. Withdraw of direct flow rights from the North Platte River would not exceed historic quantities under TOTCO's water rights.

A.3.1.8 Sanitation System

PCW would rent portable toilets from a local sanitation company. Portable toilets would be located in staging areas and throughout the Application Area where active construction is occurring and would be relocated when required. A typical portable toilet can serve up to 10 workers for a 1-week work period. As many as 122 toilets may be required on-site during the first year of construction. During maintenance phases, a portable toilet would be located at each electric substation site and serviced as necessary. The portable toilets would be replaced and serviced according to manufacturer's recommendations.

Based on the currently planned location of the operations and maintenance building, PCW expects to connect the building to the sewer systems of Sinclair.

A.3.2 Operations and Maintenance Building

Operations and maintenance would be accomplished through a Supervisory Control and Data Acquisition (SCADA) system from an operations and maintenance building.

Two sites are being considered for the operations and maintenance building. The first (currently preferred) location would be within the 244-acre IRF site in T21N, R86W, Sections 22 and 23. The alternate location for the operations and maintenance building would be within a 40-acre site located in T21N, R86W, Section 25 (**Figure A.3-2**). The operations and maintenance building would be 40 feet wide by 75 feet long by 16 feet in height next to a graveled staging/storage area approximately 5 acres in size.

A.3.3 Transportation Network

The following sections are based on information from the March 2009 POD (PCW 2009a) and the Preliminary Transportation Management Plan (PCW 2010b) for the revised Applicant Proposed Alternative.

A.3.3.1 Intermodal Rail Facility

Depending on the final WTG model selected, PCW proposes to construct an IRF for receiving shipments of WTG components. If an IRF were not constructed, then all WTG components would be transported to the Application Area via trucks and semi-tractors and trailers, and the area designated for the rail facility would not be developed. The IRF, if constructed, would be a new facility located within a 244-acre area adjacent to WY 76 in T21N, R86W, Sections 22 and 23 on land privately owned by TOTCO (shown in **Figure A.3-2**).

If constructed, the IRF would be built during the first year of project construction activities. The existing IRF in the City of Rawlins (the Rocky Express) would not be used to receive WTG components. Preliminary discussions are underway between PCW and UPRR regarding the location of an intermodal facility in Carbon County.

For the purposes of the analysis, it is assumed that the IRF would be constructed. It also is assumed that construction vehicles and material deliveries would all be routed from the proposed IRF to the internal project haul road (PCW 2010b).

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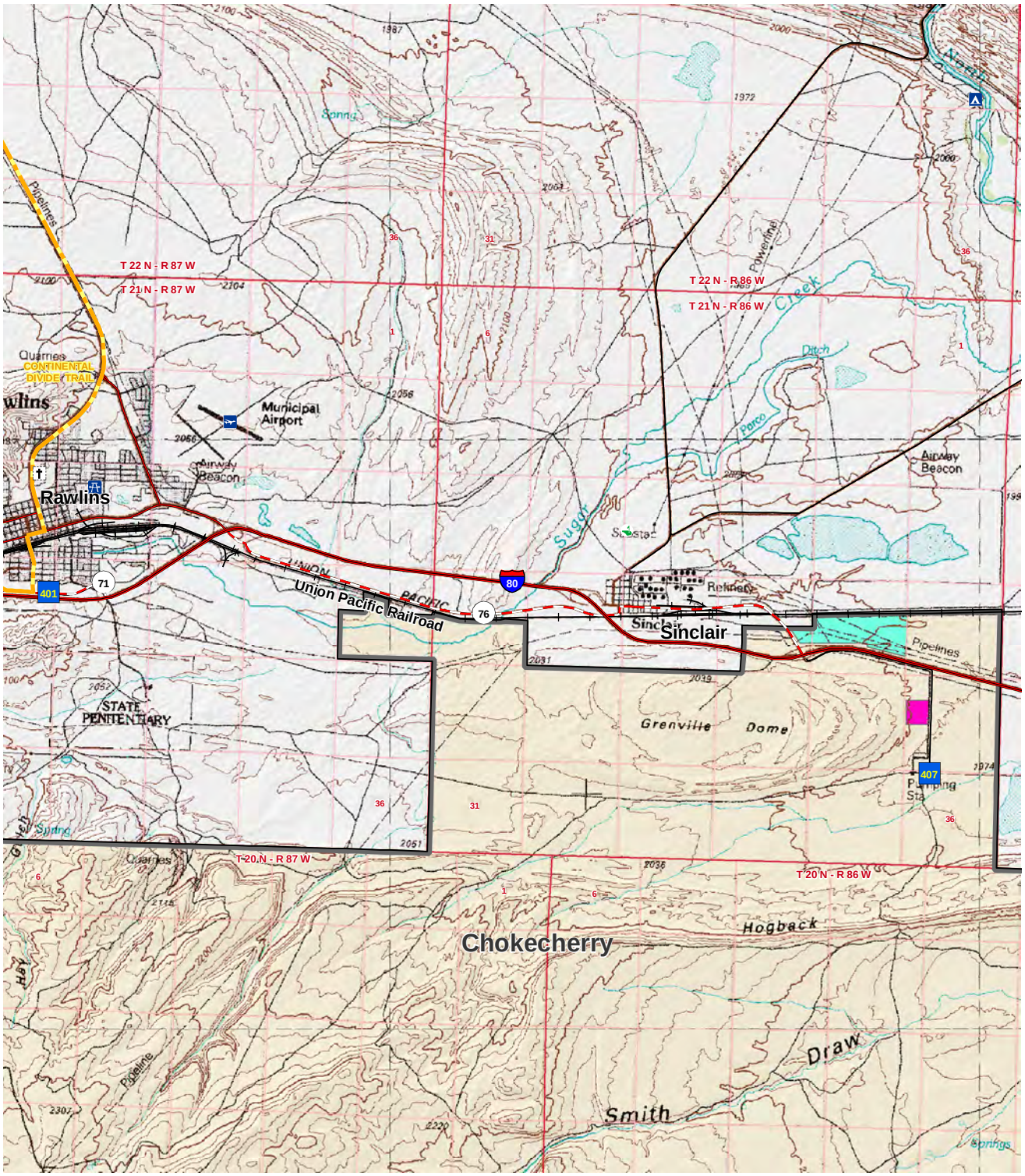

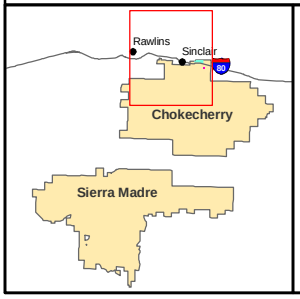

Legend

- Continental Divide Trail
- Application Area

Project Facilities

- Alternate O&M Facility
- Intermodal Rail Facility
- Historic Trail
- Interstate Highway
- U.S. Highway
- State Highway
- County Road
- Railroad

Chokecherry and Sierra Madre Wind Energy Project

Figure A.3-2

Potential Locations for the Operations and Maintenance Building and Intermodal Facility

0 0.5 1 2 Miles
0 1 2 3 Kilometers
1:100,000
N

A standard 80-foot flatcar would be used to hold the WTG components during transport. A total of 15 flatcars would be required to ship two turbines, which would be approximately 1,410 feet in total length. To transport the 1,000 WTGs proposed, a total of 125 120-car trains, each about 11,280 feet long without locomotives, would be required. At the intermodal facility, two 300-ton cranes would be required to unload the WTG components from trains onto trucks, semi-tractors, and trailers for transport to the Application Area. The final IRF would be designed with the following assumptions:

- All turbines would be shipped via rail;
- No more than 353 turbines would be delivered in any year (2,648 railcars per year);
- A delivery schedule would consist of seven months throughout the year (April to October);
- Nominally, the site configuration would have the capacity to store up to 304 turbines and parts;
- Additional turbines would be stored on site within project staging areas; and
- Parts would not be stored through the winter.

A.3.3.2 Access Roads

The purpose of the proposed access roads is to provide access to the CCSM sites from major roadways. Internal resource roads, discussed in the next section, would provide access to the WTGs and ancillary features (e.g., overhead electric transmission lines and substations) within the Application Area. The proposed access and internal resource roads allow the materials and equipment required for the construction of the project to be delivered to the site. These access and internal resource roads also would be needed to provide ongoing access to the sites for routine maintenance and repairs upon completion of construction and during decommissioning.

All construction materials are anticipated to be transported by rail to the IRF. If materials are not transported by rail, they would likely be transported to the access route using I-80. The very few vehicles anticipated to arrive from the north would be transported through Rawlins using US 287 bypass and travel I-80 east to the project access route at Sinclair. All heavy vehicles would be routed from the rail distribution center, across the I-80 overpass in the Town of Sinclair, to County Road 407 C.I.G. Road (CR 407 [C.I.G. Road]) where they would connect to the internal haul road. All WTG components would be hauled along internal access roads to their final locations. It is anticipated that the vehicles carrying the WTG components would be able to use the bridge over I-80. Due to the bridge's limited width, flaggers or a temporary traffic signal would be required whenever oversize vehicles cross the bridge, as well as during daily peak commuting periods and during material delivery. All materials are assumed to be delivered via rail, which would result in the heaviest movement being from the IRF on WY 76 across the I-80 overpass at Exit 221.

Materials destined for the Sierra Madre site would be transported along the project's internal haul road and would cross WY 71 to reach the western portion of the site. Flaggers or a temporary traffic signal would be needed at the crossing with WY 71 to reduce potential conflicts with traffic using WY 71.

New access locations that have direct access to WY 71 would follow WYDOT procedures for obtaining an access permit. The existing roads that are proposed as access locations may need to obtain a revised access permit due to the increase in the number of trips on the roadway. WYDOT requires that a Traffic Impact Study accompany all requests for access to a project that would generate more than 50 trips a day. A Traffic Impact Study would be completed for the project once the site plan and trip estimates have been finalized.

The approval of new or revised access permits by WYDOT would require that the access locations meet safety standards. Detailed analysis of each new or revised access permit would be conducted in conjunction with the WYDOT permitting process.

After the site access locations and proposed roadways have been finalized as part of the final project design, a Traffic Management Plan would be developed in coordination with WYDOT for traffic both on- and off-site. Through the WYDOT and Carbon County permitting processes, any required construction traffic mitigation to accommodate increased construction traffic, overweight loads, and oversized loads would be addressed. Such mitigation could include use of flaggers, relocating signs, and placing temporary paving. If excessive wear is evident during project construction, these road surfaces would be restored to their original condition upon completion of construction. Any roadway damage due to the transport of the heavy equipment would need to be repaired on the public roadways when the construction of the project is complete.

A.3.3.3 Internal Road Network

Internal resource roads would be located within the Application Area boundaries and would provide access to each WTG and ancillary features (e.g., overhead electric transmission line and substations) during construction, operation, and maintenance. All internal resource roads would be surfaced with gravel. The internal resource roads would be designed in compliance with the design criteria specified in the BLM Gold Book (BLM 2007) and BLM Manual 9113: Roads (1985). Drainage facilities would meet BLM design criteria and would be designed to provide the required level of protection for the WTG pads and roads during precipitation events.

The main objective of the road design would be to efficiently provide the required access to the WTGs by using existing roads or unimproved two track roads to the greatest extent possible and improved to Gold Book standards for intended use for this project. The limitations and movements of construction equipment and transport vehicles also would factor into the design. The internal road network would be developed while considering the following:

- Constructability constraints such as steep cliffs, narrow valleys, and waterways;
- Wind potential map and a wake effect buffer for each WTG of eight blade diameters in the prominent wind direction and three blade diameters perpendicular to the prominent wind directions;
- Maximum allowable grade of 10 percent due to the weights of the tower sections and nacelles, and the capability of the trucks and cranes; and
- Large turning radii in the roads to accommodate the lengths of the rotor blades.

Roads would need to be cleared and graded to a minimum width of approximately 60 feet to allow for a compacted roadway, plus a cleared shoulder, drainage, and top soil storage. Roads in steep areas could be up to 150 feet wide or more depending on cut-and-fill required for construction on slopes (i.e., the cut and fill slope required for the Miller Hill Road would be 1,000 feet, which is the largest required on the project). For the purposes of this analysis, disturbance associated with the construction of new roads is assumed to be 94 feet wide to provide the most conservative estimate of surface disturbance; however, the driving width of all roadways, except the main internal haul road, would be reclaimed to 20 feet. A 10-foot cleared shoulder would be constructed on each side of the road with a drainage ditch on the outside edge of the cleared shoulders, and a 6-foot-wide area for the storage of topsoil would be located on the outside edge of the drainage ditches.

Final roadway alignments would include erosion control measures to stabilize steeper slopes and to prevent loss of soil. These measures would include hay bales, shallow swales and ditches, rock riprap embankments, and culvert outlet protection. Final alignments would be ground-verified using BLM RFO knowledge of potentially problematic areas for road construction and maintenance. Since specific alignments have not yet been established, additional NEPA analysis would be required to analyze final site-specific siting and design.

Under all action alternatives, an internal haul road would be sited between the CCSM sites. All heavy hauls and delivery of equipment, supplies and materials are assumed to be routed on an internal haul road and not use WY 71/Sage Creek Road. The internal haul road is assumed to remain at full construction width during operations and maintenance. PCW would evaluate whether the haul road width may be reduced post-construction based on transportation and safety considerations.

A.3.3.4 Construction Traffic

Trucks and tractor-trailers would be used to transport equipment to the sites. Mobile cranes would be used for WTG erection. Two- and three-axled concrete mixers would be used to transport concrete to the site and pour foundations. Typical WTG construction involves 15 truck loads to deliver one complete WTG assembly (tower, nacelle, and rotor). The typical weight of the components ranges up to 165,400 pounds. Typical foundation construction involves 40 mixer truck loads to pour one 10,800 ft^3 foundation. Trucks would have an average load capacity of 270 ft^3 per truck. It also is assumed that construction vehicles and material deliveries would all be routed from the proposed IRF to the internal project haul road. Typical weights of the materials can range up to 200,000 pounds per truckload. These oversized loads would require special permits from WYDOT as well as escort vehicles from the IRF to the boundary of the Application Area.

Parking would be in designated areas that are located within staging areas. The number of vehicles associated with the work force depends on carpooling but it is estimated that there would be approximately two vehicles for every three employees. Within a typical 40-acre staging area, approximately one acre would be allocated for construction trailers and employee parking. The remaining acreage would be used for additional vehicle and equipment parking and storage of construction materials.

Construction traffic volumes would vary throughout the project duration. The volume and mix of vehicles would depend on the amount and type of work occurring at any given time. The peak traffic month would occur in August of Year 1 of construction. All traffic entering and exiting the Application Area is expected to come from the north. The highest traffic volume scenario assumes approximately 4,250 vehicle trips per day to and from the Application Area (August of Year 1) due to worker trips and off-site construction truck trips, such as aggregate, cement, and construction equipment trucks. Of the 4,250 trips to and from the Application Area each day in the peak month of Year 1, worker trips would account for approximately half (2,130 trips/day) with the remainder of the trips being construction vehicles (2,120 trips/day). Since it is undetermined where the workforce would be housed, it is assumed that the project work force would be housed outside of the project limits, requiring all workers to travel on public roads to and from the project each day. **Table A.3-4** presents the estimated number of construction traffic that could occur during the project.

Numerous pieces of heavy equipment would be transported to the Application Area. Articulated trailers and vans would be used to transport equipment to the project. Heavy equipment consists of WTG assembly haul trucks, graders, dozers, rippers, backhoes, and front-end loaders as well as mobile cranes that would be used for WTG erection. There would be nearly 700 truckloads of heavy equipment to the Application Area at the highest volume. Most of these pieces of equipment would be trucked to the Application Area over the course of the first few months of the construction season and hauled back out at the completion of the construction year. Once these pieces of heavy equipment are delivered to the Application Area, they would remain on-site for the duration of the construction season. While a relatively high number of trucks transporting equipment to and from the Application Area would occur over the course of several days at the start and end of the construction season, these volumes would be much lower than the everyday peak hour traffic volumes sustained throughout the season.

Table A.3-4 Off-site Project-generated Daily Construction Traffic (One-way Trips per day[1])

	Trip Type	Apr	May	Jun	Jul	Aug	Sep	Oct
Year 1	Trucks	206	228	268	2,817	2,122	1,641	83
	Aggregate	198	227	267	2,744	2,091	1,614	28
	WTG[2]	0	0	0	0	0	0	0
	Additional Const. Vehicle[3]	8	1	1	73	31	27	55
	Workers	83	117	269	1,350	2,129	1,867	1,230
	Total	**289**	**345**	**536**	**4,167**	**4,251**	**3,509**	**1,313**
Year 2	Trucks	198	766	379	627	383	249	240
	Aggregate	133	616	170	436	191	146	140
	WTG[2]	0	56	106	113	113	19	0
	Additional Const. Vehicle[3]	65	94	103	78	79	84	100
	Workers	846	1,638	1,839	1,624	1,523	1,217	1,099
	Total	**1,440**	**3,936**	**2,976**	**3,505**	**2,672**	**1,964**	**1,818**
Year 3	Trucks	361	291	368	319	347	206	118
	Aggregate	292	140	172	140	162	113	62
	WTG[2]	0	56	106	113	113	16	0
	Additional Const. Vehicle[3]	69	94	90	66	73	77	56
	Workers	790	1,297	1,452	1,401	1,383	1,306	1,081
	Total	**1,873**	**2,169**	**2,557**	**2,357**	**2,425**	**1,925**	**1,435**
Year 4	Trucks	198	284	292	428	254	75	47
	Aggregate	133	140	105	272	95	14	7
	WTG[2]	0	65	113	113	113	38	0
	Additional Const. Vehicle[3]	65	79	74	44	46	24	40
	Workers	913	1,472	1,581	1,288	1,274	1,140	1,074
	Total	**1,507**	**2,325**	**2,457**	**2,572**	**2,035**	**1,365**	**1,215**

[1] Each delivery to the site from the intermodal facility or other off-site location, and each trip by a worker employed on-site results in two one-way trips.

[2] Pilot cars not included. Each WTG would require 15 truckloads from off-site.

[3] Additional construction vehicles would consist mostly of deliveries other than WTG components and aggregate, such as rebar and cement. Water trucks would be required for all years of construction, but would not make external trips once the trucks are on-site. The only exception would be for the water needed in the Sage Creek Basin area, which would come from a well at the base of Miller Hill on the Sierra Madre site.

A.3.4 Electrical System

The project includes the construction of collector systems, double circuit overhead electric transmission lines, and electric substations to collect and interconnect the generated power from the project to a 500 kilovolt (kV) interconnection substation.

A.3.4.1 Collector System

The WTGs would be grouped into collector circuits based on the locations and the proposed road system. Collector lines would collect power output from 6 to 12 WTGs, depending on the location of the WTGs and the routes of the access roads. Once the “collector group” has been connected via underground cables, the collector line would proceed to the collector substation.

The collection system would be primarily underground unless geotechnical, environmental or electrical efficiency reasons require building overhead. Approximately 15 percent of the collection system could be overhead line construction.

In the medium-voltage system (34.5 kV), the WTG electrical system output would be collected with medium-voltage, high-density, insulated, underground cables. The medium-voltage cables would be installed underground adjacent to roads and connected to the collector substations where voltage would again be stepped up for delivery to the high-voltage (230 kV) transmission line. The collector system would be a three-phase system, which means that there are three 34.5-kV cables per circuit.

Trenching and Placement of Underground Electrical and Communications Cables

Electric collector lines would consist of 34.5 kV three-phase cables that would be direct-buried within the roadway shoulders in trenches of varying widths, depending on the number of circuits along that route, at a depth of 6.5 feet. Where electric collector lines are located along water crossings, the cables would be buried a minimum of 18 inches below the culvert. Communication and continuous grounding lines would be placed in the same trench. Cables would be buried to a depth of 6.5 feet, which considers typical freeze-thaw depths for the region so that the electrical system is not disturbed by any soil heaving during the annual freeze-thaw cycles. Cement stabilized sand may be used as a cable trench thermal backfill. Thermal backfill may be imported from an off-site, permitted commercial source. Then, native backfill would be used. No debris (e.g., brush, large rocks, refuse) would be buried during backfilling. Loose material in backfilled trenches would be compacted with a bulldozer.

Overhead Collector Lines and Communication Cables

An overhead exclusion zone would be required around each WTG, which would restrict placement of overhead facilities within a 300-foot radius from each WTG. The overhead exclusion zone is intended to keep overhead equipment away from the WTGs and to provide adequate space for laying down the WTG rotor assembly and assembling cranes for maintenance and repairs, if needed. Therefore, the collector system would generally operate as an underground circuit, since the collector lines originate from the base of every WTG. However, express lines, or “homerun” lines, could be overhead if they are in open areas away from the 300-foot WTG overhead exclusion zone. Overhead collector lines could be sited in areas with open terrain where WTGs would not be sited.

Depending on the location, a single-circuit line would have three lines attached to the pole. Most of the overhead line would be in areas where the configuration would be a double-circuit pole. The typical span length for the 34.5-kV line would be 300 feet. The poles would be wood or steel wood-pole equivalents, each buried approximately 10 feet deep (based on site conditions) and each being approximately 40 feet in height above ground. Where multiple double-circuit 34.5 kV lines occupy the same corridor, the collector lines would be spaced 40 feet apart on the centerline.

A.3.4.2 Padmount Transformers

The electrical system would be composed of low-voltage and medium-voltage subsystems. The low-voltage subsystem (approximately 690 volts) would consist of three-phase conductors that connect individual WTGs via underground cables to a padmount transformer and switchgear. Depending on the specific WTG configuration, the padmount transformer and switchgear may sit adjacent to the WTG tower or be enclosed inside the WTG tower. Transformer capacity would be 2,500- to 3,000-kilovolt amperes (kva) depending on the specific WTG.

If the transformer/switchgear equipment is not located inside the WTG tower, the equipment would be placed on a portion of the WTG pad and would be installed on a foundation set on structural fill. The type of foundation would depend on the requirements of the transformer/switchgear associated with the selected turbine and the soil conditions at each site. These concrete foundations could either be precast (i.e., manufactured off-site) or cast on-site. Where concrete foundations are cast on-site, the amount of concrete required would be one cubic yard or less, which is within the estimates for turbine foundations and truck trips. Transformer pad dimensions would be approximately 5 feet by 5 feet.

A.3.4.3 Substations

The collector substations convert the 34.5-kV collector voltage to 230 kV for transmission to the 500-kV interconnection substation. Each of the collector substations would have 30 to 36 collector circuits gathering output from the WTGs.

PCW has indicated that each 230 kV and collector substation would encompass a 15-acre footprint (800 feet by 810 feet) within staging areas. The 500-kV interconnection substation would encompass a 35-acre footprint. All substations would be sited within the 40-acre short-term construction and staging area footprints. However, final design, transportation, and safety considerations may require substations to be located separately from staging areas. If so, an additional 120 acres (40 acres for each of the three collector substations) of initial surface disturbance may be incurred. For analysis purposes, it is assumed that substations would be located separately from staging areas.

Riser poles for the 34.5-kV collector circuits at the substation connection point would have a pole-top, three phase switch (operable from the ground), wildlife boots (a protective covering over cable terminators), and lightning arrestors. Each electric substation would be secured with an 8-foot chain-link fence (grounded) topped with barbed wire and contain a locked gate entrance. No slating would be used on the security fences. High-voltage warning signs would be visibly posted around the substations.

A.3.4.4 Overhead Transmission Lines

A double-circuit 230-kV alternating current (AC) overhead transmission line would run from each collector substation to the 500-kV interconnect substation. The 230-kV lines are routed to avoid the 300-foot overhead exclusion area[1] around each WTG. Two types of structures are currently being considered for the 230-kV transmission line: double circuit steel poles with braced post insulator assemblies and double circuit steel poles with davit arms and vertical insulator strings. The steel pole structures would be 80 to 100 feet high and would be spaced approximately 900 to 1,400 feet apart. For analysis purposes, it is assumed that spacing would be 900 feet apart.

Single-pole structures would be constructed of weathering steel that would be delivered in several sections and assembled on site. The weathering steel would develop a dark brown patina once it has

[1] The 300-foot overhead exclusion area is a safe zone intended to keep overhead equipment away from the WTGs and to provide adequate space for laying down the WTG rotor assembly and assembling cranes for maintenance and repairs, if needed.

weathered. The weathering steel was selected because it blends in with many landscapes. The tangent structures would be direct-embedded in the soil with embedment depths ranging from 15 to 25 feet, depending on structure loadings and soil characteristics. Angle structures would require single concrete footings with anchor bolts. The piers would range from 5 to 10 feet in diameter and a depth of 25 to 30 feet.

Transmission Line Assembly and Construction Access

The construction ROW width for the overhead electric transmission line would be 300 feet, although not all of this area would be disturbed during construction. The 300-foot ROW is required for interim disturbance during construction, but long-term disturbance would consist of the transmission line and access road to allow for periodic maintenance and repair. The width of the transmission line access road would be 20 feet and would be constructed using the same design as for other project access roads.

Work areas would be required at each transmission line structure site to facilitate assembly of the structure and the safe operation of equipment and other construction activities. Transmission line structures would be located adjacent to the transmission line operations and maintenance road, and spur roads would be used where structures cannot be sited adjacent to the existing operations and maintenance road. A temporary 283-foot-long loop road, 20 feet wide, would be constructed around each structure site to provide equipment access to the structures. The work area would be cleared of vegetation only to the extent that it is necessary. Grading may be required to accommodate some structure sites in steep or rough terrain. The temporary construction areas would be located within the 300-foot transmission line ROW. At each structure site, a level spot would be needed for the crane to erect the structure. Excavations for the tower foundations would be made with a vehicle mounted power auger or backhoe, where the soil permits. In rocky areas, the foundation holes may be excavated by drilling, or special rock anchors may be installed. Spoils material would be spread on the ground or may be used in other portions of the Application Area if it meets reclamation standards. Concrete and anchor bolt foundations would be used for the transmission structures at angles. At each structure site, cast-in-place footings would be installed by placing reinforcing steel and anchor bolt clusters into the foundation hole, positioning the anchor bolt cluster, and encasing it in concrete. Spoil material would be used for fill, where suitable.

Once construction of the structures is complete, the temporary loop road would be removed and the temporary construction area would be reclaimed in accordance with the BLM-approved Reclamation Plan. The only remaining disturbance would be the tower footings.

After the transmission line structures are erected, transmission line pulling and tensioning would occur. Transmission line pulling and tensioning areas would be spaced approximately 2 miles apart along the transmission line route. These areas would be used as part of conductor installation. Mid-span pulling and tensioning sites would vary in size but would typically be 175 feet by 300 feet. Dead-end pulling/tensioning structure sites would be about 300 feet by 1,275 feet.

A.3.5 Wind Turbine Generators

Multiple turbine models are being considered for potential use in the project—Clipper C89, Fuhrlander FL2500, Gamesa G80, GE (1.5SLE, 1.5XLE, 2.5XL), RePower MM82, Siemens (SWT-2.3-93, SWT-2.3-101), and Vestas (V80, V90 [1.8 MW, 3.0 MW], V112). These turbine models were chosen based on the following criteria:

- A nameplate capacity of 1.5 to 3.0 MW;
- Meet requirements for construction in areas with Wind Resource Class 6 and higher; and
- Ability to withstand the expected temperature extremes and wind speeds.

Turbine models being considered for this project range from approximately 262 feet at the hub height to approximately 328 feet. The project may be constructed using a combination of turbine heights. However, additional studies are necessary before a final turbine selection could be made. For the purposes of the analysis, it is assumed that all turbine model sizes would be approximately 328 feet within the project alternative footprint. The final decision on the turbine model used would be based on the availability of turbine models and suitability for the wind regimes across the Application Area. Dimensions of a representative WTG model is provided in **Table A.3-5**.

Table A.3-5 Representative Wind Turbine Specifications

Turbine Specifications	Unit	Dimensions
Rated Power	MW	2.5
Rotor Diameter	ft	328.1
Standard Tower Height	ft	328.1
Tower Type		Tubular Steel
Standard Tower Color		5% Gray
Power Regulation		Pitch
Fixed/Variable Speed		Variable
Cut-In Wind Speed	ft/sec	11.5
Nominal Wind Speed	ft/sec	44.3
Cut-Out Wind Speed	ft/sec	82.0
Rotor Speed (min)	RPM	5.0
Rotor Speed (max)	RPM	14.0
Generator Type		PSM
Generator Voltage (60 Hz)	V	690
Generator Speed (min)	RPM	N/A
Generator Speed (max)	RPM	N/A
IEC Class		2A
Design 50-yr 10-min avg min	ft/sec	123.0
Design 50-yr 10-min avg max	ft/sec	139.4
Tip Speed (min)	mph	58.5
Tip Speed (max)	mph	163.9

The WTGs would be equipped with both aerodynamic and manual braking systems designed to shut down the blades during high wind conditions or in case of electric power failure. When not operating, the blades would be rotated so that the edges would face the wind, which would keep them from rotating independently and prevent damage to the units.

A.3.5.1 WTG Foundation Construction

The WTG component laydown areas (approximately 0.25 acre) within each pad site would be compacted sub-soil. The remainder of the WTG pad sites (1.25 acres for a total pad site size of 1.5 acres) would be brush-hogged to remove vegetation and debris from the laydown areas.

The WTG towers are typically 16 feet in diameter at the base and anchor-bolted to a concrete foundation that extends below the ground to support the tower. The type of foundation used would depend on the WTG model selected and the results of final geotechnical analyses.

Methods used for tower foundation excavation would vary depending on depth to bedrock. If no rock is expected, foundations at least 50 feet in diameter and at least 25 feet deep would be excavated with a high hoe or a trackhoe. The excavated material would be stockpiled adjacent to the site if it is suitable for use as backfill or hauled to a central area on-site for reprocessing using rock crushers and screening equipment. If rock is encountered near the final excavation depth, a backhoe would be equipped with a chisel point to remove bedrock. After excavation, the bottom of the foundation would be formed and poured. If bedrock is present, then it may be more cost effective and more stable to drill anchors into the bedrock rather than construct reinforced concrete foundations. Due to a lack of geotechnical information at this programmatic level, it is unclear as to whether blasting may be required. If it is determined that blasting is required, the preliminary blasting plan (dated February 23, 2010) would be updated into a comprehensive blasting plan for further coordination with the BLM and other permitting authorities. The design specifications for foundations, WTGs, and towers would be finalized prior to subsequent site-specific NEPA analysis. For the purposes of analysis, the largest foundation (10,800 ft^3 spread footing foundation) is considered in this EIS.

A.3.5.2 Tower and Turbine Assembly and Erection

Tower and turbine locations would be flagged and staked. Approximately 1.5 acres around each WTG location would be brush-hogged to remove vegetation and debris from the laydown areas that would interfere with the storage, assembly, and installation of WTGs, electric transmission line towers, or substations. **Figures A.3-3** and **A.3-4** display a typical wind farm construction site. **Figures A.3-5** and **A.3-6** display a typical WTG pad site during and post construction.

Towers, blades, and nacelles would be delivered by truck, rail, or a combination of both, transported on-site with trucks, semi-tractors, and trailers and unloaded within each WTG pad using various size cranes. Other components would be stored in staging areas. The four-piece tubular tower sections would be assembled onto the foundation using various crane sizes. The nacelle would then be installed on top of the tower. The blades would be mounted onto the rotor hub on the ground before the rotor assembly is mounted onto the nacelle. Each WTG would require the use of 7 to 8 large cranes to erect. However, due to the rate of part delivery and construction phasing, no site pad would require more than two cranes at any given time. The large cranes would then proceed to the next WTG site.

The FAA regulations require that the administrator be notified of any “construction or alteration of more than 200 feet in height above the ground level at its site” (14 CFR § 77.13[a][1]). Notice is required at least 30 days before the earliest of: (1) the date the proposed construction is to begin; or (2) the date an application for a construction permit is to be filed (Id. at § 77.17[1] & [2]). PCW would comply with these notification requirements and notify the FAA by completing a Notice of Proposed Construction or Alteration Form (FAA Form 7460-1) and submitting it to the Obstruction Evaluation Service (OES).

Figure A.3-2 Typical Wind Farm Construction

Figure A.3-3 Typical WTG Assembly

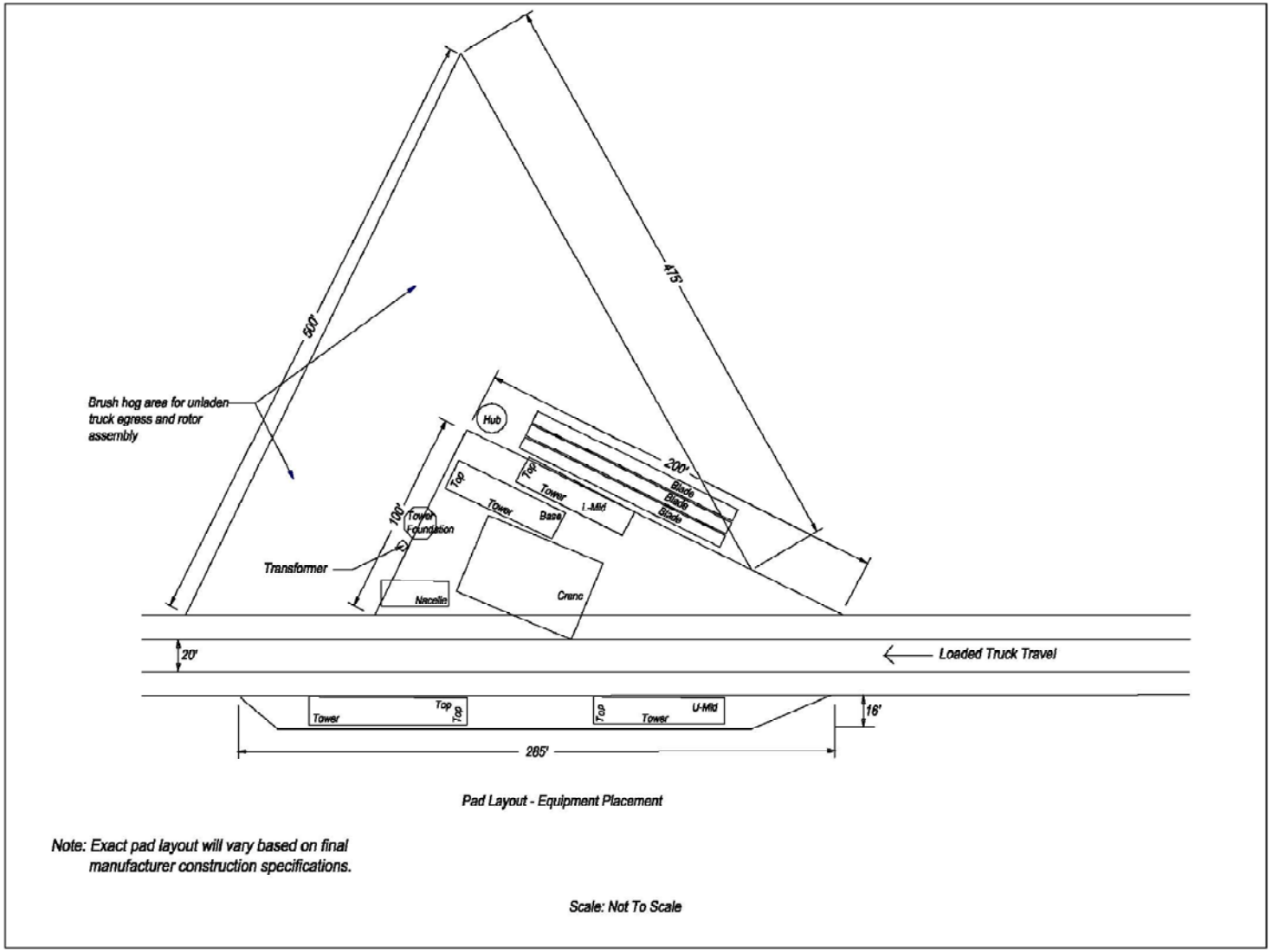

Figure A.3-4 Typical WTG Pad Layout during Construction

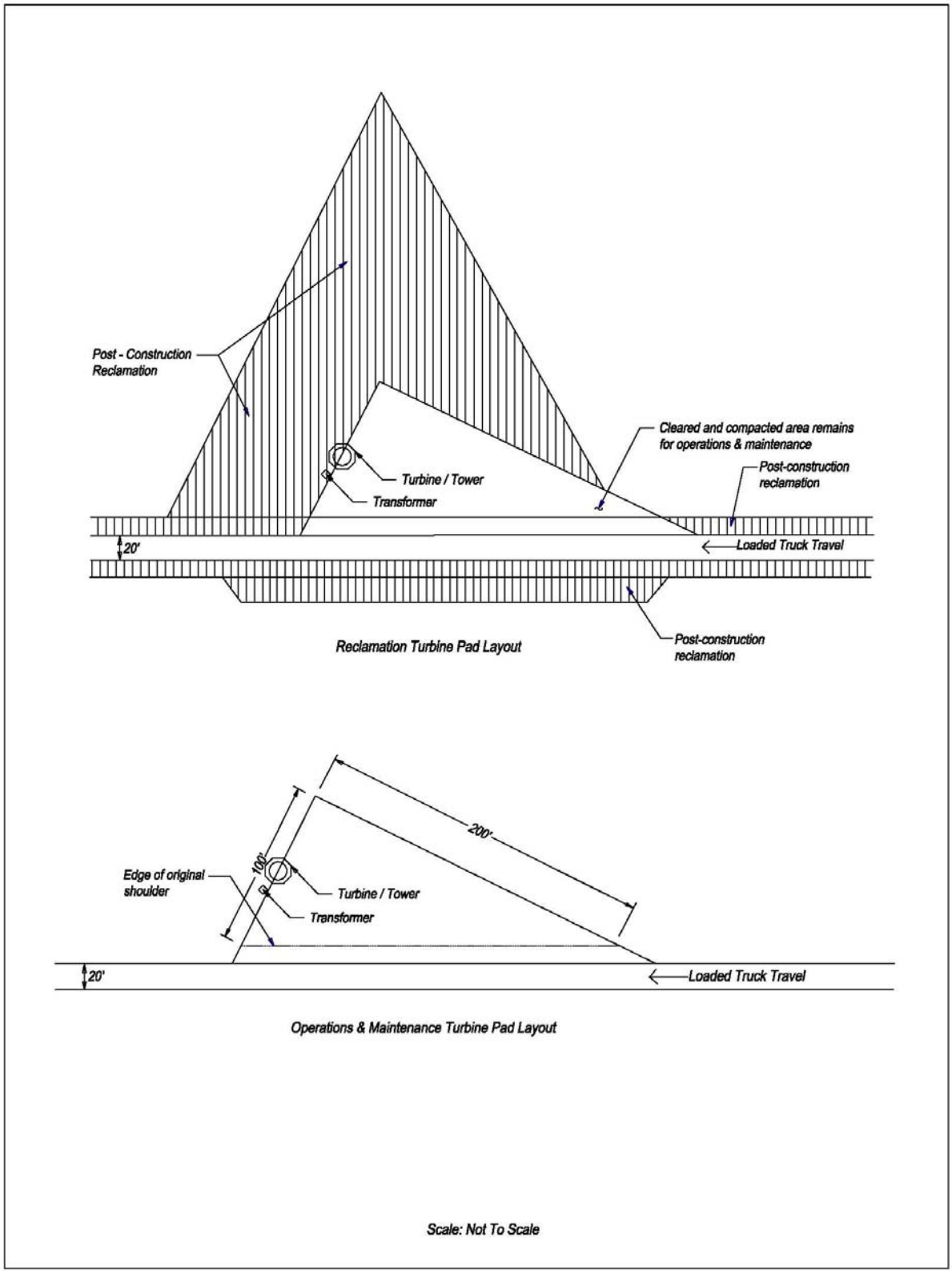

Figure A.3-5 Typical WTG Pad Post Construction

A.3.5.3 WTG Painting and Coating

Turbine towers, nacelles, and rotors would be painted a 5 percent gray color (the manufacturer's standard color) to comply with FAA requirements. Each of these components would be painted or coated prior to transportation to the site. WTG models that are being considered for use in this project would not require recoating for the life of the project. The padmount transformers and other ancillary structures would be painted a color that blends with the surroundings.

A.3.5.4 Wind Turbine Lighting

Towers would be lighted according to FAA requirements (Advisory Circular 70/7460-1K), entitled "Obstruction Marking and Lighting"). The current FAA requirements mandate a white strobe during daylight hours and a red strobe during nighttime hours. Daytime lighting of wind farms is not required, as long as the WTGs are painted a bright white or light off-white color. If darker paint is used, WTG marking may need to be supplemented with daytime lighting. Obstruction lights should not have unlighted separations or gaps of more than 0.5-mile and lights should flash simultaneously. The light fixtures would need to be placed as high as possible on the turbine nacelle so that they are visible from 360 degrees. The FAA has an administrative procedure that allows for petition of only lighting the perimeter WTGs and a select group of internal WTGs. The FAA would make the final determination regarding the exact number and locations of the towers that would be lighted and the specific lighting design to be used. PCW would request approval of lighting consistent with the FAA guidelines, including: 1) lighting of the perimeter turbines; 2) lighting of interior turbines only as necessary; 3) no daytime lighting; and 4) desirable color of lighting.

A.3.6 Interim Reclamation and Long-term Disturbance

Interim reclamation involves reclamation of all areas remaining after construction is complete. Final reclamation (discussed in Section A.5.5) would occur after the life of the project. In consultation with the BLM, PCW would implement a project-specific Reclamation Plan developed in accordance with BLM policy concurrent with the FEIS. This project would comply with the Wyoming Reclamation Policy (IM WY-2009-022), the Rawlins RMP and FEIS reclamation plan (BLM 2008, Appendix 36), the *Record of Decision for Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments* (BLM 2005), and various other applicable planning and management guidelines, policies, documents, and regulations.

Once construction of the facilities is complete, the cleared shoulders and drainage ditches on either side of the roads would be revegetated from a 40-foot width to a 20-foot driving width, but the shoulders would not be recontoured. The internal haul road would remain at a 40-foot width. WTG pads would be reclaimed and restored to a 0.25-acre cleared area around each WTG for future access during routine maintenance and repair activities. The construction area for the transmission lines and substations also would be reclaimed in accordance with the BLM-approved project-specific Reclamation Plan. During maintenance requiring a crane (estimated at 12 occurrences per year on average), wind turbine access roads may need to be temporarily re-disturbed from 20-foot-back to 40-foot-wide to allow for crane transport. This would result in approximately 2.4 acres per mile of widened roadway. In addition, wind turbine pad locations would be temporarily expanded from the 0.25 acre of long-term disturbance to up to 1.5 acres (an increase of 1.25 acres) for the crane and support equipment to perform the repairs. Disturbance associated with extraordinary maintenance (roads and pads) would be re-vegetated at the completion of the maintenance activity.

A.4 Operations and Maintenance

Once the project is fully functioning, on-site personnel would operate and maintain the wind energy facilities. Operation of the project would require up to 112 to 114 full-time employees to maintain roads, service turbines, and maintain the transmission lines. The operations and maintenance personnel would

be hired from the local labor pool to the maximum extent practicable. The majority of the employees would be full-time over the calendar year and throughout the anticipated life of the project.

Permitted land uses such as grazing would still occur in the Application Area. Operations and maintenance practices would continue to adhere to the applicant-committed BMPs as outlined in **Appendix C**.

It is anticipated that the majority of traffic to and from the project would involve daily trips between on-site operations and the operations and maintenance facility currently expected to be located south of CR 407 (C.I.G. Road) in Section 31, T21N, Range 86 West. The majority of the trips would include traveling to the operations and maintenance facility during the morning peak, where it is anticipated that the majority of the maintenance equipment for the workers would be staged. Once the workers reach the staging area, most of the trips would be on-site for the remainder of the workday until the evening peak, when the workers would be leaving the site. As an estimate, it was assumed that each employee would make three external trips per day to and from the site. Assuming 113 employees per day, this would result in approximately 340 trips per day to and from the site, with the majority of the trips occurring in the peak morning and evening periods.

A.4.1 Turbine Commissioning and Final Testing

The commissioning of one WTG can take place while other WTGs are under construction; however, it is important to have the substation and collector system energized and working properly prior to commissioning. Depending on the manufacturer and the turbine type selected, commissioning of a WTG would take from one to three days. Final testing of the wind facilities would involve mechanical, electrical, and communications testing and inspections to ensure that all systems are working properly. All installations and inspections would be in compliance with applicable codes and standards.

A.4.2 Project Maintenance

Maintenance would occur as necessary or as specified by the equipment manufacturer, when climatic conditions permit. Inspections of the facilities would occur as necessary to fulfill federal, state, and local policies. When access is required for maintenance and repairs, the same precautions identified for the construction of the project would be followed. Crews would be instructed to protect livestock, vegetation, wildlife, and other resources of significance. Maintenance of the project facilities would consist of routine maintenance, non-routine maintenance, and exceptional maintenance, each of which is described in the following subsections.

A.4.2.1 Routine Maintenance

Routine maintenance of the WTGs would be necessary to optimize performance and to detect potential malfunctions. Routine maintenance would consist of WTG oil changes, lubrication, rotor blade washing, and other scheduled activities that are required to keep the turbines in operating condition. The amount of oil for each WTG is scaled according to the size of the WTG. A 2-MW WTG requires 80 gallons of oil, a 2.5-MW WTG requires 100 gallons of oil, and a 3-MW WTG requires 120 gallons of oil. The exact schedule of routine maintenance would depend on the WTG model selected, but is expected to occur approximately every 6 months. Based on the lubricating oil requirements of a 3-MW WTG, routine maintenance of the WTGs would generate an estimated 240,000 gallons of used oil on an annual basis. In addition, the used oil would have to be replaced with new oil, which would require the storage of bulk oil (new) at the operations and maintenance facility. There would be four 11,875-gallon aboveground storage tanks at the operations and maintenance facility used for storage of both new and used lubrication oil. Used oil would be disposed of at an authorized facility in accordance with applicable legal requirements.

The transmission lines would be inspected two times per year by ground or aerial patrols, and maintenance would be performed as necessary. Substation maintenance activities would include routine, scheduled equipment maintenance and grounds keeping.

Road Maintenance

As part of the routine maintenance activities, the internal resource roads would be maintained in a condition that allows for continued access to the WTGs. Road maintenance activities would incorporate existing BLM standards regarding road maintenance consistent with those described in the BLM Manual 9113: Roads (BLM 1985) and the Surface Operating Standards of Oil and Gas Exploration and Development (BLM 2007) (i.e., the Gold Book). All roads would be maintained in a safe and environmentally responsible manner.

Project operation would require the use of the new roads for equipment and personnel to reach the WTGs. In addition, an access road that runs adjacent to each WTG site and the project substations would be used. The access roads would provide vehicular access to the following facilities:

- Each WTG;
- Meteorological towers;
- Substations;
- Operations and maintenance building; and
- Transmission line structures.

Most road maintenance would be performed on an as-needed basis. The frequency and type of maintenance that is required would be determined by routine inspections. The inspections would be performed on a regular basis and following snowmelt or heavy or prolonged rainfall. Inspections would identify maintenance needs for reduction of ruts and holes, maintenance of crowns and outslopes to keep water off the road, replacement of surfacing materials, clearing of sediment blocking ditches and culverts, maintenance of interim reclamation, and noxious weed and invasive plant species control. The maintenance program would ensure that maintenance operators have proper training and understand the road maintenance objectives and requirements.

To mitigate fugitive dust, road surfaces would be watered or otherwise treated with BLM-accepted dust control measures. These treatments would occur on an as-needed basis, depending on weather conditions and the amount of traffic on the road.

Snow plowing would take place on an as-needed basis in accordance with BLM approval. The following standard stipulations are typically included as a part of ROW grants:

- When snow removal from the road is undertaken, equipment used for snow removal operations shall be equipped with 6-inch shoes to keep the blade six-inches off the road surface. Holder shall take special precautions where the surface of the ground is uneven and at drainage crossings to ensure that equipment blades do not destroy vegetation.
- No new surface disturbance, which includes blading or plowing of the soil, will be allowed. If surface disturbance does occur during the snow removal process, Company must notify the BLM RFO. With any and all surface disturbance, a Class III cultural survey of the disturbed area will be required.
- No new surface disturbance, which includes blading or plowing of the soil, will be allowed to occur during the snow removal process. However, if disturbance does occur reclamation of this area will be required.

A.4.2.2 Non-routine Maintenance

Non-routine maintenance would consist of any unscheduled repair activities where the use of large cranes is not required. Non-routine maintenance may consist of WTG heater replacement, WTG fan replacement, rotor blade patching, brake repairs, yaw system repairs, or belt replacement. Any emergency maintenance would involve prompt movement of crews to repair or replace any damaged equipment.

A.4.2.3 Exceptional Maintenance

Exceptional maintenance activities would be any repair that requires large equipment (i.e., 600-ton cranes). To accommodate large cranes, the roads immediately adjacent to the WTG pad where the maintenance is required would need to be reconstructed to the 40-foot construction width. Exceptional maintenance may include rotor assembly replacement, single blade replacement, drivetrain replacement, generator replacement, or nacelle gearbox replacement. Exceptional maintenance may take place during adequate weather conditions year round.

A.4.2.4 Maintenance Frequency and Equipment

Routine maintenance activities would be regularly scheduled. Non-routine maintenance and exceptional maintenance would be conducted as the need arises. **Table A.4-1** presents the anticipated frequency that maintenance activities would occur and the number of man-hours required for each type of repair. It is estimated that 10,553 equipment operating hours would be needed for operations and maintenance activities in the summer months and 7,469 equipment operating hours would be needed in the winter months.

Table A.4-1 Anticipated Frequency of Repairs and Required Repair Hours

Component	Anticipated Number of Failures per Year	Crane Required	Crane Hours per Event	Manhours per Event
Blade Patching	50	No	0	70
Blade Replacement	3	Yes	120	39
Drivetrain	3	Yes	120	123
Gearbox	3	Yes	120	93
Generator	3	Yes	120	20
Brakes	5	No	0	8
Yaw System	3	No	0	8
Switch Gear Cabinet	4	No	0	8
Transformer	1	No	0	8

A.5 Decommissioning

The requested ROW grant is for a term of 30 years with the option to renew the ROW grant and upgrade the wind facility, as necessary. The major components of WTGs are modular, and thus, can be removed, replaced, or upgraded as necessary without extensive cost. However, at such time that decommissioning becomes necessary, all facilities (e.g., towers/turbines, electrical network, and upper 2 feet of foundations) would be removed and recycled, to the extent practicable. Unsalvageable materials would be disposed of in an approved disposal facility. Ground disturbance associated with

complete decommissioning of the project would be similar to the ground disturbance associated with construction of the project.

In the event the project requires decommissioning, the following sequence would be used for removal of the components:

- Remove WTGs and meteorological towers;
- Partially remove WTG foundations;
- Remove above-ground electrical network;
- Remove electric substations;
- Remove operations and maintenance building; and
- Reclaim access roads (unless requested otherwise).

Decommissioning of the project facilities is expected to take three years, primarily during April to October, and would have similar equipment and workforce requirements to construction of the project. The estimated amount of total workforce is provided in **Table A.5-1** and total equipment operating hours required is provided in **Table A.5-2**.

Construction traffic volumes would vary throughout the decommissioning of the project. The majority of the trips generated would be due to hauling the large turbine components off-site. The total number of daily trips to be generated in the peak month is expected to be approximately 1,085 trips (50 percent in, 50 percent out). The total manpower required for the project decommissioning in the peak construction month would generate approximately 740 trips per day. The total number of off-site construction truckloads would be approximately 345 trips per day. The total truckloads also include the pilot cars required to accompany each oversized load. It was estimated that 75 percent of the WTG truckloads would require two pilot cars apiece. **Table A.5-3** displays the estimated roundtrip traffic volume during the peak month of decommissioning. Any roadway damage due to the transport of the heavy equipment would need to be repaired on the public roadways when the decommissioning of the project is complete.

A.5.1 Tower and Turbine Removal

Removal of the towers and WTGs would involve a process that is similar to construction. Equipment and personnel needs would be comparable to construction, as would disturbance areas. Approximately 1.5 acres per turbine pad location would be necessary, and access roads would need to be rewidened to construction widths. Dismantling would occur in reverse order of construction, and materials would be salvaged or recycled to the maximum extent practical. Control cabinets, electronic components, and internal cables would be removed.

The rotor, nacelle, and tower sections would be lowered to the ground where they may be transported for reconditioning and reuse, or disassembled/cut into more easily transportable sections as salvageable, recyclable, or disposable components. Those parts that cannot be refurbished and reused, or recycled, would be disposed of in an approved disposal facility after all fluids have been removed. The WTG tower and nacelle would yield approximately 80 percent salvageable materials that can either be reused or recycled. The blades are made primarily of fiberglass, so if they cannot be reused elsewhere they would be disposed of in the proper facilities. All meteorological towers also would be removed and reused or recycled.

Table A.5-1 Estimated Total Workers per Month in Each Decommissioning Year[1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total
Year 1	0	0	1	193	321	335	335	332	174	271	0	0	1,962
Year 2	0	0	1	180	314	327	327	327	300	271	0	0	2,047
Year 3	0	0	1	249	394	400	394	394	347	309	0	0	2,488
Project Total													**6,497**

[1]Estimate based on an average of 60 hours/week/worker.

Table A.5-2 Estimated Total Construction Equipment Operating Hours per Month in Each Decommissioning Year

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total
Year 1	0	0	117	31,128	55,903	47,952	47,952	47,059	39,564	39,334	0	0	309,009
Year 2	0	0	117	35,148	48,838	51,970	51,970	51,077	43,582	43,352	0	0	326,054
Year 3	0	0	117	52,560	66,311	69,382	69,382	68,489	60,993	41,928	0	0	429,162
Project Total													**1,064,225**

Table A.5-3 Peak Daily Trips During Decommissioning Month[1]

Trip Type	Project Roundtrip Total
Total Manpower (Regular Shift)[2]	370
Turbine Truckloads	56
Pilot Cars[3]	84
Other Construction Truckloads[4]	32
Total Roundtrips	**542**

[1] Peak month of construction is indicated as July of Year 1 in Decommissioning. All trips indicated are roundtrips. Monthly trip estimates assume 24-day work month.

[2] There would be nearly 370 workers on-site during the peak decommissioning month (July of Year 1).

[3] Up to 75 percent of WTG truckloads would require two pilot cars.

[4] Additional construction vehicles would consist of water trucks, crane equipment trucks, etc.

A.5.2 Foundation Removal

Foundations would not be completely removed upon decommissioning of the project; rather, they would be removed to just below the surrounding ground surface (approximately 2 feet or per current industry standard) and backfilled. To completely remove the foundations would require additional surface disturbance, off-site disposal or recycling of the foundation materials, and import of fill for the resultant holes.

Removal of the top portion of the foundations would involve equipment and personnel to break and excavate concrete, then backfill and re-grade the surface to approximate pre-disturbance contours. Concrete would be broken up and recycled for use as material for roads, to the maximum extent practicable, or disposed of in an approved disposal facility. Upon completion of foundation removal, all disturbed areas would be backfilled using local soil/topsoil and reclaimed in accordance with the BLM-approved Reclamation Plan.

A.5.3 Electrical Network Removal

Assuming that the transmission lines would not be used for other potential developments, all transmission line components would be removed. Removal of the electrical network (e.g., transformers, electric collection system, substations, and overhead transmission lines) would involve a similar process as construction, with similar equipment and personnel needs. Disturbance areas equal to those needed during construction would be required to remove the electrical network. Components of the electrical network would be dismantled in reverse order of construction, and materials would be salvaged or recycled to the maximum extent practicable or disposed of in an approved disposal facility. Any underground electrical cables would be left in place. Following dismantlement, all storage facilities and substations would have an inspection for the presence of industrial contamination from minor spills or leaks. If any are found, decontamination would be done in full compliance with applicable regulations in place at that time.

A.5.4 Access Roads Removal

Once all materials have been removed from the site, the access roads would be reclaimed in accordance with the BLM-approved Reclamation Plan, unless the BLM and/or the landowner prefer they stay in place. Previously existing roads would be reclaimed to the original widths and new roads would be removed and reclaimed. All gravel would be removed and either reused or disposed of in the proper facilities.

Reclamation would include regrading (including de-compacting soils), spreading topsoil, and revegetating all disturbed areas. Once the roads have been removed, or the width has been reduced, the area would be reclaimed according to the BLM-approved Reclamation Plan.

A.5.5 Final Reclamation and Abandonment

Final reclamation would occur upon decommissioning of the project, which may be 30 years or more after completion of construction. Interim reclamation of all areas remaining after construction is complete is discussed in Section A.3.6. All reclamation (interim and final) would conform to the requirements outlined in a project-specific Reclamation Plan developed in accordance with BLM policy concurrent with the FEIS.

At the end of the project's useful life, the owner/operator would obtain the necessary authorizations from the appropriate regulatory agencies to decommission the facilities. Upon decommissioning, all facilities would be removed and recycled, as detailed in the above sections. Unsalvageable materials would be disposed of in an approved disposal facility. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed and would include re-grading (including de-compacting soils), spreading topsoil, and re-vegetating all disturbed areas. Detailed final reclamation procedures would be developed by the operator using appropriate techniques consistent with industry standards at the time.

Final reclamation equipment and personnel requirements are expected to be similar to the requirements for construction reclamation. Initial reclamation would follow the three-year decommissioning by one year. It is anticipated that successful reclamation can take up to five years. The estimated amount of total workforce is provided in **Table A.5-4** and total equipment required is provided in **Table A.5-5**.

Table A.5-4 Estimated Total Workers per Month in Each Final Reclamation Year[1,2]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total
1	0	0	0	0	0	0	0	32	32	32	0	0	96
2	0	0	0	32	32	32	32	19	19	19	0	0	185
3	0	0	0	16	16	16	16	17	17	17	0	0	115
4	0	0	0	8	8	8	8	11	11	11	0	0	65
5	0	0	0	0	0	0	0	12	12	12	0	0	36
6	0	0	0	0	0	0	0	12	12	12	0	0	36
7	0	0	0	0	0	0	0	9	9	9	0	0	27
8	0	0	0	0	0	0	0	3	3	3	0	0	9
9	0	0	0	0	0	0	0	1	1	1	0	0	3
Project Total													**572**

[1] Reclamation is anticipated to take a total of 9 years consisting of the 3-year decommissioning, 1 year of initial reclamation, and up to 5 years for successful reclamation.

[2] Estimate based on an average of 60 hrs./week/worker

Table A.5-5 Estimated Total Construction Equipment Operating Hours per Month in Final Reclamation Year

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual Total
1	0	0	0	0	0	0	0	7,680	7,680	7,680	0	0	23,040
2	0	0	0	7,680	7,680	7,680	7,680	4,560	4,560	4,560	0	0	44,400
3	0	0	0	3,840	3,840	3,840	3,840	4,080	4,080	4,080	0	0	27,600
4	0	0	0	1,920	1,920	1,920	1,920	2,640	2,640	2,640	0	0	15,600
5	0	0	0	0	0	0	0	2,880	2,880	2,880	0	0	8,640
6	0	0	0	0	0	0	0	2,880	2,880	2,880	0	0	8,640
7	0	0	0	0	0	0	0	2,160	2,160	2,160	0	0	6,480
8	0	0	0	0	0	0	0	720	720	720	0	0	2,160
9	0	0	0	0	0	0	0	240	240	240	0	0	720
Project Total													**137,280**