Glenrock I, Glenrock III, and Rolling Hills Wind Energy Facilities

Eagle Conservation Plan

PacifiCorp

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1.0 Introduction

Wind energy is one of the fastest growing sources of renewable energy in the United States, and is generally viewed as an environmentally friendly alternative to nuclear and fossil fuel power plants (American Wind Energy Association [AWEA] 2008, National Research Council [NRC] 2007). Development of wind energy is strongly endorsed by the Secretary of the Interior and is one of the Department of Interior's highest priorities (US Fish and Wildlife Service [USFWS] 2003b, Bureau of Land Management [BLM] 2013). Energy from wind-powered generation resources serves an important role in meeting PacifiCorp's loads, which includes Wyoming consumers. In addition, wind energy enables PacifiCorp to meet its renewable portfolio standards, and applicable federal Green House Gas goals and objectives.

PacifiCorp has developed this Eagle Conservation Plan (ECP) for the Glenrock I, Glenrock III, and Rolling Hills Wind Energy Projects (the "Project", "GRH Wind Energy Facility" or "Site") located in Converse County, Wyoming to support an application for an eagle incidental take permit for bald and golden eagles. The ECP provides the information and analyses necessary for the U.S. Fish and Wildlife Service (USFWS) to consider issuance of eagle take permits for the Project subject to the National Environmental Policy Act (NEPA). Additionally, PacifiCorp is required to apply for an eagle take permit under the Project's Migratory Bird Compliance Plan (see section 1.1). The ECP provides detailed information on siting, configuration, construction, and operation for the Project. Actions taken that promote minimization of eagle take are highlighted with the goal of minimizing eagle take to the maximum extent practicable. The ECP supports an application for an incidental take permit for bald and golden eagles and commits to compensatory mitigation that meets the statutory preservation standard for golden and bald eagles. PacifiCorp applies the principles in its RESPECT policy to guide the company's corporate commitment to the environment (Appendix A). That commitment is reflected in this Eagle Conservation Plan (ECP) for the Project.

The 2013 USFWS Eagle Conservation Plan Guidance, Version 2 (ECPG, 2013b) provides guidance for conserving bald and golden eagles during siting, construction, and operations of wind energy facilities through a staged approach similar to the tiered approach in the 2012 USFWS Land-based Wind Energy Guidelines (WEG, 2012). Additionally, USFWS Region 6 has developed a regional guidance memo "Final Outline and Components of an Eagle Conservation Plan (ECP) for Wind Development Recommendations from USFWS Region 6" (Reg. 6 ECPG). Both the USFWS ECPG and the Reg. 6 ECP Guidance were followed in developing the Project ECP. The ECPG emphasizes the importance of implementing avoidance and minimization measures throughout all phases of wind energy development and operations. The ECPG has been developed to assist project developers and operators in complying with regulatory requirements and avoiding incidental take of eagles at wind energy facilities, while also providing guidance to inform the collection of biological data needed to support permit applications for facilities that may pose a risk to eagles.

The Project is an operational facility; therefore, the ECP format and information varies slightly from standard guidance provided by the USFWS and specifically USFWS – Region 6. In an effort to follow the Reg. 6 ECP Guidance, this ECP presents only pre-construction information in Section 4 – Initial site assessment (ECPG Stage 1), Section 5 – Site-specific survey and assessments (ECPG Stage 2), Section 6 – Avoidance and minimization of risk in Project siting, and Section 7 – Predicting eagle fatalities (ECPG Stage 3). Post-construction information is presented in Section 9 – Calibration and updating of the fatality predictions and continued risk assessment. Additionally, the compensatory mitigation and adaptive management sections have been removed from Section 8 (as directed in the Reg. 6 ECP Guidance) and moved to Section 9 after the calibration and updating fatality predictions information is presented. We believe this outline presents information to the reader in a more clear approach, with discussion on mitigation and adaptive management occurring after all current Project information is presented. This ECP identifies and describes conservation measures and actions that will be implemented to minimize current and future impacts to eagles at the Project. Technical reports are provided in the Appendices to this ECP for all studies completed and data collected to date.

1.1 Migratory Bird Compliance Plan

PacifiCorp entered into a plea agreement with the U.S. Department of Justice and USFWS in December 2014. As part of the plea agreement, a Migratory Bird Compliance Plan (MBCP) was developed to provide a collaborative framework for PacifiCorp's implementation of measures that will ensure compliance with the requirements of the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act during the term of the MBCP. A brief summary of the actions required under the MBCP that relate specifically to eagles are provided below:

- Develop protocols for post-construction monitoring and conduct USFWS approved mortality monitoring
- Develop protocols for eagle nest surveys and conduct USFWS approved nest surveys
- Apply for a Special Use – Utility (SPUT) permit and adhere to required reporting standards
- Implement a carrion removal program
- Develop and submit an ECP
- Conduct compensatory mitigation measure for eagle mortalities

The implemented actions are discussed in more detail throughout this ECP. It is understood that the MBCP requirements will remain in effect until an incidental eagle take permit has been issued or termination of the non-prosecution period set forth in the plea agreement.

1.2 Purpose of the ECP

In accordance with the ECPG (USFWS 2013b) this ECP provides information in support of an application for an incidental eagle take permit for the Project. The ECP will assess the risk of the Project to eagles; document eagle specific survey and monitoring work and results, both pre- and post-construction; document avoidance and minimization measures implemented pre- and post-construction; and discuss the Project's adaptive management plan and actions taken to date.

The ECP is written to reflect the Project's development history and operations. The ECP is organized to follow the Reg. 6 ECP Guidance as closely as possible; however, the organization

is influenced by the availability of data to inform the decision making process. The Project's design phase pre-dated issuance of the *Eagle Conservation Plan Guidance* (ECPG) and the *U.S. Fish and Wildlife Service Land-based Wind Energy Guidelines* (WEG; USFWS 2012, 2013b; see Sections 2.1.3 and 2.1.4 for more details). This ECP reflects PacifiCorp's commitment to implement an adaptive management program that includes minimization measures, monitoring and compensatory mitigation. The adaptive management program is designed to support the objective of "no net loss" of golden or bald eagles within the Eagle Management Units (EMU) associated with the Project, so that it is consistent with USFWS's goal of maintaining stable or increasing breeding populations of eagles.

1.3 ECP Term

The ECP will cover the term of any potential incidental eagle take permit PacifiCorp receives for this Project. PacifiCorp has and will continue to update this ECP in coordination with the USFWS through an adaptive management program (*see* Section 9.0). Should operation continue beyond the expected life of the Project, this ECP will be reviewed, updated, and remain in effect until the Project is decommissioned.

2.0 Regulatory Framework

This section describes the regulations and guidelines relevant to this ECP.

2.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA; 1918) is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. The MBTA states, "Unless and except as permitted by regulations… it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill… possess, offer for sale, sell …purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird ….[The Act] prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior."16 U.S.C. 703. The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines.

2.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA; 1940) (16 USC §§ 668-668d) prohibits the take of bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), unless authorized by federal regulation. The BGEPA defines "take" of an eagle to include a broad range of actions, including to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb. The term "disturb" in regulations found at 50 CFR § 22.3 means "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In 2009, the Service promulgated a final rule on two new permit regulations that specifically authorize under BGEPA the non-purposeful (i.e., incidental) take of eagles and eagle nests in certain situations (see 50 CFR 22.26 & 22.27). The permits authorize limited take of bald and golden eagles; authorizing individuals, companies, government agencies and other organizations to disturb or otherwise take eagles in the course of conducting lawful activities. To facilitate issuance of eagle take permits for wind energy facilities the Service finalized the ECPG. If eagles are identified as a potential risk at a project site, developers are strongly encouraged to follow the ECPG. The ECPG describes specific actions that are recommended to achieve compliance with the regulatory requirements in BGEPA, for an eagle take permit, as described in 50 CFR 22.26 and 22.27. The ECPG provides a national framework for assessing and mitigating risk specific to eagles through development of ECPs. In December 2016, the USFWS published notice of a final rule revising its eagle permitting regulations and extended the maximum permit duration to 30

years. In communication with USFWS, PacifiCorp intends to develop this ECP to avoid and minimize impacts to eagles to the maximum extent practicable and to support an eagle incidental take permit application.

2.3 USFWS Land-Based Wind Energy Guidelines

In 2003, the USFWS published the *Interim Voluntary Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2003a Guidelines).[1] The 2003 guidelines encouraged the "wind energy industry to follow these guidelines and, in cooperation with the Service, to conduct scientific research to provide additional information on the impacts of wind energy development on wildlife." In 2004, USFWS issued *Instructions for Implementation of Service Voluntary Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (2004 Instructions).

In 2012 USFWS issued the WEG (USFWS 2012). The WEG replaced the 2003 Guidelines.[2] The WEG set out a voluntary and collaborative approach to implement a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. Further the WEG provided a "tiered approach" to assess the "potential adverse effects to species of concern and their habitats." The tiered approach is an iterative decision-making process for collecting information in increasing detail; quantifying the possible risks of proposed wind energy projects to species of concern and their habitats; and evaluating those risks to make siting, construction, and operation decisions. The WEG also provide Best Management Practices (BMPs) for site development, construction, retrofitting, repowering, and decommissioning.

2.4 Eagle Conservation Plan Guidance

Originally issued in draft form in January 2011, the ECPG provides a roadmap to wind energy developers and operators for obtaining programmatic eagle take permits in accordance with the Eagle Permit Rule.[3] The ECPG also supplements the WEG.[4] Whereas the WEG provided a broad overview of wildlife considerations at wind energy facilities, the ECPG provides guidance specifically related to bald and golden eagles.

The ECPG clarifies the relationship between the tiers of the WEG and the stages of the ECPG process. Because the ECPG stages do not align precisely with the WEG tiers, the new guidance details which ECPG stages occur within each tier.[5] This alignment is illustrated in the table[6] below (Table 1):

[1] 68 Fed. Reg. 41175 (July 10, 2003).
[2] *See* 77 Fed. Reg. 17496 (March 26, 2012).
[3] 50 CFR. § 22.26.
[4] 77 Fed. Reg. 17496 (March 26, 2012).
[5] ECPG at vii.
[6] ECPG at 18.

Table 1. Comparison between the USFWS WEG and ECPG step-wise approaches.

Land-based Wind Energy Guideline Tiers		Eagle Conservation Plan Guidance Stages	
Tier 1	Preliminary evaluation or screening of potential sites	Stage 1	Site assessment
Tier 2	Site characterization	Stage 2	Site-specific surveys and assessments
Tier 3	Site characterization	Stage 3	Predicting eagle fatalities
Tier 4	Post-construction surveys to estimate impacts	Stage 4	Avoidance and minimization of risk using ACP's and compensatory mitigation
Tier 5	Other post-construction studies and research	Stage 5	Calibration and updating of the fatality prediction and continued risk-assessment

The conservation practices outlined in the ECPG are intended to offset the short- and long-term negative effects of wind energy facilities on eagle populations.[7] Those practices will also benefit other avian species, and in particular, other raptor species. The USFWS recommends "an adaptive management framework predicated, in part, on the precautionary approach for consideration and issuance of programmatic eagle take permits."[8]

Adaptive management techniques "consist of case-specific considerations applied within a national framework" that may include "operational adjustments at individual projects at regular intervals where deemed necessary and appropriate."[9] Ultimately, "[i]mplementation of the final ECP must reduce predicted eagle take, and the population level effect of that take, to a degree compatible with regulatory standards to justify issuance of a programmatic take permit . . . ."[10] Compatibility with regulatory standards means maintaining stable or increasing breeding eagle populations.

Although the ECPG applies generally to all wind energy facilities with risk of eagle take, the guidance primarily addresses developers and operators in the initial stages of facility siting and development. For wind energy facilities already operating, the guidance may apply somewhat differently. The ECPG states that "[f]or projects already in the development or operational phase, implementation of all stages of the recommended approach in the ECPG may not be applicable or possible."[11]

Operators of wind energy projects (and other activities) that were in operation prior to 2009 that pose a risk to golden eagles may qualify for programmatic eagle take permits that do not automatically require compensatory mitigation. This is because the requirements for obtaining programmatic take authorization are designed to reduce take from historic, baseline levels, and the preamble to the Eagle Permit Rule specified that unavoidable take remaining after implementation of avoidance and minimization measures at such projects would not be subtracted from regional eagle take thresholds.

[7] ECPG at 4-5.
[8] *Id.* at 9.
[9] *Id*.
[10] *Id*. (emphasis added).
[11] *Id*. at iii.

This ECP was developed in accordance with the ECPG. This ECP also relies on the Reg. 6 ECP Guidance, which provides recommendations on the content and organization of an ECP, and requests supplemental information related to avoidance and minimization measures.

2.5 National Environmental Policy Act

The National Environmental Policy Act (NEPA) [42 U.S.C. 4321 et seq.] establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within the federal agencies. The Act requires federal agencies to incorporate environmental considerations in their planning and decision-making through a systematic interdisciplinary approach. All federal agencies are required to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment. Issuance of an eagle take permit by the USFWS constitutes a discretionary federal action and thus requires an assessment of the potential environmental impacts associated with the action and alternatives under NEPA. As a result, the USFWS must complete a NEPA analysis before it makes a decision about whether or not to issue an eagle incidental take permit for the Project.

2.6 Endangered Species Act

The ESA directs the USFWS to identify and protect endangered and threatened species and their critical habitat, and to provide a means to conserve their ecosystems. Among its other provisions, the ESA requires the USFWS to assess civil and criminal penalties for violations of the Act or its regulations. Section 9 of the ESA prohibits take of federally-listed species. Take is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" 16 U.S.C. 1532. The term "harm" includes significant habitat alteration which kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering, 50 CFR 17.3. Projects involving Federal lands, funding or authorizations will require consultation between the Federal agency and the USFWS, pursuant to section 7 of the ESA. Projects without a Federal nexus should work directly with USFWS to avoid adversely impacting listed species and their critical habitats.

2.7 State and Federal Permit Requirements

Evaluation of a former PacifiCorp coal mine for potential wind energy projects began in 2002, and pre-construction wildlife surveys began in April 2007 and continued to November 2007 (Johnson et al. 2008). A Section 109 Permit application was submitted to the Wyoming Industrial Siting Council (WISC) in November 2007, and it was approved in March 2008, after a public hearing on February 19, 2008. The Industrial Siting Application (ISA), which is part of the state permitting process, addressed a variety of environmental aspects of the Project, including air quality, noise, soil resources/geologic hazards, cultural resources, vegetation resources, surface and groundwater resources, land use/recreation, recreational resources, wetlands/waters of the US, visual/scenic resources, and wildlife resources, including avian resources, bats, and federally listed wildlife species.

As part of the preparation for the WISC permit process, PacifiCorp met with state, federal and local agencies, including the Wyoming Game and Fish Department (WGFD) on June 19, 2007 and the USFWS Cheyenne Ecological Services office on August 31, 2007. The purpose of these meetings was to provide an overview of the Project and the Industrial Siting Application process, address any issues and concerns (including pre- and post-construction monitoring), and answer questions. To provide the public an opportunity to comment on the Project, open houses were held in Glenrock on August 1, 2007 and in Rawlins on July 31, 2007. Several other open house meetings were held, including a state agency meeting in Cheyenne on July 30, 2007 and local (city and county) agency meetings in Laramie, Rawlins, Casper, Glenrock and Douglas in July and August of 2007. The public was invited to all state and local agency meetings as well. The application also included the baseline wildlife study report and the post-construction wildlife monitoring plan as appendices.

The Project was constructed primarily on reclaimed coal mine lands that were part of the former Dave Johnston mine. The mine operated from 1958 to September 2000. Final surface mine reclamation activity began in 1999 and ended in 2005; however, contemporaneous reclamation efforts began as early as the mid-1960s. PacifiCorp worked with the Wyoming Department of Environmental Quality (WYDEQ) to modify reclamation permit conditions to allow for the construction of the wind energy project. Several reclamation conditions regarding erosion control, weed management, and land use are in effect until 2017 or thereafter.

3.0 Project Description

The Project is located entirely on Townships 35, 36, and 37 North, and Range 74 and 75 West on approximately 14,000 acres of privately held fee lands owned by PacifiCorp in Converse County, Wyoming (Figures 1 and 2). The approximately 12-mile (19-kilometer [km]) long (north to south) and 2-3 mile (3-5 km) wide Project is situated approximately 15 miles (24 km) due north of Glenrock, Wyoming. Strip mining of the site began in 1958; however, mining ceased in September 2000, and the site has been completely reclaimed. Project construction began in March 2008 and was completed in January 2009. All Project turbines were commissioned by January 17, 2009, and began operation. In 2019, the Project was repowered. Details on the environmental setting and Project infrastructure are provided below.

3.1 Environmental Setting

The Project lies on the south-western edge of the Powder River Basin Coal Field. The Project area is primarily on a reclaimed coal mine, which has been restored through grading and seeding efforts. The Project is within the Wyoming Basin ecoregion. This ecoregion is a broad intermontane basin dominated by arid grasslands and shrublands supporting bunchgrasses and sagebrush, interrupted by high hills and low mountains. Maximum precipitation occurs during the spring and early summer. The annual average precipitation in the area is less than 16 inches (41 cm). Precipitation varies greatly due to terrain and snow falls frequently from October through May. The prevailing westerly wind speeds are frequently 30 to 40 miles per hour (mph; 48-64 km/hour) sustained, with gusts that exceed 50 to 60 mph (80-96 km/hour).

The topography is characterized by rolling hills and sandstone capped buttes with elevations ranging from approximately 5,750 to 5,898 feet (1,750 to 1,795 m; Figure 3 and 4). From a landscape perspective, the Project is situated along an eastern extension of a much larger north-south oriented ridgeline north of the North Platte River valley. Elevation and topography are fairly consistent across the larger landscape around the Project.

Habitat at the Project is dominated by native sagebrush steppe and large areas of grassland where the coal mine has been reclaimed. According to the US Geological Survey National Land Cover Dataset (USGS NLCD 2011), the Project is dominated by two main habitat types herbaceous (grassland) and shrub/scrub (8,892 ac [64.22%]; and 4,485 ac [32.39%]; respectively; Table 2, Figure 5). In addition to these main cover types, the NLCD identifies approximately 3.27% of the landcover at the Project as barren land, while all other cover types each compose less than 1% (Table 2, Figure 5). Although the NLCD identifies small areas of deciduous forest, evergreen forest, and woody wetlands in the Project area, none of these cover types have been documented during field surveys. Based on the USGS NLCD 2011, there is no developed land with the Project area. There are three permanent stock ponds in the west-central portion of the Project area and multiple ephemeral depressions. Rock outcrops occur in the extreme southern- and northern end of the Project area.

Table 2. The land cover types, coverage, and composition within the Project Area, Converse County, Wyoming.

Habitat	Acres	% Composition
Herbaceous (grassland)	8892.12	64.22
Shrub/Scrub	4484.99	32.39
Barren Land	453.10	3.27
Deciduous Forest	9.56	0.07
Evergreen Forest	5.78	0.04
Woody Wetlands	0.10	0.00
Total	**13,845.65**	**100**

Data from the US Geological Survey National Landcover Database (2011).

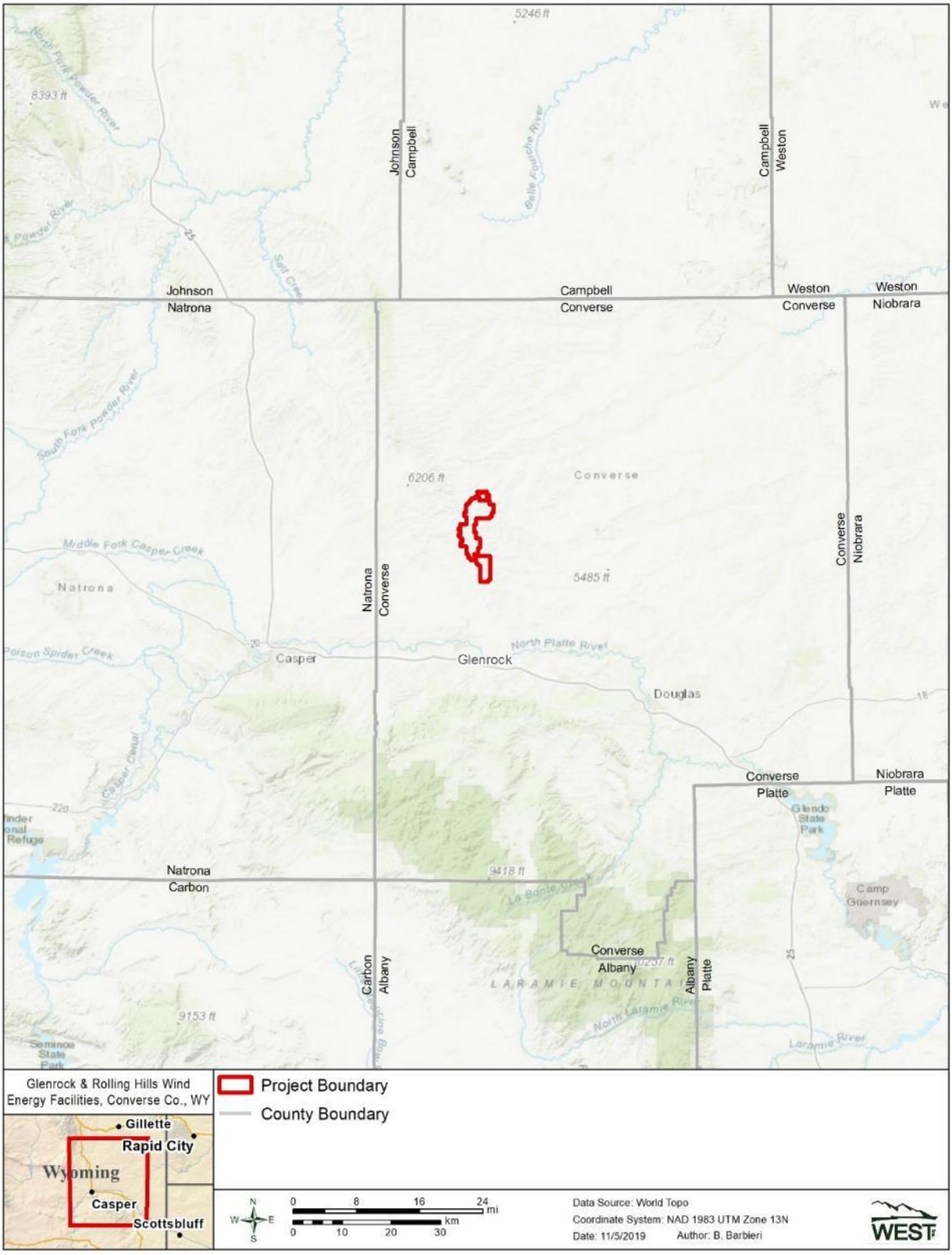

Figure 1. Location of the GRH Wind Energy Facility, Converse County, Wyoming.

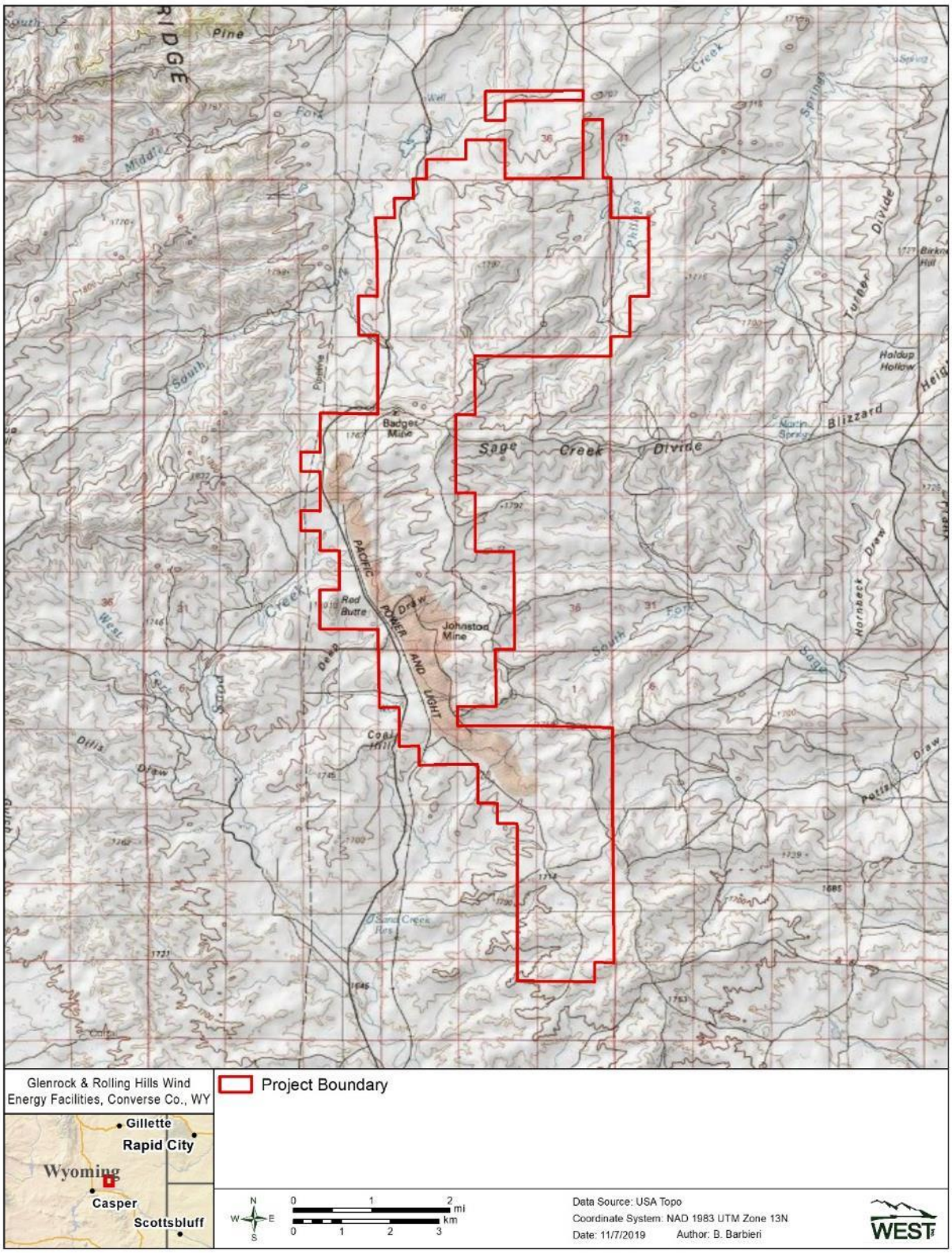

Figure 2. Location of the GRH Wind Energy Facility, Converse County, Wyoming.

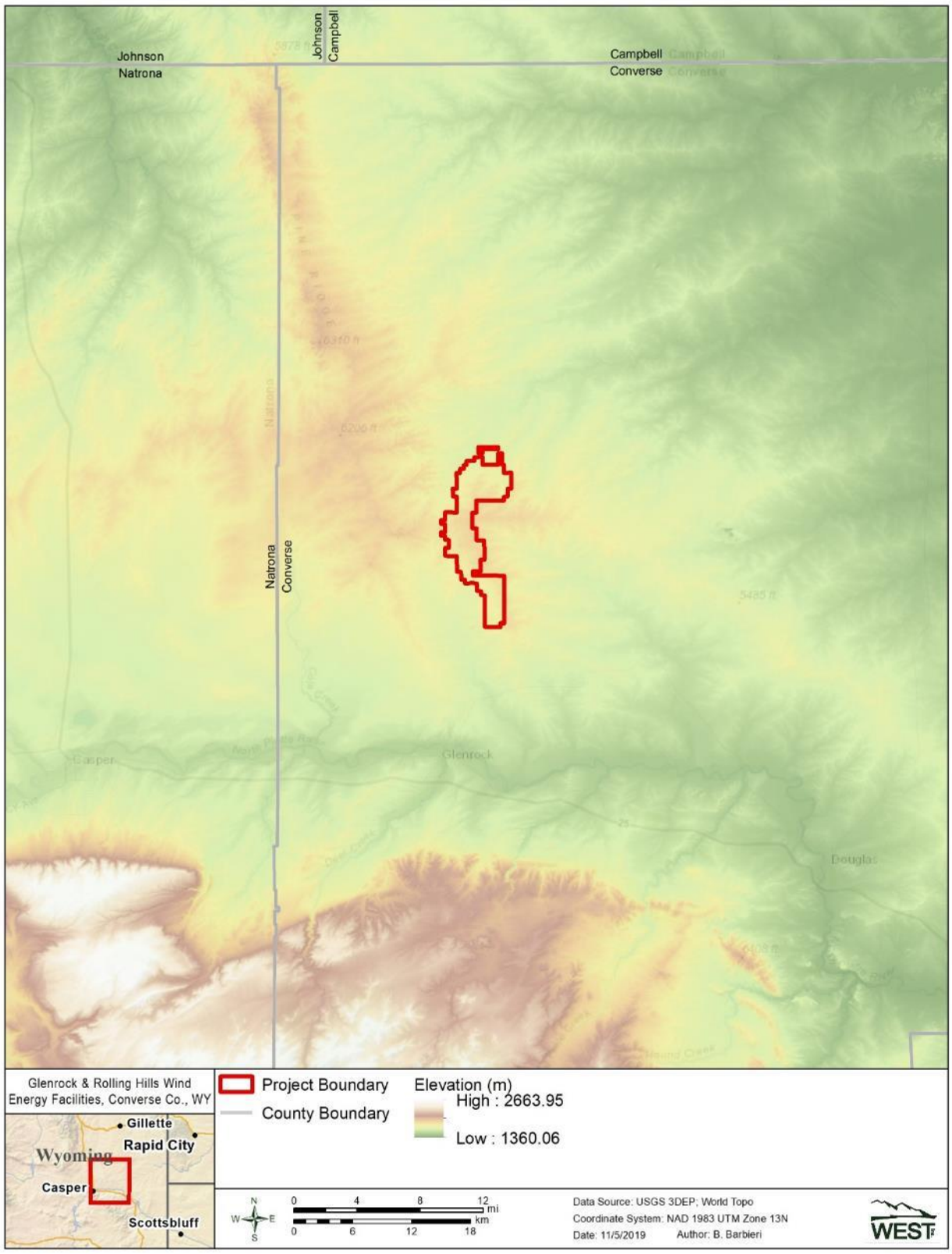

Figure 3. GRH Wind Energy Facility, Converse County, Wyoming – Elevation in the region of the Project.

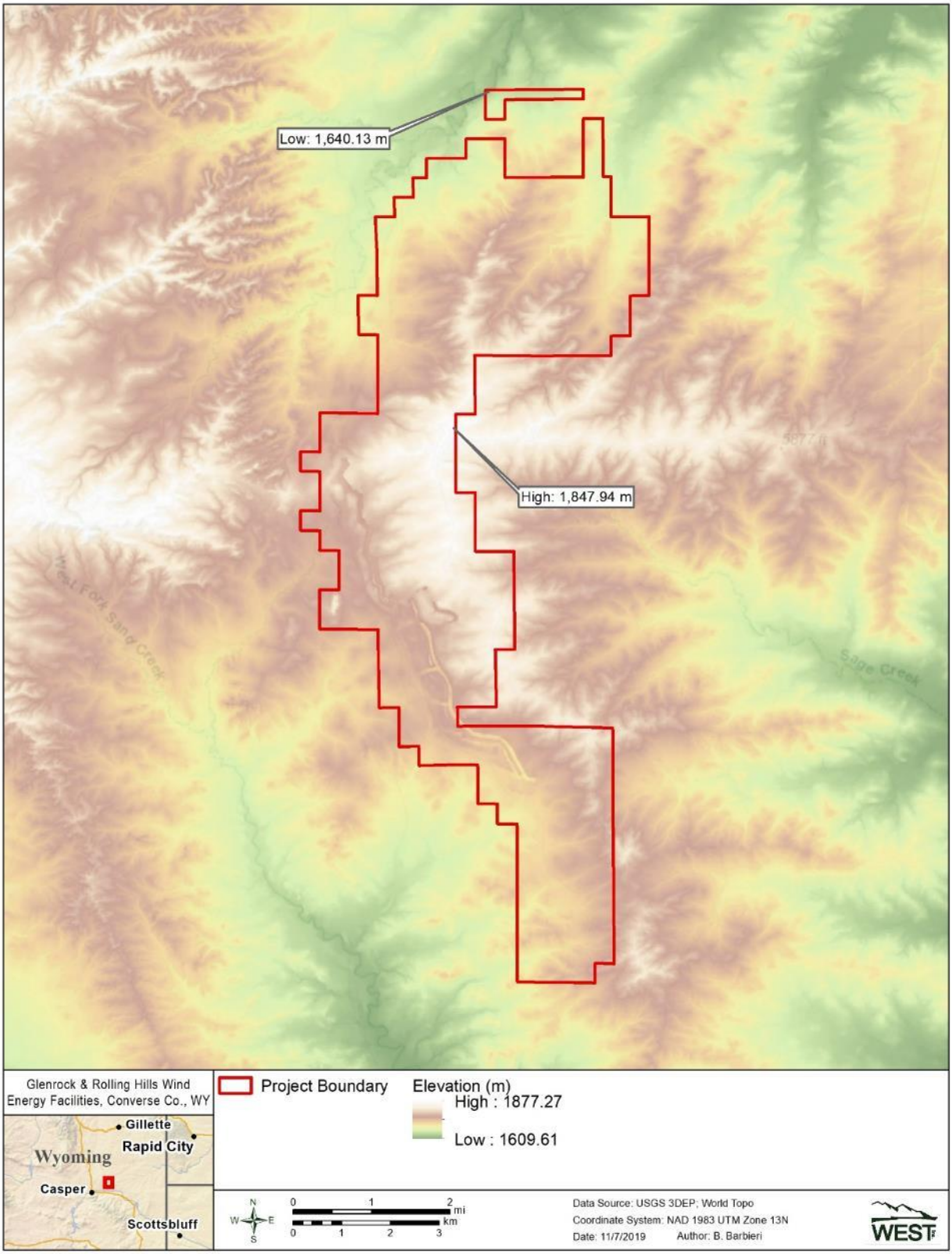

Figure 4. GRH Wind Energy Facility, Converse County, Wyoming – Elevation across the constructed Project.

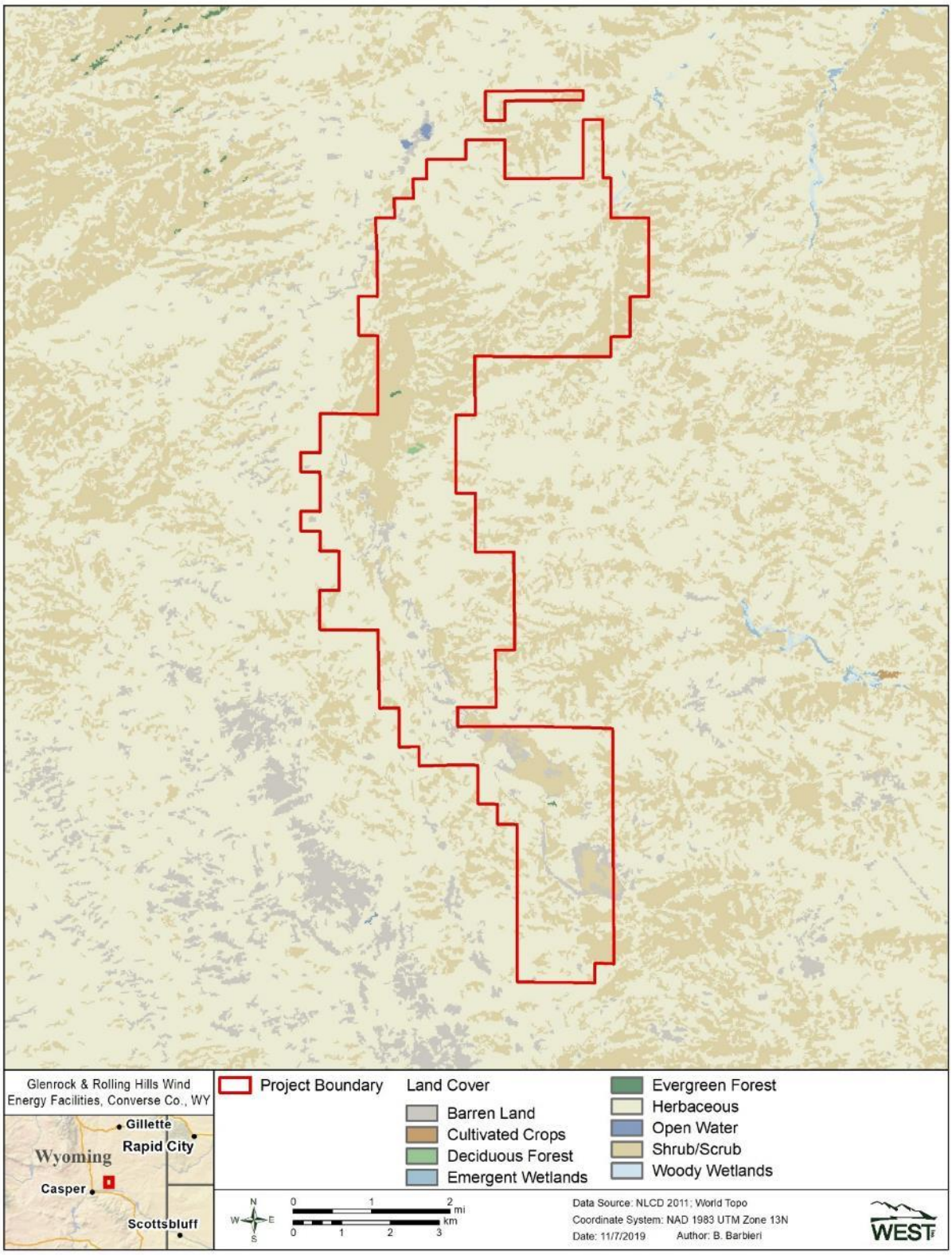

Figure 5. GRH Wind Energy Facility, Converse County, Wyoming – Land Cover for the constructed Project boundary.

3.2 Land Use

The primary existing land use of the Project area is production of renewable energy through the use of wind turbines. The Project area was previously used as an open pit coal mine but all mining had ceased by 2000 and the site was reclaimed. No other mineral extraction activities currently occur on the site. The Project site had been leased to adjacent private landowners for grazing of livestock, including cattle and sheep.. No public recreation occurs on the site, including hunting, and access to the Project is strictly controlled.

3.3 Project Infrastructure

The Project was originally constructed as 158 turbines with a nameplate capacity of 237 MW (Figure 6a and b). The GE 1.5-MW turbines have a rotor diameter of 252 ft (77 m) and the wind turbines are situated on 262-ft tall (79 m) steel tubular towers secured to concrete foundations. In 2019, 126 turbines were repowered to 1.85-MW turbines for an updated 281.1-MW Project capacity. A 13-mile (21-km) 230 kilovolt (kV) transmission line (Figure 5) to deliver Project output to the Windstar switching substation was built along PacifiCorp-owned property that was once occupied by a railroad line that extended approximately 15 miles (24 km) from the Project to the Dave Johnston thermal energy generation facility. In addition to the turbines and interconnection line, the Project includes a variety of access roads, crane pads, a laydown area, batch plant, communication/collection systems, one substation, operation and maintenance building, transmission lines, and metrological towers. Full descriptions of Project infrastructure are provided below and temporary and permanent impacts are quantified in Table 3. Not all of the temporary and permanent impacts were quantified when they occurred; therefore, values provided below are based on the best available information and in some cases were calculated based on measurements made using aerial photographs. If the impact could not be reasonably quantified, no value was assigned and this was noted.

Direct loss of habitat is not the only type of impact associated with the Project. Indirect impacts associated with the Project include habitat fragmentation, wildlife displacement, avoidance, and collision with infrastructure (see Section 7.2 below for additional discussion of other types of impacts beyond temporary and permanent habitat loss).

Table 3. Estimated temporary and permanent acres of impact associated with the GRH Wind Energy Facility, Converse County, Wyoming.

Project Feature	Temporary Habitat Acres Impacted	Permanent Habitat Acres Impacted
Wind Turbine Generators and Crane Pads	47.4	8.7
Access Roads (onsite and transmission line associated)	164.8	82.4
Transmission Line*	unknown	-
Collection Lines*	315.2	-
Laydown Area and Batch Plant	10.0	0
O&M Building	0	0
Substations and Interconnection station	5.0	3.0
Metrological towers	-	<0.1
TOTAL	**532.4**	**94.1**

*Impacts associated with above ground line are not included in the acreage

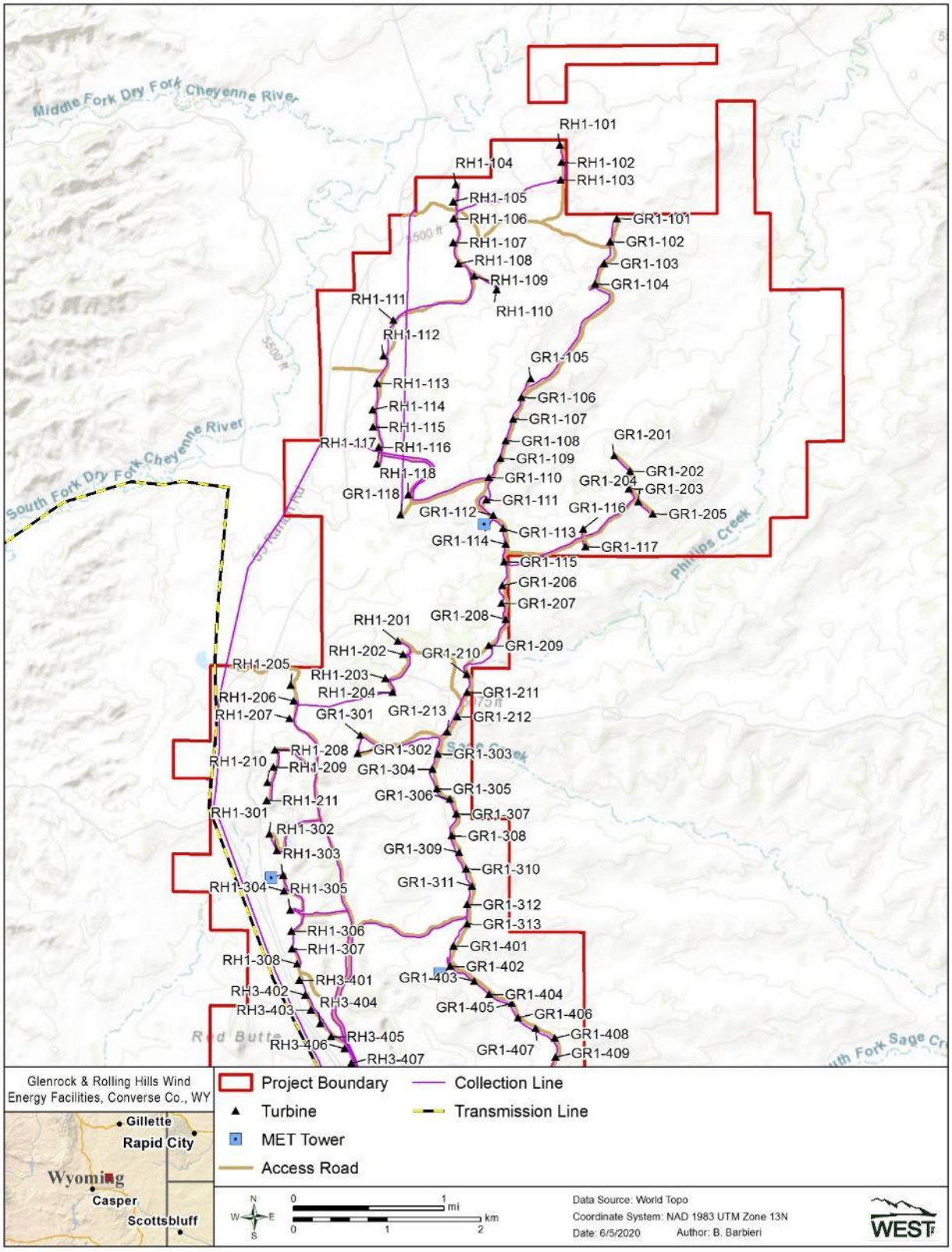

Figure 6a. GRH Wind Energy Facility, Converse County, Wyoming – Infrastructure layout.

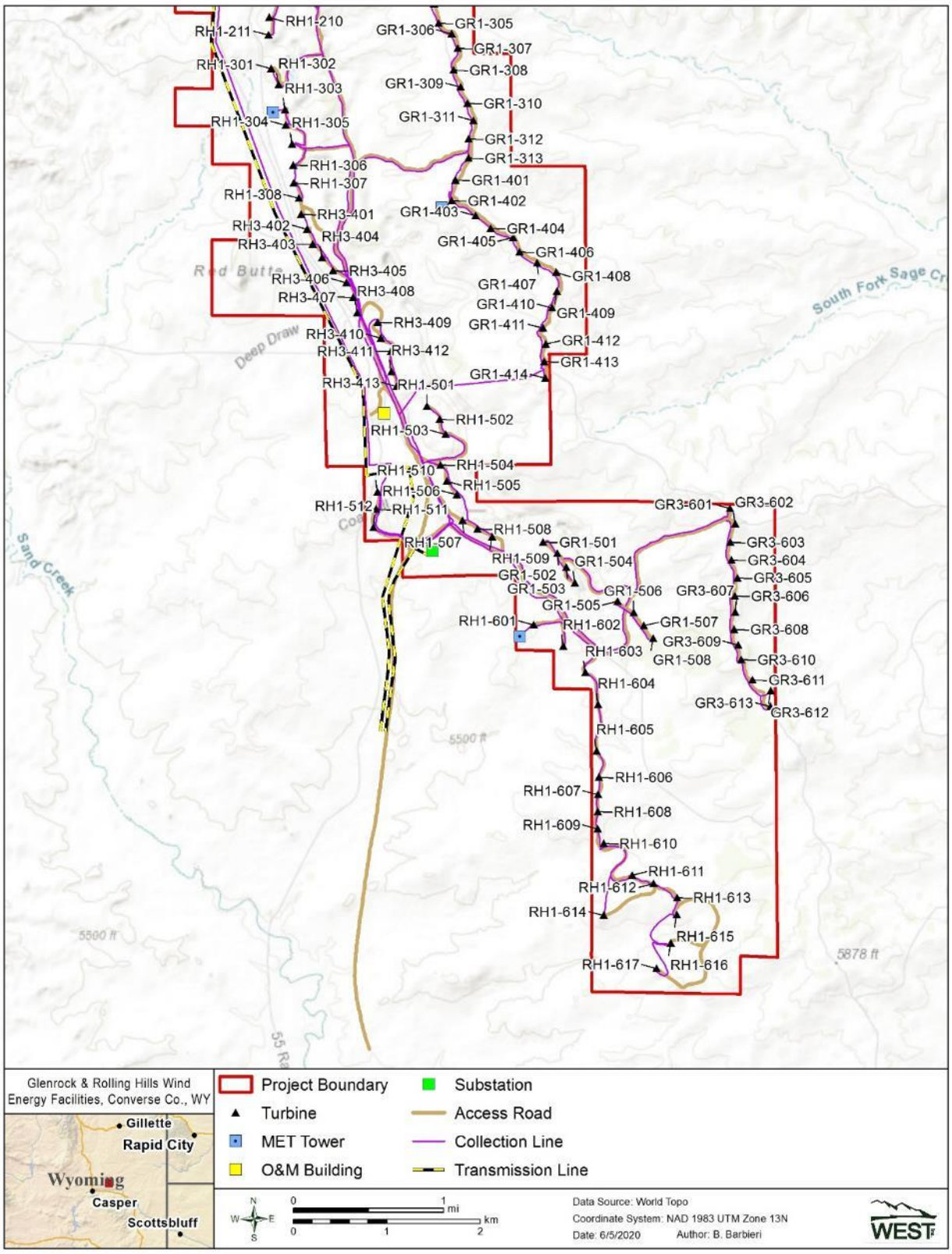

Figure 6b. GRH Wind Energy Facility, Converse County, Wyoming – Infrastructure layout.

3.3.1 Wind Turbine Generators and Crane Pads

One hundred and fifty-eight wind turbine generators were constructed and are currently operating. Temporary impacts associated with turbine construction varied by individual turbine and ranged from 0.1 – 1 acres (based on aerial imagery review), with an average of 0.3 acres per wind turbine. Permanent impacts were typically 0.06 acres per turbine. This resulted in 47.4 temporary impact acres and 9.5 permanent impact acres associated with the wind turbines.

When construction was complete, an approximate area 40 ft wide by 60 ft long (12 m x 18 m) was maintained as a pad for each wind turbine for O&M procedures, totaling 8.7 acres of permanent impact combined for the Project.

3.3.2 Access Roads

In areas where existing roads did not provide access to WTG or substation locations, and along the length of turbine strings, new gravel roads were constructed. Roads were designed under the direction of a licensed engineer and compacted to meet turbine and transformer equipment load requirements. Access roads were located to minimize disturbance, avoid sensitive resources (e.g., raptor nests, cultural resource sites), and maximize transportation efficiency. To allow safe passage of the large transport equipment used in construction, all-weather gravel roads were built with adequate drainage and compaction to handle 15-ton per axle loads. Permanent road widths were approximately 20 ft (six m), while temporary construction roads varied greatly across the Project, but were assumed to average 40 ft (12 m) for the purpose of this discussion. Passing turnouts were located approximately every four miles along access roads, where needed. The Project included construction of approximately 34 miles (55 km) of new access roads, for a total of approximately 164.8 acres of temporary impacts and 82.4 acres of permanent impacts associated with access roads.

3.3.3 Laydown Area and Batch Plant

An approximately 10-acre (4-hectare [ha]) laydown area was used during Project construction, which included a 2-acre (0.8-ha) batch plant within the laydown area. The laydown area was used to stage construction components and store construction supplies and equipment. The laydown area experienced temporary surface disturbance that entailed stripping and stockpiling of both topsoil and subsoil. The area of temporary disturbance was restored and reseeded to pre-construction conditions upon completion of construction.

3.3.4 Communications and Collection System

Generated electricity moves through an underground and overhead collection system to the Project collector substations. Both power and communication cables were buried in trenches a minimum of 42 inches (107 centimeters) deep. In addition to overhead lines constructed for the Project, there are existing distribution lines on or adjacent to the Project which provide service to local customers.

In total, approximately 22 miles (35 km) of overhead lines exist within or nearby the Project area. Many of these overhead lines pre-existed the Project and provide electric service to customers.

As such, temporary impacts were not calculated for overhead lines. Permanent impacts are difficult to calculate because the ground disturbance is primarily associated with the transmission poles that have a negligible footprint. Further impacts/risks associated with above ground lines are discussed in section 7.3.

An estimated 65 miles (105 km) of underground collection system wiring was installed for the 158-turbine Project. In many cases the lines were sited parallel to the access roads. The width of temporary impacts associated with underground lines varied across the Project from 30 – 80 ft (9 – 24 m) and averaged 40 ft (12 m). Under this assumption, approximately 315.2 acres (127.6 ha) of temporary impacts occurred. No permanent impacts were associated with underground lines.

3.3.5 Substations and O&M Facility

The Project substations are owned by PacifiCorp. Clearing and grading the Project substations and switch yard sites resulted in temporary impacts of approximately 5 acres (2 ha). Main transformers installed at the Project substations were installed within a permanent 3-acre (1.2-ha) parcel of land centrally located within the Project area. Following construction, the substation and switchyard facilities were surrounded by a security fence.

The Dave Johnston Coal Mine substation provides electrical service for the pre-existing Dave Johnston mine maintenance buildings and the Project Operations and Maintenance (O&M) facility. The O&M facility, which contains all necessary plumbing and electrical connections needed for typical operation of offices and a maintenance shop, is also located at the Project. Utilities such as electric service, water service, sewer service, telephone service, as well as access to a septic system, are required at the Project.

3.3.6 Transmission Line

A 13-mile (21-km) 230 kV overhead transmission line associated with the Project was constructed in 2008. The line extends from the Project collector substations south to the Windstar switching substation located approximately six miles (9.6 km) east of Glenrock, Wyoming. The line was constructed on existing PacifiCorp property that extends south 15 miles (24 km) to the Dave Johnston facility. Sixty-nine transmission line mono poles were installed, with an average span between poles of approximately 1,000 ft (305 m). The line poles consist primarily of single steel pole structures, secured with concrete bases. Pole height is approximately 60 ft (18.3 m). Ground based temporary impacts that occurred during the transmission line construction are not known and are difficult to quantify; therefore, they are not approximated for this document. Permanent impacts are difficult to calculate because the ground disturbance is primarily associated with the transmission poles that have a negligible footprint. Further impacts/risks associated with above ground lines are discussed in section 7.3.

3.3.7 Meteorological Towers

Four permanent met towers occur at the Project. The permanent towers are used to collect meteorological data for the Project. The permanent met towers are lattice-type, free-standing (unguyed) structures. Each tower is approximately 262 ft (80 m) high with an equilateral triangle base, each side of which is roughly 25 ft (8 m) long. Temporary impacts were not available and

are not presented. The permanent ground impact per tower is approximately 0.01 acres (0.004 ha) and less than 0.1 acres (0.04 ha) for all four met towers combined.

3.3.8 Post-Construction Grading, Erosion Control, and Project Clean-up

Once construction of the Project was completed, all disturbed areas were graded to their approximate original contour, and areas disturbed during construction were stabilized and reclaimed using erosion control measures, including site-specific contouring, reseeding, or other measures (i.e., hydro-seeding, rock check-dams, straw waddles). Areas were reseeded with native vegetation mixes supplied by the construction contractor and included non-native Kentucky bluegrass (*Poa pratensis*), thickspike wheatgrass (*Elymus lanceolatus*), and slender wheatgrass (*E. trachycaulus*). The erosion control measures were implemented in compliance with the Project's construction Storm Water Pollution Prevention Plan (SWPPP). Areas disturbed around each turbine during construction were reverted to the original land use after construction except for permanent impacts as described above.

3.3.9 Operations and Maintenance

PacifiCorp will perform Project O&M for the life of the Project, which is anticipated to be 30 years from the commission date. PacifiCorp and its O&M contractor will control, monitor, operate, and maintain the Project by means of the Supervisory Control and Data Acquisitions (SCADA) system, and regularly scheduled on-site inspections will be conducted.

Maintenance activities typically occur within areas previously disturbed by construction. Abnormal activities may include the need to disturb areas to facilitate crane access. Turbine maintenance is typically performed up-tower, and O&M personnel perform maintenance within the tower or nacelle and access the towers using pick-up trucks.

Each turbine has an associated maintenance pad for activity requiring a heavy operating crane. No significant construction is required to use the crane pads and disturbance is kept to a minimum during maintenance activities.

Large scale noxious weed management has and will continue to be performed by a licensed herbicide and pesticide applicator on all turbine pads, roads, substations, and O&M facility infrastructure during the spring and fall, or on an as needed basis. Application amounts and products vary by season, weather conditions, site properties, and target vegetation type and density. Products used at the site may include Krovar, Method 240 SL, Piper, Ranger Pro, Perspective and Esplanade.

3.3.10 Repower

PacifiCorp repowered 126 of the 158 Project turbines in 2019 (Figure 7). The effort was initiated April 4, 2019 and completed November 11, 2019. The remaining 32 turbines will not be repowered. The repower included upgrading the turbine's nacelles and rotors with new nacelles and rotors have a rotor diameter of 299 ft (91 m) and an overall height of 413 ft (126 m). Table 4 demonstrates the change in rotor swept area for individual turbines and the Project as a result of

the repower. A full list of repower turbines IDs, outage date, and online date is provided in Appendix B. Only the turbine rotors, blades, and nacelles (with associated gearbox/generator components) were upgraded during repowering. PacifiCorp did not modify the existing ancillary facilities and support structures, such as turbine tower sections, tower foundations, maintenance pads, on-site substations, collector lines, and O&M buildings as part of the repower. Additionally, the existing crane pads and permanent disturbance areas were used during the repower process.

Table 4. Change in rotor swept area for repowered turbines at the GRH Wind Energy Facility, Converse County, Wyoming. Square-meters (sq-m) are used to provide a more sensible value.

	Rotor Swept Area (sq-m) 1.5-MW turbine	Rotor Swept Area (sq-m) 1.85-MW turbine	Change in Rotor Swept Area (sq-m)	Percent Change after Repower
Individual Project Turbines	4,657	6,504	1,847	39.6%
All Project Turbines	735,806	968,528*	232,722	31.6%

*Total areas includes a combination of 1.85 MW and 1.5 MW turbines

3.3.11 Decommissioning and Restoration

Throughout the Project's economic life, PacifiCorp expects to explore alternatives for decommissioning and/or additional repowering the Project. If required, PacifiCorp would reapply for new or amended permits to retrofit the turbines and power system with upgrades based on new technology.

If the Project terminates operations in the future, PacifiCorp would obtain the necessary authorization from the appropriate regulatory agencies to decommission the facilities. Generally, wind energy projects that are decommissioned contain a high "scrap value" due to the materials and equipment contained in the infrastructure (steel infrastructure, electric generators, and copper).

In general, decommissioning of the Project may result in burial of foundations below an allowed depth, and any unsalvageable material would be disposed of at authorized sites. The soil surface would be restored as close as reasonably possible to its original contour. The Project substations may remain in place post-decommissioning, if required to be utilized for other purposes. If the buried/overhead power lines could not be used by PacifiCorp for other utility purposes, all structures, conductors, and cables would be removed unless otherwise allowed to remain in place.

Demolition or removal of equipment and facilities will meet applicable environmental and health regulations. Additionally, PacifiCorp may salvage economically recoverable materials or recycle Project materials for future uses.

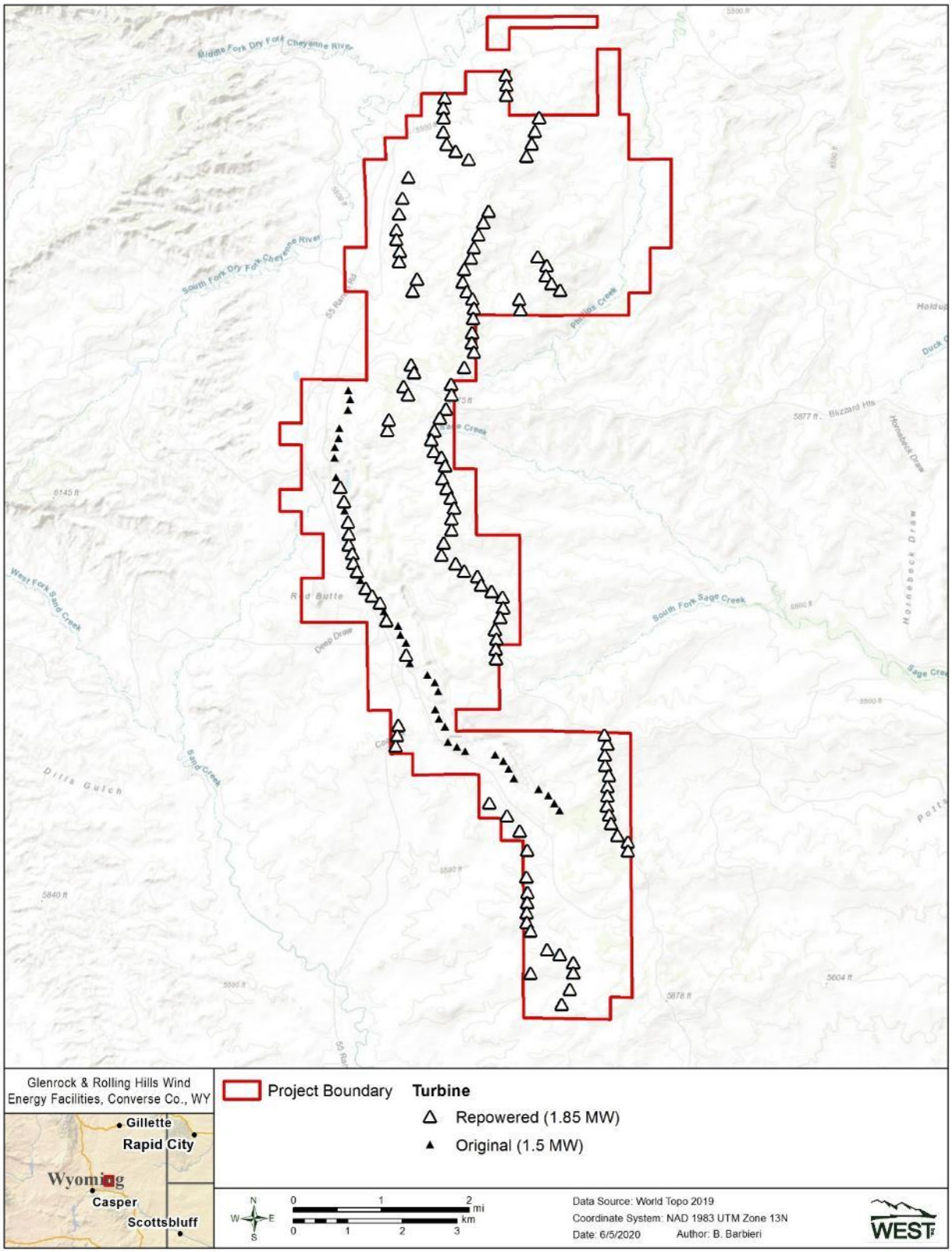

Figure 7. GRH Wind Energy Facility, Converse County, Wyoming – Repowered Turbine Layout.

4.0 Initial Site Assessment (ECPG Stage 1)

The Project was designed and developed prior to the issuance of the 2009 Eagle Permit Rule. The Project was constructed and became operational before this rule was issued and prior to release of the WEG (USFWS 2012), ECPG (USFW 2013b), and Final Eagle Rule (USFWS 2016). Due to this timing, this ECP document focuses primarily on the operational phase of the Project.

The location was selected primarily due to historic use as a mine site, and PacifiCorp's desire to utilize the already impacted landscape with a history of documented good wind resources. To support the initial site assessment, PacifiCorp initiated communication with the WGFD and USFWS in 2007 (multiple meetings with Pat Deibert – Wyoming Ecological Services Field Office). These discussions included identification of wildlife studies and monitoring recommendations for the Project. Additional discussion centered around removal of eagle nest platforms within the proposed Project area.

Based on identified environmental concerns, PacifiCorp gathered publically available data on wildlife and conducted site-specific surveys to further assess the Project. Publically available data included greater sage-grouse (*Centrocercus urophasianus*) lek locations and big game habitat classification maps maintained by the WGFD as well as raptor nest data from the Bureau of Land Management (BLM). Field surveys included conducting avian use and raptor nest surveys.

5.0 Site-Specific Surveys and Assessments (ECPG Stage 2)

Information in this section addresses recommendations under Stage 2 of the ECPG (baseline surveys). Site-specific surveys were conducted based on communication with state and federal agencies. The ECPG (USFWS 2013b) was not published prior to initiating site-specific surveys; therefore, the survey methods described below did not meet all of the survey standards recommended in the ECPG (USFWS 2013b) and Final Eagle Rule (USFWS 2016). This includes eagle use surveys and nest surveys.

The list below provides details on differences between the surveys conducted for the Project and the current USFWS data standards:

- Survey points were selected using systematic random sample instead of a randomized method.
- Surveys were conducted for 20 min in duration as opposed to a 60-min duration.
- Eagle flight paths were recorded but flight data were not collected on a per minute basis.
- Surveys were conducted approximately weekly from April 18 to June 9, 2007, and from September 19 to November 14, 2007. Eagle flight paths were recorded. Eagle surveys were not conducted at least once a month for two full years.
- During surveys all birds including both small and large birds were recorded instead of only recording eagles and other large birds.
- The 12 2,625-ft (800-m) avian survey plots provided coverage over 31.4% of the area within 0.6 mile (one km) of constructed turbines (or 33.9% of the turbine layout's minimum convex polygons), which actually exceeded the minimum of 30% coverage recommended by the survey standards.
- Eagle nest surveys were conducted in the Project area and 1-mile buffer, instead of a 10-mile (16-km) Project buffer.
- Nest data were not collected to specifically assess nest occupation, productivity, or nest success.
- Only ground nest surveys were conducted, there were no aerial surveys for eagle nests. Also there were no extended four hour ground observation periods at nests. The number of seasonal nest surveys did not meet current USFWS recommendations in Region 6 which recommends at least six nest surveys.

The eagle use survey (eagle point counts) standards recommended by the USFWS are recommended to inform the USFWS Collision Risk Model. The methods and results presented below represent the surveys that occurred to evaluate eagle use at the Project and support baseline conditions and risk assessments. Because this is an operational Project, the baseline data are presented in this section to illustrate the available information used to inform the risk assessment during Project development, consistent with the ECPG; however, Section 9.0 includes data from multiple years of post-construction surveys, and these data are used to further inform discussions on Project risk and future take predictions.

5.1 Pre-Construction Avian Surveys

During the spring and fall of 2007, pre-construction avian studies were conducted that included fixed-point avian use surveys, nest surveys, and greater-sage grouse brood/pellet count surveys (Johnson et al. 2008) to assess potential Project impacts. Summaries of the avian use surveys and the nest survey conducted in 2007 are provided below. A brief description of the pellet count survey is included; however, this survey had no bearing on evaluating eagle use at the Project, other than documenting abundance of a potential eagle prey species. The full technical report is provided in Appendix D.

5.2 Fixed-Point Avian Use Surveys

5.2.1 Methods

Fixed point surveys were conducted using methods described by Reynolds et al. (1980). Twelve 2,625-ft (800-m) radius points were selected to survey representative habitats and topography of the study area (Figure 8). The 12 2,625-ft (800-m) plots provided coverage over 31.40% of the area within 0.6 mile (one km) of constructed turbines (or 33.93% of the turbine layout's minimum convex polygons). All bird species observed during surveys were recorded whether perched or in flight, and large bird flight paths were mapped even if observations were beyond the 2,625-ft (800-m) radius. Observations beyond survey plot were not used any analysis, but do provide additional information on eagle use across the Project. Surveys were conducted approximately weekly during the spring migration and early breeding season (April 18 to June 9, 2007; seven survey rounds) and fall migration (September 19 to November 14, 2007; nine survey rounds). Point count duration was 20 minutes (e.g., Hoover and Morrison 2005, Smallwood et al. 2009, Strickland et al. 2011). This resulted in approximately 2.3 total hours of survey effort per point in the spring and approximately 3.0 hours of survey effort per point in the fall for a combined total of approximately 64 hours of survey effort for the spring and fall combined. Surveys were conducted during daylight hours and survey periods were varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed about the same number of times; however, the schedule varied in response to adverse weather conditions (e.g., fog and/or rain), which caused delays and/or missed surveys.

Locations of all large birds, including eagles, were recorded on field maps by observation number. Approximate flight height and direction were recorded. Flight paths were digitized in ArcGIS after surveys were conducted.

5.2.2 Results

A total of 186 20-min fixed point surveys were conducted with 97 individual golden eagle observations in 88 groups. No bald eagle observations were recorded during the survey period. Golden eagle comprised approximately 8.1% of all bird and 47.1% of all raptor observations. Golden eagle had the highest overall use of all raptor species during the spring (0.47/plot/20-min survey) and fall (0.51/plot/20-min survey). The northern end of the Project area (Points 1, 3, 4) had higher use by golden eagles than the remainder of the Project area (Figure 9). Detailed descriptions of all golden eagle observations are provided in Table 5. Flight paths of golden eagles were mapped on field maps showing topography of the avian survey plot. These flight paths were

not included in the original study report but are included in this ECP (Figure 10). Flight paths were mapped across all survey points, with points 1 and 4 having the most mapped observations..

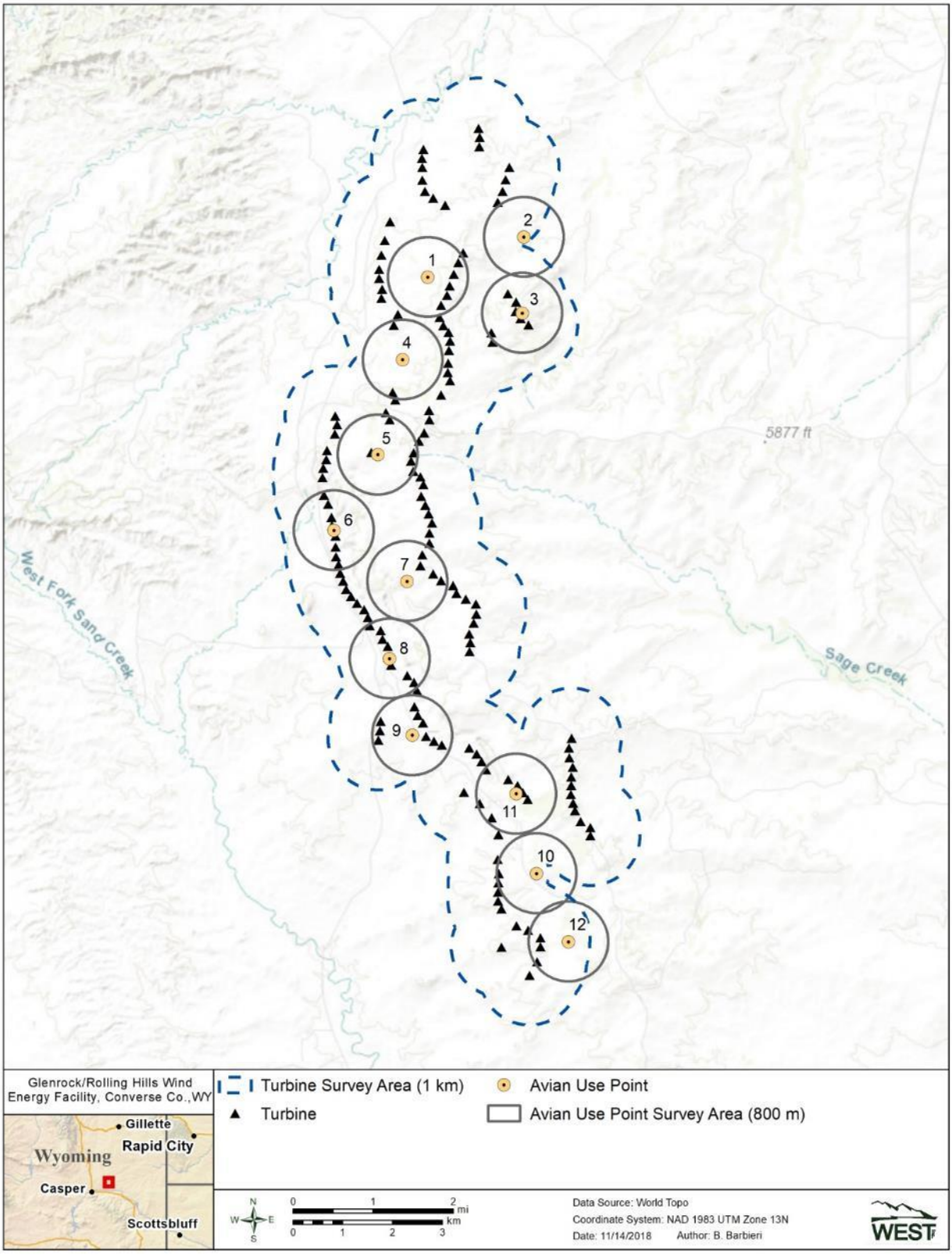

Figure 8. Fixed-point avian use survey points at the GRH Wind Energy Project surveyed during baseline evaluations. Figure includes a 1-km buffer from constructed turbines.

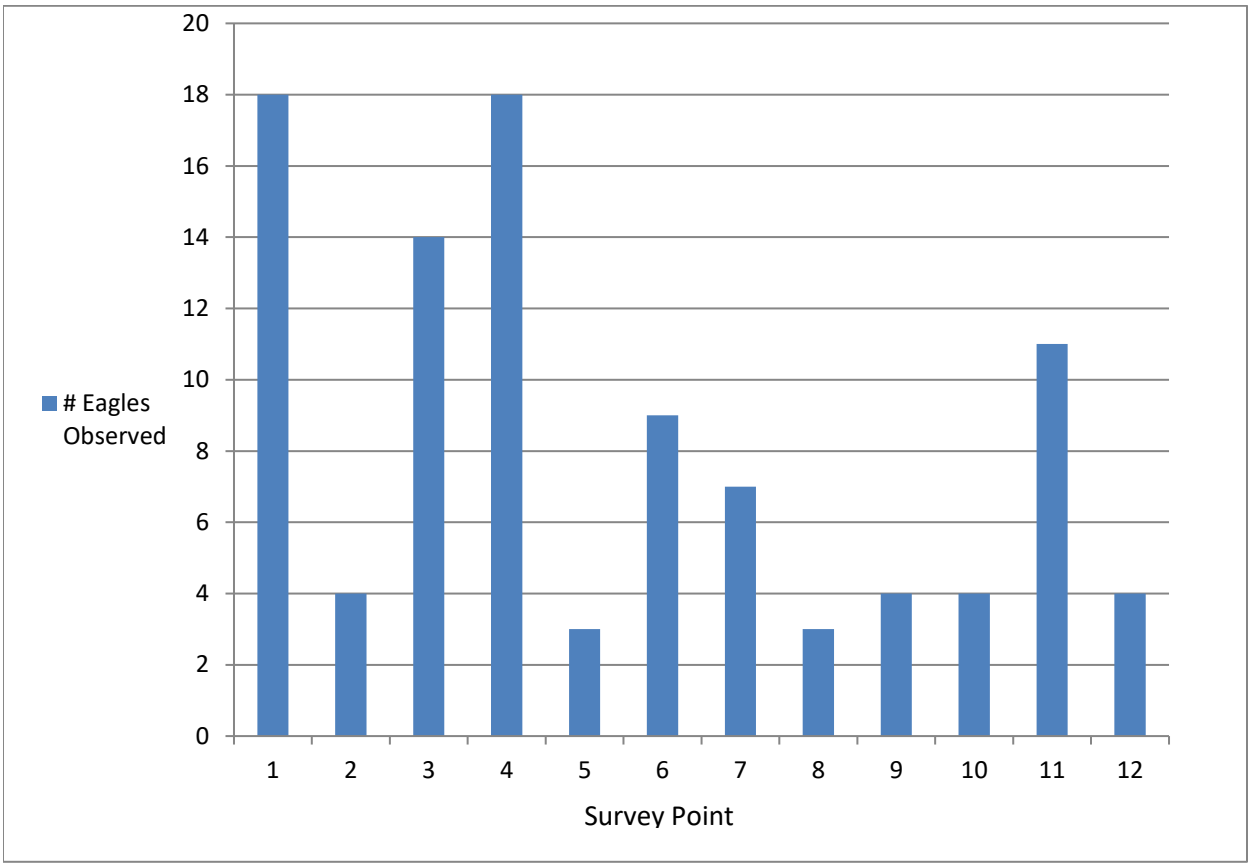

Figure 9. Golden eagle observations during fixed-point avian-use survey by points at the GRH Wind Energy Project during spring and fall 2007.

Table 5. Details of all golden eagle observations during the spring and fall 2007 avian use surveys at the GRH Wind Energy Project, Converse County, Wyoming.

Date	Station	# of Individuals	Age	First Activity*	Initial Flight Height (meters)	Initial Distance from Observer (meters)	Closest Distance from Observer (meters)
4/18/2007	1	1		SO	50	1100	900
4/18/2007	4	1	JUVENILE	SO	20	800	75
4/18/2007	5	1	JUVENILE	GL	8	700	700
4/18/2007	6	1		OT	NA	600	600
4/18/2007	8	1		SO	25	900	750
4/26/2007	10	1	ADULT	SO	50	600	300
4/26/2007	11	1		FL	20	600	600
4/26/2007	1	1	SUBADULT	SO	75	500	400
4/26/2007	1	1	ADULT	SO	350	400	300
4/26/2007	4	1	JUVENILE	GL	20	400	400
4/26/2007	6	1	ADULT	FL	4	300	300
5/1/2007	1	1		PE	NA	400	350
5/1/2007	6	1	ADULT	SO	250	300	150
5/9/2007	7	1	ADULT	PE	NA	800	800

Table 5. Details of all golden eagle observations during the spring and fall 2007 avian use surveys at the GRH Wind Energy Project, Converse County, Wyoming.

Date	Station	# of Individuals	Age	First Activity*	Initial Flight Height (meters)	Initial Distance from Observer (meters)	Closest Distance from Observer (meters)
5/9/2007	7	1	ADULT	SO	100	1000	1000
5/9/2007	1	1	ADULT	PE	NA	300	300
5/9/2007	1	1		GL	4	600	600
5/9/2007	3	1	JUVENILE	SO	35	700	700
5/9/2007	4	1		GL	35	200	200
5/9/2007	4	1	JUVENILE	SO	50	300	300
5/10/2007	11	1	ADULT	PE	NA	800	800
5/10/2007	3	1	JUVENILE	SO	100	300	300
5/10/2007	3	1	JUVENILE	GL	8	800	800
5/16/2007	11	1		PE	NA	1000	1000
5/17/2007	1	1		FL	35	700	650
5/17/2007	4	1		PE	NA	800	800
5/23/2007	1	1	SUBADULT	GL	10	200	200
5/23/2007	1	1	SUBADULT	GL	12	200	200
5/23/2007	1	1	SUBADULT	GL	15	400	400
5/23/2007	1	1	SUBADULT	GL	75	450	400
5/23/2007	4	1		SO	25	800	700
5/23/2007	4	1		SO	25	800	800
5/23/2007	6	1	SUBADULT	SO	75	500	400
5/23/2007	7	1	JUVENILE	FL	10	1000	1000
5/23/2007	10	1	ADULT	PE	NA	800	800
5/23/2007	11	1	ADULT	PE	NA	800	800
5/30/2007	3	2	JUVENILE	FL	35	1000	700
6/9/2007	3	1	JUVENILE	SO	25	1200	1200
6/9/2007	4	1	JUVENILE	PE	NA	800	800
6/9/2007	10	1	ADULT	PE	NA	800	800
6/9/2007	11	1	ADULT	PE	NA	800	800
9/19/2007	1	1	ADULT	SO	100	750	750
9/19/2007	1	1	ADULT	FL	10	650	650
9/19/2007	3	1	ADULT	SO	500	500	500
9/19/2007	3	2	MIXED	SO	300	800	400
9/19/2007	4	1	JUVENILE	SO	100	600	450
9/26/2007	4	1	JUVENILE	FL	50	500	500
9/26/2007	4	2	JUVENILE	FL	50	700	700
9/26/2007	7	1	SUBADULT	FL	100	780	750
9/26/2007	11	2		FL	50	800	750
9/26/2007	11	1		SO	100	800	700
9/26/2007	12	1	SUBADULT	SO	50	400	350
10/4/2007	2	1		SO	200	800	750
10/4/2007	3	1	SUBADULT	SO	10	750	750
10/4/2007	3	1	JUVENILE	SO	200	400	375
10/4/2007	3	1	ADULT	SO	25	150	100
10/4/2007	6	2	ADULT	SO	150	750	600
10/4/2007	7	1	ADULT	FL	200	450	300
10/17/2007	1	1	JUVENILE	SO	200	800	450
10/17/2007	2	1		SO	150	700	700
10/17/2007	3	1	JUVENILE	SO	100	400	300
10/17/2007	3	1	SUBADULT	SO	100	750	750

Table 5. Details of all golden eagle observations during the spring and fall 2007 avian use surveys at the GRH Wind Energy Project, Converse County, Wyoming.

Date	Station	# of Individuals	Age	First Activity*	Initial Flight Height (meters)	Initial Distance from Observer (meters)	Closest Distance from Observer (meters)
10/17/2007	4	1		SO	150	790	790
10/17/2007	4	2		SO	200	750	500
10/17/2007	5	1		FL	25	450	450
10/17/2007	6	2	MIXED	SO	200	750	400
10/17/2007	8	2	ADULT	SO	250	150	150
10/17/2007	11	1	ADULT	FL	100	800	500
10/25/2007	1	2	SUBADULT	SO	200	800	700
10/25/2007	4	1		SO	100	800	750
10/25/2007	9	1		SO	50	700	700
10/25/2007	11	1	ADULT	SO	200	800	450
10/25/2007	12	1	SUBADULT	SO	150	650	350
10/30/2007	6	1		SO	100	750	500
10/30/2007	7	1	ADULT	PE	NA	750	750
11/8/2007	1	1	SUBADULT	SO	200	600	550
11/8/2007	1	1		SO	200	500	250
11/8/2007	2	1	ADULT	SO	10	750	750
11/8/2007	4	1	ADULT	SO	200	500	450
11/8/2007	4	1	ADULT	SO	15	800	780
11/8/2007	12	1		PE	NA	800	800
11/8/2007	12	1	SUBADULT	SO	100	700	450
11/14/2007	1	1	ADULT	SO	125	600	600
11/14/2007	2	1	ADULT	FL	100	780	700
11/14/2007	5	1		SO	200	700	700
11/14/2007	7	1	SUBADULT	FL	200	600	600
11/14/2007	10	1		PE	NA	750	750
11/14/2007	11	1		FL	50	600	600

*Activities include perched (PE), soaring (SO), gliding (GL), flapping (FL), and other (OT).

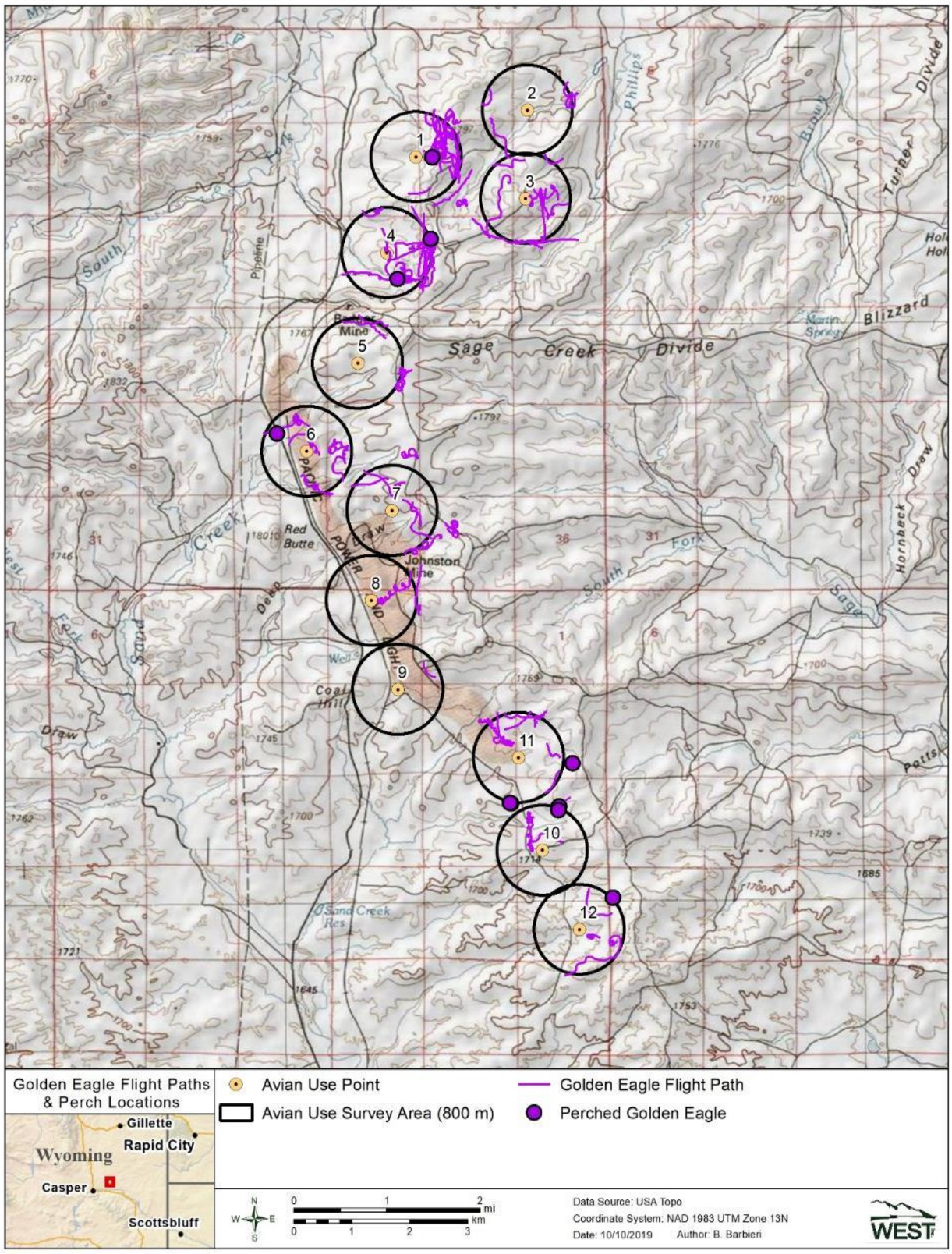

Figure 10. Golden eagle flight paths recorded at the GRH facility during the 2007 preconstruction baseline study.

5.3 Eagle Nest Surveys

5.3.1 Methods

Raptor nest surveys were completed in the spring of 2007 throughout the Project and 1-mile (1.6-km) buffer. The Project was systematically searched by vehicle and by foot. All suitable eagle nesting habitat was surveyed, including artificial nest platforms on the mine site, trees, cliffs, and rocky outcrops. Universal Transverse Mercator (UTM) coordinates, as well as nesting substrate and current status (e.g., inactive, active, incubating, young in nest) were recorded for each nest located.

5.3.2 Results

Four active (incubating adult) golden eagle nests were found during the 2007 raptor nest surveys (Figure 11). Three of the nests were on artificial eagle nest platforms within the Project boundaries and the fourth active golden eagle nest was located in a cottonwood tree just northeast of the Project area (Figure 11). Fledge success was not documented during the 2007 survey. All golden eagle nests found during the survey were active, with no inactive nests documented.

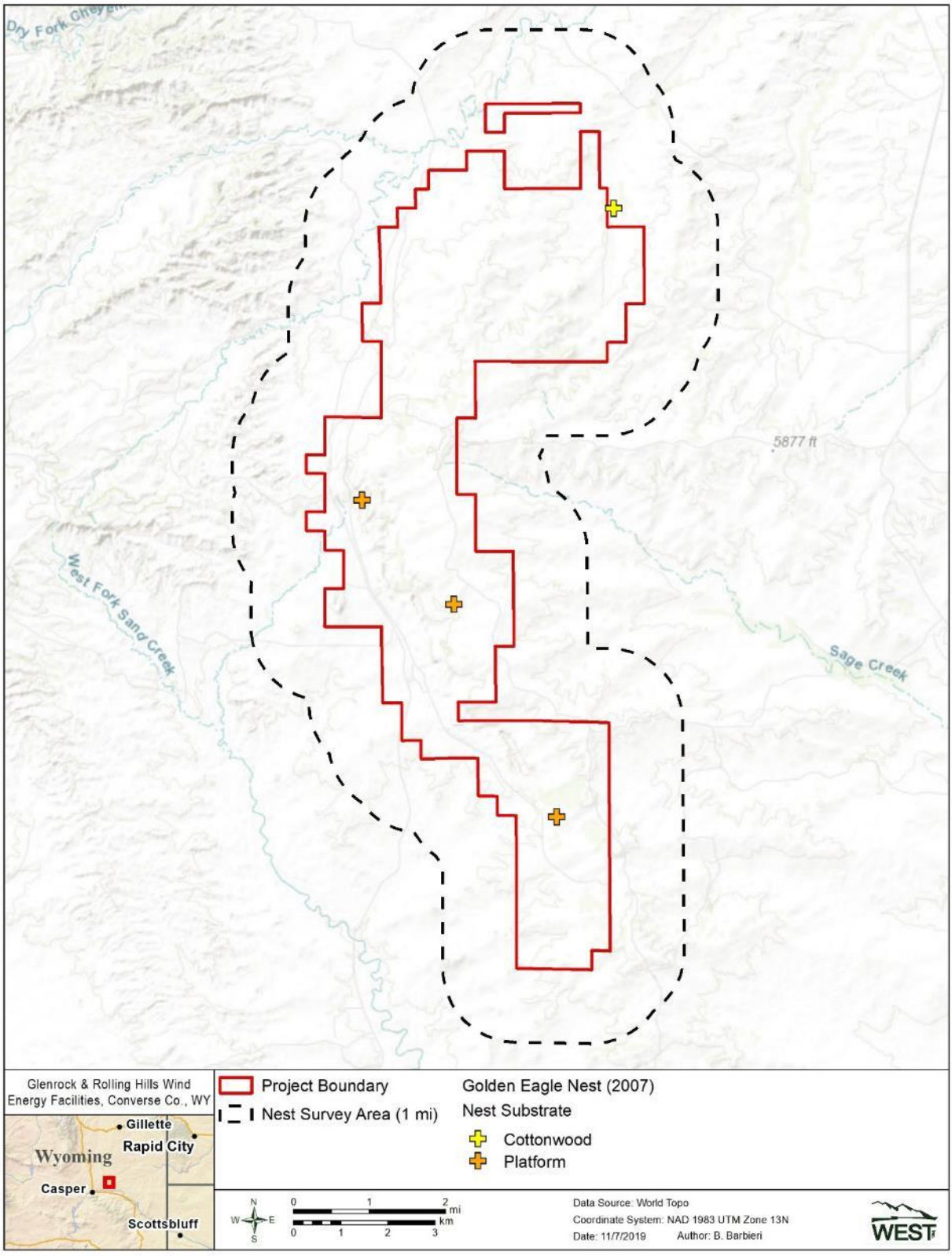

Figure 11. Location of golden eagle nests found in 2007 during nest surveys at the GRH Wind Energy Project and 1-mile buffer from the Project, Converse County, Wyoming.

5.4 Prey Base Assessments

5.4.1 Methods - Greater Sage-grouse

Greater sage-grouse represent a potential prey source for golden eagles. No sage-grouse leks were known to occur on or near the Project area; however, the Project area has been used as brood rearing habitat. Surveys associated with sage-grouse were developed in coordination with the WGFD to assess impacts to the grouse, not to specifically support eagle risk assessments, but are included in this ECP as they provide some level of information on golden eagle prey abundance in the Project area.

Four sage-grouse brood surveys were conducted prior to construction in July and August 2007. Greater sage-grouse pellet count surveys were also conducted prior to, during, and after construction by estimating pellet density within 328 ft (100 m) of proposed turbine locations at the Project as well as at a reference area (Johnson et al. 2010). The surveys were conducted to establish a baseline of greater sage-grouse pellet density for comparison pre- and post-construction to evaluate the potential for avoidance of the wind energy facility by greater sage-grouse.

The initial Wyoming Executive Order for Greater Sage-Grouse Core Area Protection (WGFD 2014) did not exist during the initial site assessment stage; however, the Project area is less than one mile east of the nearest greater sage-grouse core population area (Figure 12). The core areas identify the most important sage grouse habitat in the state and are afforded additional protection under the Executive Order, which was recently revised by Governor Mark Gordon (Wyoming Executive Order 2019-3).

5.4.1.1 Results - Greater Sage-grouse

Three adult males, six adult females, and 19 juvenile sage-grouse were classified during the sage-grouse brood surveys. Based on results of these surveys, sage-grouse broods rarely use the Project area because it does not provide important brood rearing habitat. No additional sage-grouse brood surveys were conducted following the initial preconstruction survey.

The density of sage-grouse pellet groups averaged 99.0/acre (245/ha) at turbine plots and 17.0/acre (42/ha) at reference plots prior to construction (Table 6). Sage-grouse pellet density averaged 8.5/acre (201.0/ha) at reference plots and 2.8/acre (6.9/ha) at plots located within 100 m of wind turbines for the two sampling events that occurred during construction of the facility. For the three sampling events that occurred after the facility became operational, sage-grouse pellet density averaged 61.6/acre (152.2/ha) within 100 m of turbines and 3.8/acre (9.4/ha) at reference plots. Based on the pellet count data, greater sage-grouse use of the development area was consistently higher than the reference area both prior to and after construction; however, it was lower than the reference area during construction. Greater sage-grouse use of the Project area declined during construction, returned to levels similar to those during preconstruction conditions in both the spring and fall of 2009, and declined again in the spring of 2010. Compared to preconstruction use in the fall of 2007, data collected in the spring of 2010 showed a decrease

in greater sage-grouse use by 81.4%. A similar comparison for the reference plots shows a decrease in greater sage-grouse use by 100%. Sage-grouse pellet surveys were discontinued following the spring 2010 effort at the direction of the technical advisory committee (TAC).

Table 6. Density (#/acre) of greater sage-grouse pellet groups observed in plots during surveys at the Glenrock/Rolling Hills Wind Resource Area, Converse County, Wyoming.

		# pellet groups/acre	
Season	**Timing**	**Turbine plots**	**Reference plots**
Fall 2007	Pre-construction	99.0	17.0
Spring 2008	During construction	0	14.2
Fall 2008	During construction	5.6	2.8
Spring 2009	Operational	79.0	11.3
Fall 2009	Operational	87.4	11.3
Spring 2010	Operational	18.4	0

5.4.1.2 Big Game

Big game may also be considered prey for golden eagles. Range maps for big game species were not developed as part of the baseline assessment; however, a review of the existing data (WGFD 2018) show seasonal ranges (winter/yearlong) for pronghorn and mule deer in the Project area (Figure 12). No crucial range or known migration routes are identified in the Project area. The WGFD has not identified parturition areas for big game species in or around the Project area. These data were not specifically used to assess eagle risk at the Project prior to development.

5.4.1.3 Livestock

Tillard Sheep Company, Smith Sheep Company, and Hornbuckle Cattle Company leased land within the Project boundary for grazing by livestock prior to construction and during Project operations. The presence of livestock, specifically lambs, provides an attraction and food source for eagles. Sheep and cattle ranching activities continue to occur seasonally at the Project. Sheep grazing may occur from February through September in the south-east Project area near turbines RH1-604 to RH1-617. Cattle grazing occurs along the same RH1 turbines from April through July; near turbines RH1-101 through RH1-107 and GR1-101 and 102 July through August and October through December; RH1-108 through RH1-112 and GR1-103 and 104 April through July; and GR1-201 through GR1-205 February through May and September through February. No lambing or calving occurs on the Project. No lambing or calving occurs near the turbines.

5.4.1.4 Other Prey

No waterfowl or waterbird use was documented during preconstruction avian point count surveys. One killdeer (*Charadrius vociferous*) was observed during spring surveys. Small water features occur throughout the Project area, mostly ephemeral in nature. These features may attract water-associated birds that provide prey for eagles.

No additional prey surveys were conducted prior to construction to specifically evaluate eagle use and associated risk at the Project. Prairie dog colonies did not occur within the Project boundary during baseline survey efforts. Surveys for other prey species (e.g., lagomorphs) did not occur

during the baseline survey efforts; however, habitat modification efforts to reduce attractants to potential prey species were conducted after the Project was operational (see Section 9.7).

Following construction, a golden eagle monitoring study was conducted from April 23, 2010 – April 22, 2011 (Johnson and Martinson 2011). As part of that study, 32 rock piles (associated with the coal mine reclamation) were mapped at the Project and the rock piles were surveyed in the summer of 2010. Results of the rock pile surveys showed that virtually all were being used by rabbits, and many were being used by other mammals such as rodents and perhaps badgers (*Taxidea taxus*), foxes (*Vulpes* spp.), or coyotes (*Canis latrans*). Remains of dead rabbits, such as skulls and bones, were present at 12 of the 32 rock piles (38%), suggesting that predators, likely including raptors, had killed rabbits and consumed them at the site of the kill. No other areas of concentrated prey such as prairie dog towns were identified on the site. These rock piles were later removed as discussed in Section 9.7.

Subsequent to this effort, it was noted during other surveys that white-tailed prairie dogs (*Cynomys leucurus*) had started encroaching onto the southern end of the Project. Additionally, an eagle mortality was located in the southern Project area in early 2014, and follow up surveys were conducted to identify potential attractants in area. The boundary of this prairie dog town was mapped in 2014 (Figure 13). Approximately 200 acres were mapped and included an area surrounding four turbines.

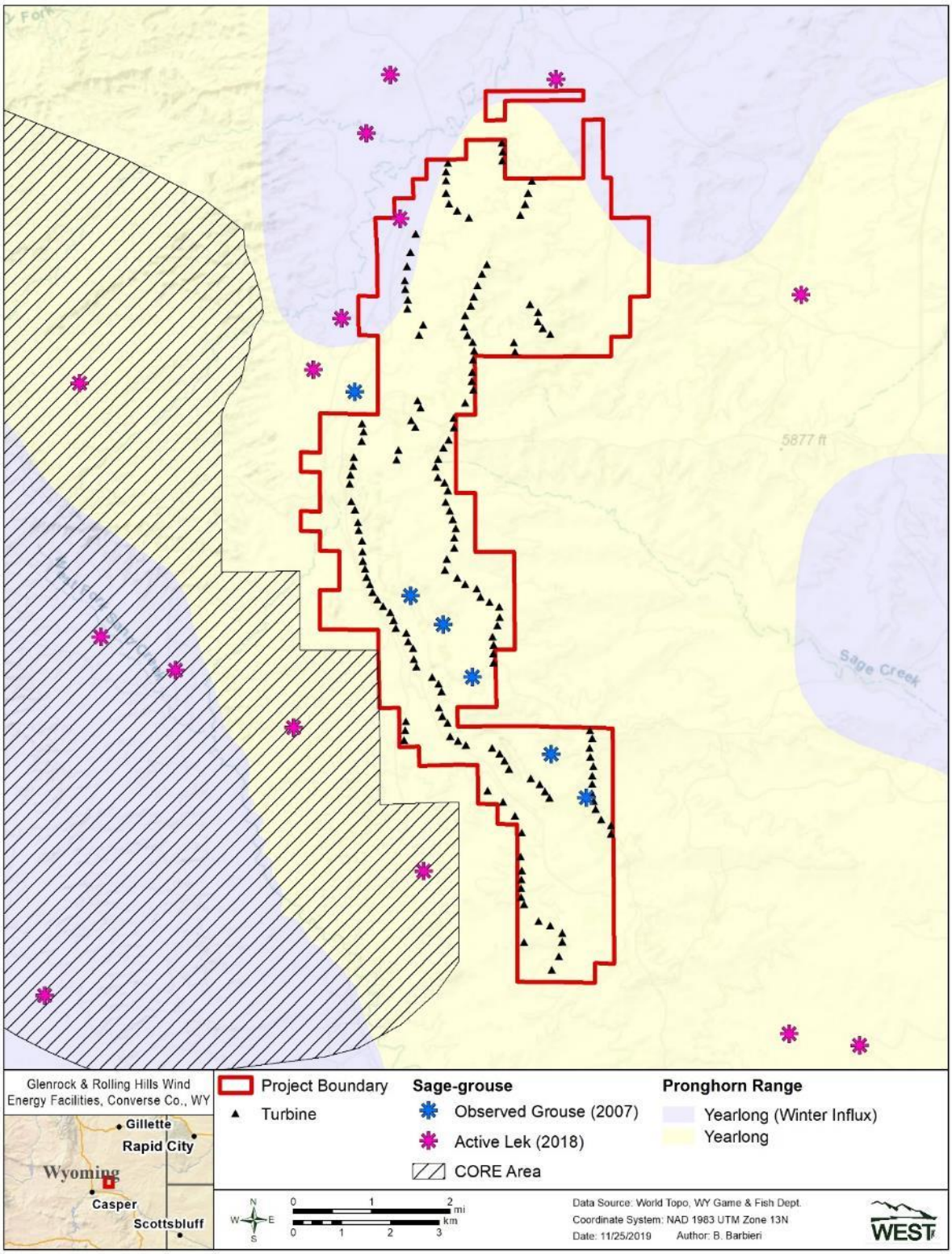

Figure 12. Greater sage-grouse core areas and location of greater sage-grouse leks and pronghorn ranges in relation to the GRH Wind Energy Project area, Converse County, Wyoming. Lek and big game data from WGFD 2018 data set.

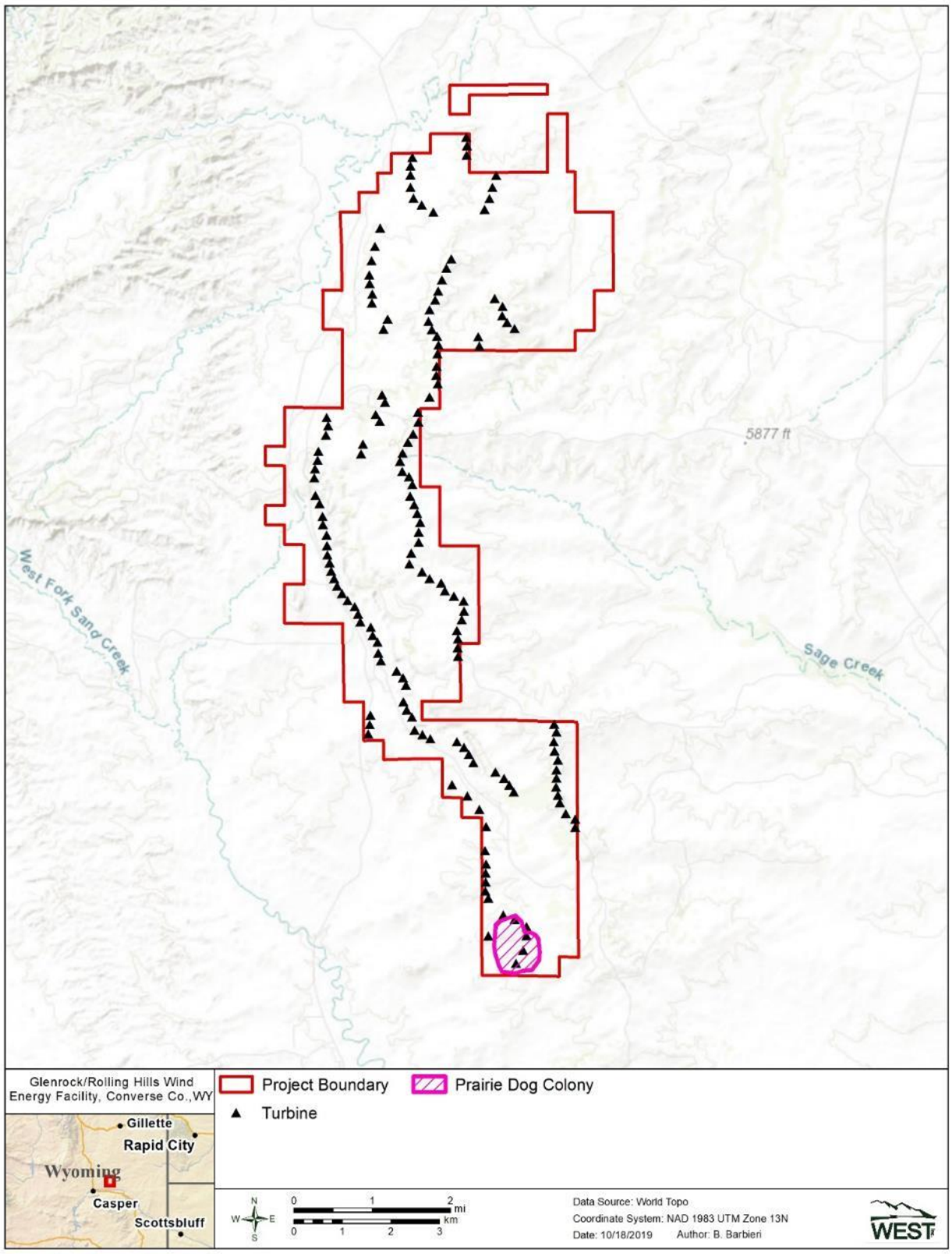

Figure 13. Location of prairie dog colony mapped at GRHProject Area in 2014

5.5 Bald and Golden Eagles

Both bald and golden eagles are known to occur within the Project area. Discussion of habitat and observations of bald and golden eagles in the vicinity of the Project are provided below.

5.5.1 Bald Eagle

No bald eagles were observed on the Project during the 2007 pre-construction avian surveys (Johnson et al. 2008). Bald eagle nesting habitat (e.g., trees in proximity to large waterbodies) is not present in the Project and foraging habitat is limited. No communal bald eagle roosts or habitat for such roosts exist in the Project area, although the BLM has documented bald eagle winter roosts in the region, including along the North Platte River located about 10 miles south of the Project and on Casper Mountain located approximately 25 miles southwest of the Project.

5.5.2 Golden Eagle

Golden eagles occur in the Project area, and had the highest use of any raptor species during the pre-construction use surveys. Four active golden eagle nests were identified within one mile (1.6 km) of the Project boundary during the pre-construction nest survey (Figure 11), including three on artificial nest structures at the Project. A permit to move the three artificial nest structures was obtained through the USFWS MBPO (issued Jan 22, 2008), and nest structures were moved from the Project area on February 18 and 19, 2008 to reduce risk prior to constructing turbines (Johnson et al. 2008). The three nest structures were moved to a location approximately 10 miles (16 km) south of the Project area. The remaining golden eagle nest was located approximately 1.1 miles (1.8 km) from the nearest turbine location. Due to annual variability in eagle use and because all golden eagle use surveys conducted after the Project became operational followed different methods than the preconstruction surveys, it is not possible to accurately evaluate to what extent moving the three nests reduced risk, although presumably removing three active nests from within the turbine development area did likely reduce risk to eagles.

Suitable golden eagle foraging habitat is available in and surrounding the Project area. The Project occurs in a region where colonial prey species (i.e., prairie dogs) are very abundant and wide spread. Additionally, lagomorphs have been observed in the Project area. Trees were planted in the Project area by a local classroom after construction to increase general wildlife habitat, these trees have since been removed. A small number of natural trees still exist across the Project and artificial perch locations (i.e., power poles, fence posts, etc.) also exist. Potential nesting habitat exists outside of the Project in the form of cliffs, trees, and man-made structures. No known communal roosts have been identified within the Project area.

5.6 Eagle Risk Categorization

Risk to eagles at the Project was identified based on pre-construction data collection. The avian use surveys documented eagle use, specifically golden eagles, in the Project area. Nest surveys documented a golden nest approximately one mile (1.6 km) from the Project. Additional data evaluation identified prey sources in the Project area and perch opportunities. Based on the site-specific surveys, minimization measures were established to reduce the risk to eagles (see Chapter 6).

6.0 Avoidance and Minimization of Risks in Project Siting (ECPG Stage 4)

In accordance with the USFWS Region 6 ECP Guidance, this section includes information on avoidance and minimization of risks to eagles during Project siting and design. Information in this section also addresses recommendations under Stage 4 of the ECPG. Because the Project was developed prior to issuance of guidance documents and before eagle risk data were publically available, many of the present-day avoidance and minimization practices were not standard at the time of development, and as such, were not implemented for this Project. Measures that were implemented are discussed below.

Throughout Project development, PacifiCorp evaluated and adopted conservation measures to avoid and minimize impacts to eagles. These conservation measures were and will be incorporated into the infrastructure layout and design, construction/clean-up, operations, and decommissioning/restoration plans for the Project. This section provides a summary of the conservation measures developed during site selection and Project design. Conservation measures that were implemented during construction, are being implemented during operations, and will be implemented during decommissioning/restoration are included in Section 8.0 below.

6.1 Site Selection and Project Design

- Initial Project development planning identified the present-day Project location as a potential wind energy site partly because the area had been previously impacted due to mining activities and therefore further development would not require the same level of impacts as a greenfield site.
    - Where possible, existing roads (approximately 16 km [10 miles]) were used or modified for the purpose of this Project.
    - Mine operations buildings were already constructed and used to support the wind Project.
    - Existing power sources were used to supply the O&M with energy. No new electrical connections were required beyond the turbine collection and transmission lines.
- A variety of turbine layout plans were considered during the development process. There is no clear indication that modifications made during the plan updates were selected in an effort to reduce impacts to eagles. However, design plan changes did have indirect avoidance/minimization results such as siting changes to focus impacts in previously disturbed areas and minimize lengths of roads and lines.
- PacifiCorp worked with the USFWS to receive a permit to remove the three artificial eagle nest platforms located in the middle of the proposed Project area. It was believed that removal of the artificial nesting structure would reduce potential risk to eagles, while creating new nesting opportunities away from the Project. PacifiCorp followed the approved permitting process and ultimately received a permit from the USFWS for this activity. The three artificial eagle nest platforms were relocated to a location 10 mi (16 km) south of the Project.

- In addition, the location of the transmission line was selected to concentrate impacts within an existing roadway, railroad, and power line corridor.
- The Project incorporates state-of-the-art turbine technology, including unguyed, tubular towers and slow-rotating (10.1 - 20.4 rotations per minute), upwind rotors.
- The Project implemented APLIC (2006) recommendations (e.g., a minimum of 60 in (150 centimeters [cm;])) of horizontal separation between energized and/or grounded parts and 40 in [100 cm] of vertical separation and insulation or covering of exposed energized or grounded parts into overhead lines constructed for the Project to minimize collision and electrocution risks to eagles).
- Most (>95%) of the collections lines (approximately 65 miles [105 km]) were designed as below ground lines to minimize potential electrocution, collision, and habitat fragmentation and barrier related impacts. Only one mile exists above ground.

7.0 Predicting Eagle Fatalities (ECPG Stage 3)

This section includes a risk assessment for the Project based on the pre-construction eagle use data collected at the Project during avian use surveys. Information in this section addresses recommendations under Stage 3 of the ECPG. Based on conversations with the USFWS, pre-construction eagle use data were not used to inform USFWS Collision Risk Model in this section. Other risk assessments are included as appropriate.

7.1 USFWS Mortality Modeling

USFWS will independently determine the appropriate level of take for this Project based on their approved take calculation methods. Therefore this section does not include a formal Collision Risk Model (CRM) assessment.

7.2 Other Impacts

7.2.1 Habitat Loss, Degradation, and Fragmentation

Construction of wind energy facilities also impact eagles and their prey through habitat loss, degradation, fragmentation, and other indirect effects. The removal of habitat and conversion of interior habitat to edge habitat during construction of turbines and associated infrastructure, such as roads and power lines, likely results in certain species being displaced from at least portions of habitat within the Project footprint. Conversely, creation of edge habitat and disturbed areas may improve habitat for some species used as prey by eagles, such as lagamorphs. Other indirect impacts may occur if pesticides are used to control rodents near turbines, O&M facilities, and other infrastructure, as these pesticides may get into the food chain and impact raptors.

Construction of the 158-turbine Project resulted in the removal of approximately 103.6 acres (41.9 ha) of habitat for the substation, interconnection substation, O&M building, turbines, crane pads, new access roads, and transmission line access roads (Table 3). The primary habitat lost was grassland on reclaimed mined land although native sagebrush steppe dominated by a mix of grassland and shrub communities also was impacted. Temporary land disturbances resulting from construction of the turbines and associated infrastructure was appropriately 532.4 acres (215.5 ha). Temporary impacts included a laydown area and batch plant, areas immediately adjacent to widened new and existing roads, and ground disturbance associated with the underground collector system (Table 3). Temporary land disturbances have been reclaimed and re-vegetated so that natural succession could occur. Although construction of the Project resulted in direct permanent and temporary habitat loss and degradation, indirect effects, such as those due to fragmentation, cannot be accounted for by evaluating only the acres of habitat directly impacted. For any wind energy project it is likely that the indirect effects on wildlife (fragmentation, etc), in terms of the total acres of impact, at least exceed, the relatively limited number of acres of habitat that are tallied as habitat loss or degradation. The current state of wildlife science is quite limited in terms of assessing these indirect effects of wind energy projects. Hence, it is not possible to quantify the indirect effects. Also, not all wildlife species are effected in the same way by indirect effects. Some species are not affected, while others are greatly affected, and affects to other

wildlife species are somewhere between these two conditions. In assessing overall potential impacts to wildlife, including species that eagles prey upon, we may not be able to quantify such effects but it is still important to qualitatively recognize them.

In addition to the direct ground-level impacts associated with this Project, construction of the Project created a hazardous area (zone of risk) to eagles the can result in collisions with turbines (as assessed in Section 7.1 above) or other vertical structures, electrocutions associated with above ground power lines, or impacts associated with the increased presence of vehicles and other equipment. Our current understanding of these additional impacts associated with Project features makes quantification of these impacts difficult; however, the potential for these impacts are recognized in this ECP.

7.2.2 Disturbance/Displacement

In addition to removing and degrading habitat, Project wind turbines may displace eagles and their prey from an area due to creation of edge habitat, the introduction of vertical structures, and disturbances directly associated with turbine operation (e.g., noise and shadow flicker) (USFWS 2012, NRC 2007). Impacts are concentrated near turbine locations and along access roads, although available data indicate that avoidance of wind turbines by birds generally extends 245 to 2,625 ft (75-800 m) from a turbine, depending on the environment and the bird species affected (Strickland 2004). Sufficient literature is not currently available to define the magnitude of these impacts, specifically as it relates to eagles.

Although construction and operation of the wind energy facility likely resulted in displacement of some groups of birds and prey species, the Project was sited to minimize disturbance to native habitat including the use of mine operations infrastructure (e.g., roads, O&M facilities), and undisturbed native habitats are abundant in the region. Therefore, it is unlikely that displacement of eagles or prey species would result in any population level impacts to eagles on a regional scale. At the local level, however, moving the three artificial nest platforms may have reduced the local population of breeding golden eagles in the immediate vicinity of the Project.

7.3 Eagle Risk Factors

In addition to abundance, the two main risk factors identified in the ECPG are: (1) the interaction of topographic features, season, and wind currents that create conditions for high-risk flight behavior near turbines; and (2) behavior that distracts eagles and presumably makes them less vigilant (e.g., active foraging or inter- and intra-specific interactions such as territorial defense).

The ECPG also provides a table of general risk factors that can be used to guide risk assessments for a Project. These factors are discussed with additional site specific information regarding each factor provided. It should be noted this information is only provided to identify general factors at the Project that may result in more or less risk and is not used to specifically identify each risk factor and magnitude at the Project. Further risk evaluations based on post-construction monitoring data are provided in Section 9.0.

7.3.1 Topography and Wind

Variation exists within the Project at a landscape scale; however, the Project is generally located along a north-south oriented ridgeline with one turbine string on top of the ridge and one turbine string located west of the slope (Figure 4). The northern and southern Project extents have more varied topography. The prominent wind direction at the Project is oriented in an easterly direction (wind blows out of the west). The orientation of the overall topography in the vicinity of the Project at a landscape scale and the prominent wind direction in relation to the Project suggest that turbines sited on steep slopes with a westerly aspect may be more risky to eagles because these areas could support strong updrafts of wind. Although scientific support is limited, some research suggests turbines in saddles or canyons or on the upwind side of ridges may pose more risk to golden eagles (Barrios and Rodriguez 2004, De Lucas et al. 2008, Hoover and Morrison 2005, Smallwood and Thelander 2004). The results of the landscape-scale assessment of topography and wind suggest that topography and wind conditions at the Project create a range of risk potential based on the micro-landscape conditions and individual turbine siting.

Baseline avian use surveys were conducted to obtain data on use of the Project area by all bird species (Johnson et al. 2008). During these surveys relatively high eagle use was recorded across the survey area, with mean use of 0.47 golden eagles/plot/20-min survey in spring and 0.51 golden eagles/plot/20-min survey in fall. The central survey area had the highest use and the northern survey area had the lowest use by golden eagles. Most of the use was recorded above windward slopes. While some gaps and saddles and other areas that could provide orographic lift are located within the Project area, these are very location specific and hard to associate with the raw eagle-use data collected from 800 m point counts.

7.3.2 Inter- and Intra-Specific Interactions and Foraging Behavior

Inter-specific interaction is the competition among different species while intra-specific interaction is competition within the same species (e.g., ECPG; *see also* Eagle Risk Factors *above*). Assuming that intra- and inter-specific competition and territorial defense increases collision risk, these behaviors likely occur within the Project based on the location of known eagle and other raptor nests in the vicinity of the Project. While this potential risk factor is identified in the ECPG, studies that clearly quantify the magnitude of risk associated with this behavior are not currently available.

Eagles are known to forage within the Project and foraging behavior near prairie dog towns is believed to result in higher risk to eagles if turbines are present. Prairie dog towns are known to occur across the region but were not located in the Project area itself prior to development However, in 2012 prairie dogs began to encroach into the southern end of the Project and there is currently a prairie dog colony of approximately 200 acres (81 ha) present. The colony surrounds four turbines (Figure 13). The Project area also is designated year-long range for pronghorn. Pronghorn use of the Project area may increase eagle use and risk to eagles foraging in the area. As indicated in Section 8.0 below, PacifiCorp is implementing a carcass removal program that should reduce risk to foraging eagles. Common perch structures are located along the highway and localized areas in the Project area in the form of transmission poles. Turbines located parallel

and relatively close to the highway may have greater risk, as eagles may fly through the turbines when traveling from perch sites or nest locations to foraging habitat.

7.4 Eagle Risk Site Categorization

The ECPG recommends that Project developers or operators use a standardized approach to categorize the likelihood that a project will meet the standards for issuance of a programmatic eagle take permit. Those categories are listed below.

- Category 1—High risk to eagles/potential to avoid or mitigate impacts is low.
- Category 2—High to moderate risk to eagles/opportunity to mitigate impacts.
- Category 3—Minimal risk to eagles.

The ECPG (USFWS 2013b) applies primarily to wind energy facilities that have not yet been constructed or are operational. GRH was constructed and operational prior to the publication of the ECPG; therefore, discussions with USFWS have determined that risk categorization does not apply to GRH and it should not be assigned a risk category.

8.0 Additional Avoidance and Minimization of Risks, and ACP's (Stage 4)

In accordance with the USFWS Region 6 ECP Guidance, this section covers additional information on avoidance and minimization of risks to eagles during construction and operations at the Project (*see* Section 6.0 *above for avoidance and minimization during Siting and Design*). Information in this section also addresses recommendations under Stage 4 of the ECPG. The compensatory mitigation and adaptive management sections have been moved to section 9.0 based on the current state of the Project and decision making process.

8.1 Construction Phase Best Management Practices

The following avoidance and minimization measures were implemented to reduce impacts to eagles during the construction phase. These measures included both direct and indirect measures to reduce impacts to eagles, their habitat, and their prey. The measures listed below include all measures implemented to address the impacts discussed in Section 7 including habitat fragmentation, degradation, disturbance, and displacement. For a detailed explanation of best management practices please see the project-specific BBCS or ISC permit application.

- During Project construction, travel was restricted to designated roads, and Project personnel were advised regarding speed limits (25 mph [40 km/hr]) to minimize wildlife mortality due to vehicle collisions and to reduce disturbance and displacement.
- Where applicable, efforts were made to minimize impacts to vegetation and soils. These efforts help minimize degradation and fragmentation of habitat for eagles and their prey. A brief list of measures to support vegetation and soils includes:
    - Minimized damage to the land surface and property to only areas necessary for safe and efficient construction;
    - Used existing roads and minimized disturbing natural vegetation where possible;
    - Restored soil and vegetation in areas impacted by construction (filling ruts and scars);
    - Restored roads, portions of roads, crane paths, and staging areas not required for operation and maintenance to the original contour. Contoured, graded, and seeded reclaimed areas as needed to promote successful re-vegetation, provide for proper drainage, and prevent erosion;
    - Implemented proper soil handling techniques (top soil removal, minimizing excavation, protecting exposed soils, minimizing work on wet soils) to help restore habitat and reduce potential fragmentation and degradation;
    - Inspected equipment for potential noxious weed sources prior to entering the facility to reduce potential for habitat degradation; and

  - Used certified weed free erosion reduction material (straw waddles) to minimize habitat degradation.

- Where applicable, efforts were made to minimize impacts to water resources and wetlands. These efforts supported reduced water impairment issues and degradation of habitat and resources that are used by eagles and their prey. For example, water quality degradation at the Project may impact fish in downstream waters used by foraging bald eagles. A brief list is provided below:
  - Wind turbines and most ancillary facilities were built on uplands to avoid surface water features and designated floodplains;
  - Refueling and staging occurred at least 300 ft from the edge of a channel bank at all stream channels. Sediment control measures were utilized to minimize impacts to aquatic and riparian habitats;
  - Restoration near drainages included matching contours to allow natural flows.
- During Project construction, riparian areas were avoided, where feasible. If avoidance was not feasible, activities within riparian areas were conducted in conformance with SWPPP requirements.
- Effective exhaust mufflers were installed and properly maintained on all construction equipment to minimize additional noise and potential disturbance to eagles and their prey.
- PacifiCorp required construction contractors to comply with federal limits on truck noise. Construction activities took place mostly during daylights hours. Nighttime construction work was minimized to avoid potential disturbance to night roosting eagles and their prey.
- All applicable hazardous material laws and regulations existing or hereafter enacted or promulgated regarding regulated chemicals were complied with, and a Spill Prevention, Control, and Countermeasure Plan (SPCC) were implemented. The only hazardous chemicals anticipated to be on-site are the chemicals contained in batteries, diesel fuel, gasoline, coolant (ethylene glycol), and lubricants in machinery. These restrictions minimize the potential for direct eagle poisoning or poisoning of their prey.
- No burning or burying of waste materials occurred or will occur at the Project. Post construction waste materials were removed from the construction area. All contaminated soil and construction debris was disposed of in approved landfills in accordance with appropriate environmental regulations to minimize habitat degradation.
- As described in Chapter 6 all overhead lines constructed for the Project incorporated Avian Power Line Interaction Committee (APLIC) recommendations (APLIC 2006). However, some of the lines had originally been designed and constructed by a contractor who had been required to use an avian-safe design. Upon PacifiCorp inspection of the line after construction, it was documented that the construction did not meet PacifiCorp's avian-safe standards and was subsequently re-insulated to achieve PacifiCorp's standards. The APLIC 2012 document was not published during the construction period.

- As described in Chapter 6 the majority of the collection system was buried, and potential collision and/or electrocution-related avian impacts associated with this Project component were minimized. Habitat loss/fragmentation was minimized by clearing and disturbing the minimum amount of habitat possible to install the lines and by allowing disturbed areas to re-vegetate to similarly adjoining conditions following construction.

8.2 Operational Phase Best Management Practices

The measures implemented during the operational phase included both direct and indirect measures to reduce impacts to eagles and their prey. The measures listed below include all measures implemented to address the impacts discussed in Section 7 including habitat fragmentation, degradation, disturbance, and displacement. Specific measures taken include:

8.2.1 Site Management

- To avoid attracting eagles and other raptors, the availability of carrion has been reduced by removing carcasses discovered on-site during regular maintenance and monitoring activities. O&M personnel, or PacifiCorp contractors, will either pick up the carrion and dispose of it at an appropriate off-site facility or immediately call the WGFD to collect the wildlife carcass to remove potential avian attractants from turbines areas. Appropriate owners are called to remove livestock carcasses. This has occurred throughout the operational period. The removal notification occurs immediately with the target carcass removed within 24 if possible and based on weather conditions, contractor/staff availability, permitting requirements, site access, site safety conditions, equipment availability etc.
- The Project is located on PacifiCorp-owned property. Hunting is not allowed near the Project turbines. A benefit of this practice is safety and a reduction in eagle attraction as gut piles and other carcass remnants are reduced. This also reduces potential lead poisoning incidents.
- Project personnel are advised regarding speed limits on roads (25 mph) to minimize wildlife mortality due to vehicle collisions and to minimize potential disturbance and displacement.
- Typical travel is restricted to designated roads; and no off-road travel is allowed except to perform operational activities such as turbine maintenance and repair and in emergencies. This measure reduces habitat degradation, disturbance, and displacement.
- PacifiCorp performs regular maintenance on Project components to ensure they are functioning properly and do not pose additional risk to eagles.
- Rodent control around turbines, buildings and other man-made structures is performed using bait traps to avoid release of the dead carcasses into the environment. PacifiCorp contracts with a rodent management company that performs monthly inspections and trap collection/replacement.
- Heavy equipment used for road maintenance and snow plowing is inspected for fluid leaks and noxious weeds by site supervisors prior to work commencement. These steps ensure

potential hazardous materials will not directly or indirectly impact eagles and that vegetation in the project area remains intact.

- Large scale maintenance cranes typically use existing crane access pads, thus minimizing ground disturbance in the event a crane is utilized. Ground disturbing activities may include the occasional need to access underground cable or communications lines.

8.2.2 Collision Risk

- Wind turbines are unguyed, tubular towers and have slow-rotating, upwind rotors. The rotation speed of the GE 1.5 MW turbines varies from 10.1 to 20.4 rpm depending on wind regimes, but is greatly reduced from pre-modern era turbines that have much higher rotation speeds that have been identified as posing higher risk to eagles (National Research Council 2007).
- Collection and communication lines were buried to minimize and avoid collision and electrocution risks to eagles and other avian species. This included over 65 miles (104 km) of buried lines.
- The six permanent MET towers erected at the Project are unguyed to reduce the potential for avian collision, as thin guy wires may pose a risk to eagles flying near MET towers.

8.2.3 Advanced Conservation Practices and Continued Monitoring

- PacifiCorp employees and on-site O&M contractors receive annual training in Wildlife Incident Reporting and Handling System (WIRHS) protocols to ensure they understand the procedures (Appendix E).
- PacifiCorp will continue to monitor for the presence of eagle carcasses at the Project in accordance with Chapter 9 of this ECP (or the Eagle Incidental Take Permit upon issuance) to verify the effectiveness of the avoidance, minimization, and mitigation strategies incorporated in the project operation and management and to support future evaluations under adaptive management.
- Ongoing operational monitoring needs will be evaluated in coordination with the USFWS, based on the results of previous operational monitoring, and will be implemented if warranted.
- An adaptive management program has and will be implemented as described in Chapter 9.
- Annual nest surveys are performed (as described in Section 9.4) to identify eagle nesting activity and success. These surveys allow PacifiCorp and agency representatives to understand current eagle use and use over time and to support discussions on adaptive management.
- Results of all monitoring activities through May of 2012, including mortality surveys and nest surveys, were recorded in formal annual reports since monitoring was initiated in May 2009 (Johnson et al. 2010, 2011, 2012). Results from monitoring surveys from 2014 – 2019 have been documented in annual Special Purpose Utility Permits (SPUT) reports

and reported in this ECP. Monitoring activities and eagle nest surveys are ongoing. The continued monitoring and evaluation of collected data has and will continue to support the need for potential adaptive management or additional study needs. These results also provide actual mortality data that can be used to determine the Project's impacts on eagles.

- PacifiCorp will meet or exceed current APLIC recommendations (2006 and 2012 guidance documents as applicable) in the event that any utility poles or power lines are built or retrofitted at the Site for ownership by PacifiCorp.
- PacifiCorp has evaluated and implemented a number of advanced conservation practices as part of the ongoing adaptive management. These items are discussed in more detail in section 9.7 and include:
    - Prey habitat modifications: General surveys were conducted to verify the presence of prey species associated with rock piles. Numerous artificial rock piles were placed on the site to provide wildlife habitat as part of the reclamation plan for the coal mine. PacifiCorp removed these rock piles from the Project area to reduce attraction for potential prey species.
    - Line burials: PacifiCorp conducted an overhead line risk evaluation and, based on the results, buried approximately one mile of overhead collector/circuit line to minimize the potential collision/electrocution risk associated with the lines and to reduce perch structures within the Project area.
    - Technology (detect and deter) research: PacifiCorp evaluated a number of experimental detect and deter systems and then funded a study to test the effectiveness of a system. The BirdsVision system was installed at the Project, monitored, and then evaluated for potential use at the Project. This information was shared with the USFWS to further industry and agency knowledge on potential eagle risk reduction solutions.
    - Experimental and informed curtailment: PacifiCorp worked with WEST Inc. to develop and implement an experiment curtailment program starting in 2012. The curtailment program occurred during all daylight hours 365 days a year from November 2012 – March 2015. Data collected during this period were analyzed and a plan for long-term informed curtailment was developed. The informed curtailment identified a 6-month period and 7-hour curtailment survey day to be conducted in perpetuity or until deemed no longer required. The informed curtailment has been conducted from October 2015 – present (November 2019 report date). A detailed description of the curtailment protocol is provided in Chapter 9 and Appendix I.
    - Perch removal: PacifiCorp has removed common perch structures located near eagle mortality locations with the goal of reducing use and subsequent risk. Perch structures removed included old man-made infrastructure no longer in use (e.g., fence posts and snow fences) as well as natural perch structures (i.e., rock outcrops) and rock piles associated with coal mine reclamation. Removal occurred

through human and mechanical processes. The large rock pile removal program (associated with mine reclamation) occurred via heavy equipment.

- Infrastructure Modification: PacifiCorp has covered road culvert ends with metal grates near turbines to reduce small mammal use (specifically lagomorphs) and potential eagle attraction.

- Carrion and Carcass Removal: PacifiCorp will continue to remove potential source(s) of eagle attraction in the Project area (e.g., carrion, prey and/or prey habitat) in accordance with applicable state and federal law. PacifiCorp has on-call carrion removal contracts in place with vendors at all Wyoming wind energy facilities to collect and remove observed carrion which could create an attraction for foraging eagles, raptors, and other scavengers. Depending upon the carcass(es) observed, PacifiCorp will contact applicable carcass owners to request permission before relocating or disposing of the carcass(es).

8.2.4 Decommissioning and Restoration

- In the event that the Project is decommissioned, infrastructure will be removed, and the site will be graded and restored to as near its original condition as reasonably possible.
- Native habitat removed as a result of Project development will be allowed to re-establish through natural succession, thereby restoring habitat over time for eagles. PacifiCorp utilizes a legacy seed mixture approved for the Dave Johnston mine reclamation effort which includes native species.

9.0 Calibration and Updating of the Fatality Prediction and Continued Risk Assessment (ECPG Stage 5) and Compensatory Mitigation (ECPG Stage 4)

9.1 Post-Construction Monitoring and Analysis

PacifiCorp placed the Project in operation in January 2009. Multiple post-construction monitoring studies have been conducted since the Project went operational including: 1) a standard three year post-construction monitoring (PCM) study (May 2009 – May 2012) which included an eagle-specific monitoring segment at the request of USFWS (May 2010 – April 2011); 2) an informal monitoring effort (June 2012 – May 2013); 3) eagle specific bi-monthly searches at original PCM turbines (July 2013 – December 2015); and 4) eagle specific monthly searches at all Project turbines (January 2016 – present). The discussion below presents data through April 2020.

The first period (May 2009 – May 2012) included an initial one year post-construction monitoring and reporting program (May 2009 – May 2010) to estimate and evaluate Project impacts, as required by the ISC permit. The monitoring study followed the protocol presented in the "WildIife Monitoring Studies at GRH Wind Energy Facility" document (Appendix G), which outlined the protocols to monitor wildlife impacts. Post-construction avian monitoring efforts included standardized carcass searches, bias trials, and nest surveys. After the one year monitoring study, in coordination with the TAC, two additional years of monitoring were implemented (May 2010 – May 2012). Additionally, at the request of the USFWS, golden eagle specific surveys were conducted for a one year period (May 2010 – April 2011) and included additional searches at turbines where eagle mortalities had been identified, habitat and prey mapping, and eagle use observations. Summaries of the post-construction surveys along with comparisons to pre-construction risk assessments are included below. The full post-construction monitoring reports are included in Appendix G. The one-year golden eagle specific surveys were included in the year two PCM report.

The second period (June 2012 – May 2013) was an informal monitoring study initiated after the standardized three-year PCM study was complete. These surveys included monthly and bi-monthly searches at turbines in strings where previous eagle mortalities had been discovered. No bias trials were conducted as part of this effort and no study reports were developed, although all eagle fatalities found were reported to the USFWS within 24-48 hours as required.

The third period (July 2013 – December 2015) was a standardized monitoring study focused only on eagle fatality detections. The surveys included searches twice a month at the turbines searched as part of the original PCM study. The same plot size was searched, but 20-m transect spacing was implemented. The remaining turbines were surveyed informally via pad checks (also known as eagle scans). Searcher efficiency trials were conducted. Carcass removal trials were not conducted. No formal reports were developed beyond the required SPUT reporting.

The fourth period (January 2016 – present) was a standardized monitoring study focused only on eagle fatality detections. All turbines were searched one time per month using 20-m transect spacing. Searcher efficiency trials were conducted. Carcass removal trials were not conducted. No formal reports were developed beyond the required SPUT reporting.

As part of the overall monitoring effort, avian carcasses discovered at the Project were handled under the WIRHS manual and will continue to be for the life of the Project (Appendix E). Eagle carcass reporting changed over time with initial reporting to the USFWS – Wyoming Ecological Services Field Office. Carcasses were retrieved by USFWS staff or PacifiCorp was authorized by USFWS Office of Law Enforcement (OLE) to collect carcasses until retrieval by USFWS. Under the current protocol, PacifiCorp reports all eagle carcasses to USFWS – OLE and obtains permission to deliver carcasses to the USFWS, National Eagle Repository. If USFWS issues an eagle incidental take permit for the Project, reporting to USFWS of eagle carcasses discovered will continue based on the permit conditions which address how these need to be reported.

PacifiCorp will continue to evaluate the search efforts and discuss potential protocol modifications with the USFWS. The results of detection trials may inform changes to the protocols used for the ongoing monitoring program. Additionally, year-round for the life of the project, PacifiCorp contractors and staff will report, using the WIRHS protocols, any eagle carcasses found.

9.2 Standardized Avian Carcass Searches – May 2009 to May 2012

Three years (May 2009 to May 2012) of post-construction monitoring studies were conducted at the Project to assess the level of avian mortalities. These surveys included monitoring for eagle mortalities.

9.2.1 Methods

The methods for the carcass search studies were broken into four primary components: 1) standardized carcass surveys of selected turbines; 2) searcher efficiency trials to estimate the percentage of carcasses found by searchers; 3) carcass removal trials to estimate the length of time that a carcass remained in the field for possible detection; and 4) adjusted mortality estimates for bird species calculated using the results from searcher efficiency trials and carcass removal trials to estimate the total number of bird mortalities within the Project area.

Eagle carcasses found within search plots were included in the mortality estimate calculations, including carcasses found outside scheduled search times, under the assumption that the carcasses found incidentally on search plots would have been found during subsequent standardized searches. All carcasses found outside of the defined search plots were not included in the estimate as areas outside of the search plots were not part of the standardized monitoring. Searcher efficiency trials were conducted to estimate how detectable birds were (i.e, the percentage of carcasses that searchers found); however, these trials did not focus specifically on eagles, but rather all large birds in general. Fifty-four of the 158 turbines were selected for surveying using a systematic design with a random start (Figure 14). The same 54 turbines were searched all three years of the post-construction monitoring study. Search plots at turbines were 160 m (525 ft) x 160 m centered on the turbine. Standardized carcass surveys occurred at all 54

turbines once every 4-week (28-day) period throughout the year, with standardized surveys at half of these turbines (27 turbines) conducted once every week (seven days) during the spring (March 16 – May 15) and fall (August 1 – October 31) migration periods. Twenty large bird trial carcasses were placed for searcher efficiency trials in Year 1, 29 large birds were placed in Year 2, and 30 large birds were placed in Year 3. A total of 22 large bird trial carcasses were placed for Year 1 carcass removal trials; 35 large bird trial carcasses were placed in Year 2; and 15 large bird trial carcasses were placed Year 3. Carcasses used for large bird trials were all adult female mallards (*Anas platyrhynchos*).

For each study year, the average probability that a large bird carcass was available and detected was calculated using the bias trial results. Season was tested to determine if removal rates were affected by season. Due to the different search intervals for half of the searched turbines, a probability of persistence was calculated for migration season (weekly and monthly) searches and non-migration season (monthly) searches in all three study years based on the appropriate removal rate.

At the request of USFWS, as part of a golden eagle monitoring program, additional carcass searches were conducted along the turbine strings where golden eagle carcasses were discovered. Five of the 54 original turbines had increased search intervals (every other week) from April 23, 2010 to April 22, 2011. Nine additional turbines (not part of the original 54 turbines) were selected and searched every other week from April 23, 2010 to April 22, 2011. Weekly eagle use surveys were also conducted near turbine strings where previous mortalities were located. Additional habitat mapping and prey-based mapping was also conducted.

9.2.2 Results

9.2.2.1 Year 1 (May 20, 2009 – May 19, 2010)

A total of 1,170 post-construction mortality turbine plot searches were completed and five golden eagle carcasses were found (Figure 15). Three golden eagles were incidental detections and two were located during scheduled searches. As reported in the Post-construction Monitoring Studies – First Annual Report (Johnson et al 2010; Appendix G2), the golden eagle carcass detected at turbine RH3-409 on September 7, 2009 was a partial carcasses. On March 17, 2010, the remainder of the carcass was detected at the same turbine by maintenance personnel. Because this carcass was technically a duplicate detection, it is not included separately throughout the ECP. The detection rate for large birds in Year 1 was 65.0% across all seasons. Individual search efficiency rates were not calculated for each individual searcher, but efforts were made to evenly distribute trials across all searchers. The mean removal time for large birds was 142.7 days across all seasons. The average probability that a large bird carcass was available and detected was 95.0% for turbines searched weekly and approximately 83.0% for turbines searched monthly.

9.2.2.2 Year 2 (May 24, 2010 – May 26, 2011)

A total of 1,162 turbine plot searches were completed as part of the standardized PCM study and 304 turbine plot searches were completed as part of the golden eagle monitoring plan (Appendix G2 and G3). Four golden eagle carcasses were detected during the study period (Figure 15). One eagle was found incidentally, one was found during schedule searches, and two were found on

the golden eagle monitoring plan plots. The detection rate for large birds in Year 2 was 53.0%. The mean removal time for large birds was 65.8 days across all seasons. The average probability that a large bird carcass was available and detected was 85.0% for turbines searched weekly, 59.0% for turbines searched monthly, and 74.0% for turbines searched on a bi-monthly basis. Additional details on the golden eagle monitoring plan are provided below.

9.2.2.3 Year 3 (May 31, 2011 – May 11, 2012)

A total of 990 turbine plot searches were completed and three golden eagle carcasses were found (Figure 15; Appendix G2). Two detections occurred during scheduled searches and one detection occurred incidentally on a non-search plot. The detection rate for large birds was 70.0%, and the mean removal time for large birds was 94.8 days. The average probability that a large bird carcass was available and detected was 93.0% for turbines searched weekly and 87.0% for turbines searched monthly.

9.2.2.4 Golden Eagle Monitoring Study (April 23, 2010 – April 22, 2011)

The Golden Eagle Monitoring Study is provided in Appendix G3. Turbine searches associated with the study are included in the Year 2 report (Appendix G2).

9.2.3 Methods

Golden eagle use surveys were conducted to identify golden eagle activity near turbine strings where previous fatalities had been recorded. Surveys were conducted for two hours once per week throughout an entire year. The three turbine strings where golden eagle fatalities had occurred were surveyed during each event. Other turbine strings were also included in the survey if eagles were observed near those strings. Efforts were made to survey each area a similar amount of time. If during the survey events golden eagles were observed more frequently near a specific turbine string, the observer adjusted their location as appropriate to record those eagles. Eagle flight paths and perch locations were recorded on maps and later digitized. Due to the methods of this survey, equal effort was not spent surveying eagles at all turbine strings.

As part of the eagle monitoring study, habitat of the Project area was mapped as were areas potentially used as nest and/or perch sites for golden eagles (e.g., man-made structures such as fences and power poles, natural rock outcrops). Areas of concentrated prey also were mapped; these were primarily artificial rock piles placed on the site as part of the coal mine reclamation project. The rock piles were surveyed during the summer of 2010 to document use by rabbits and other wildlife which may serve as golden eagle prey.

9.2.4 Results

Eighty-six groups of golden eagles totaling 99 individuals were observed over 52 surveys. The majority of the eagle observations were adults (53.5%), followed by sub-adult and juvenile (16.2% each). The remaining eagle observations were not able to be aged confidently. Most of the activity was recorded in the southern two-thirds of the Project. Flight paths are provided in Figure 16.

Habitat at the Project is dominated by native sagebrush steppe and large areas of grassland where the coal mine has been reclaimed. There are three permanent stock ponds in the west-central portion of the project area and 10 ephemeral depressions. Rock outcrops potentially used as perch sites by eagles occur in the extreme southern end and in the northern end of the Project area. Other potential perch sites include three segments of overhead power lines on the Project area.

Thirty-two rock piles were mapped at the Project. Results of the rock pile surveys showed that virtually all were being used by rabbits, and many were being used by other mammals such as rodents and perhaps badgers, foxes, or coyotes. Remains of dead rabbits, such as skulls and bones, were present at 12 of the 32 rock piles (38%), suggesting that predators, likely including raptors, had killed rabbits and consumed them at the site of the kill. No other areas of concentrated prey such as prairie dog towns were identified on the site. Two small stock ponds as well as 10 small, ephemeral waterbodies present on the site may provide habitat for other prey such as waterfowl and shorebirds.

9.2.5 Conclusions

A total of 12 golden eagle carcasses were found during the three year PCM study, of which six were found on search plots. Golden eagle carcasses detected during the three year post-construction monitoring are shown by location and date in Figure 15. Additionally, eagle use patterns and potential eagle attractants were identified as part of the golden eagle monitoring plan.

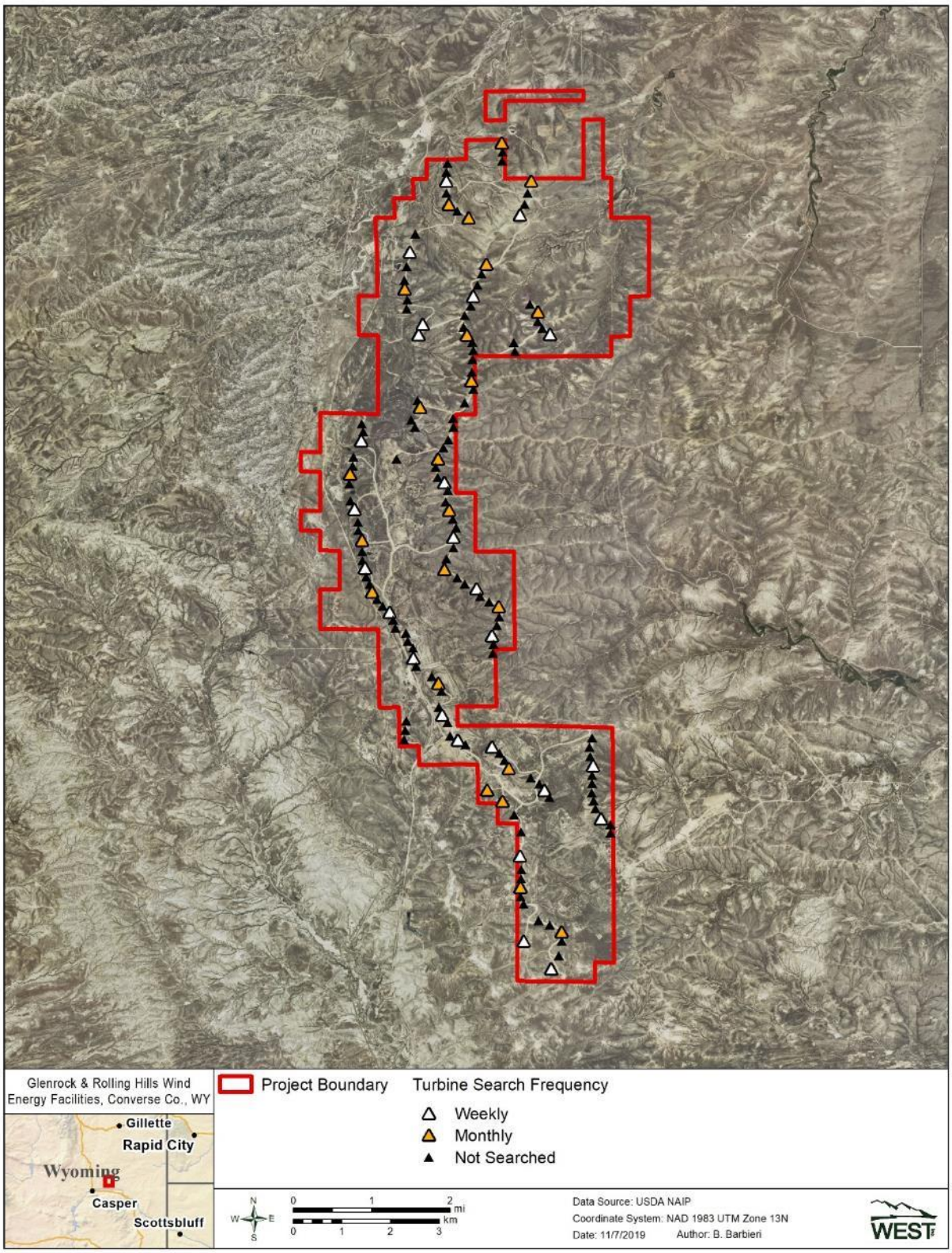

Figure 14. Location of carcass search plots at the GRH Wind Energy Facility, Converse County, Wyoming (May 2009 – May 2012 [does not include golden eagle monitoring plan turbines]).

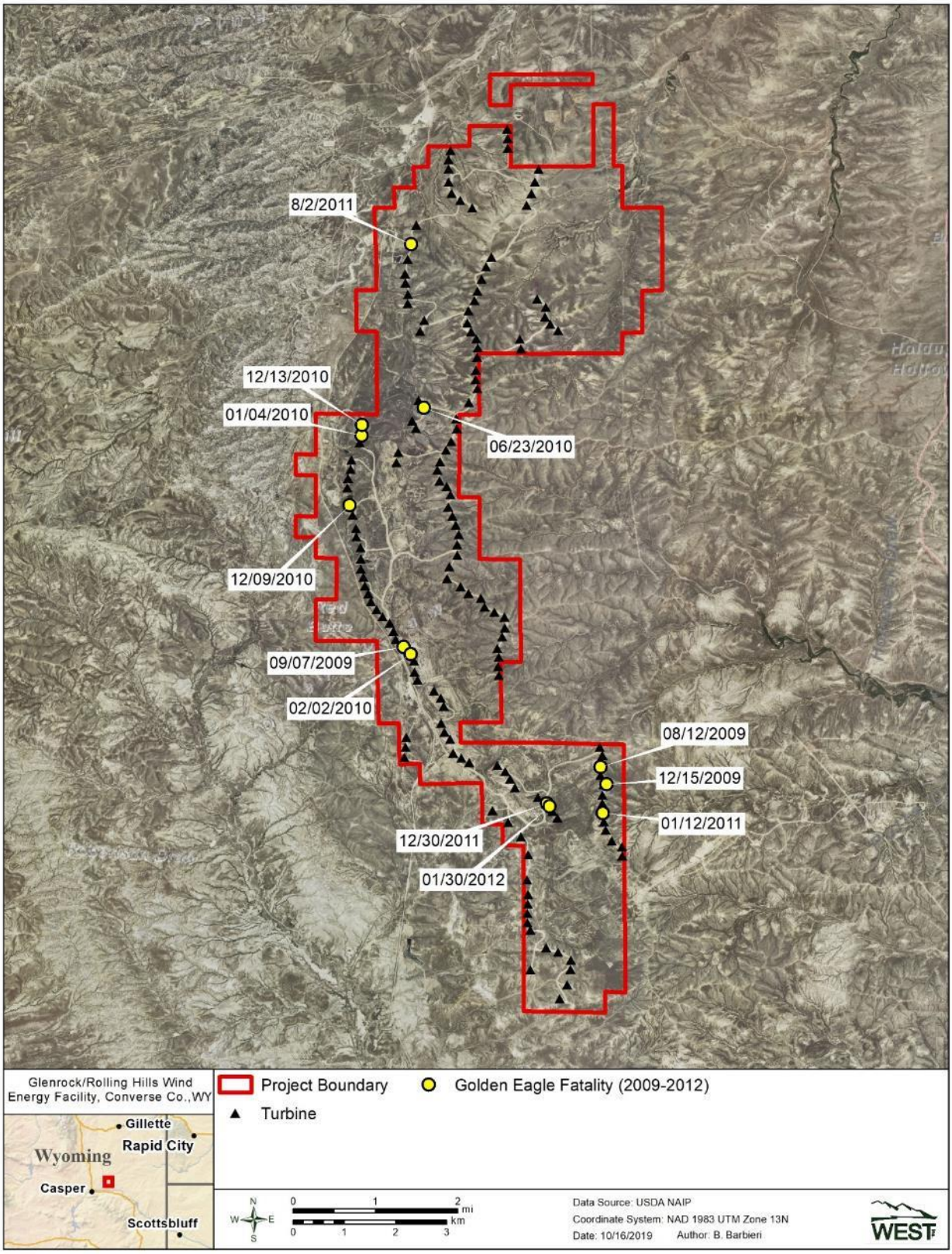

Figure 15. Location of eagle carcasses found at the GRH Wind Energy Facility, Converse County, Wyoming, between May 2009 and May 2012 (three year post-construction monitoring period).

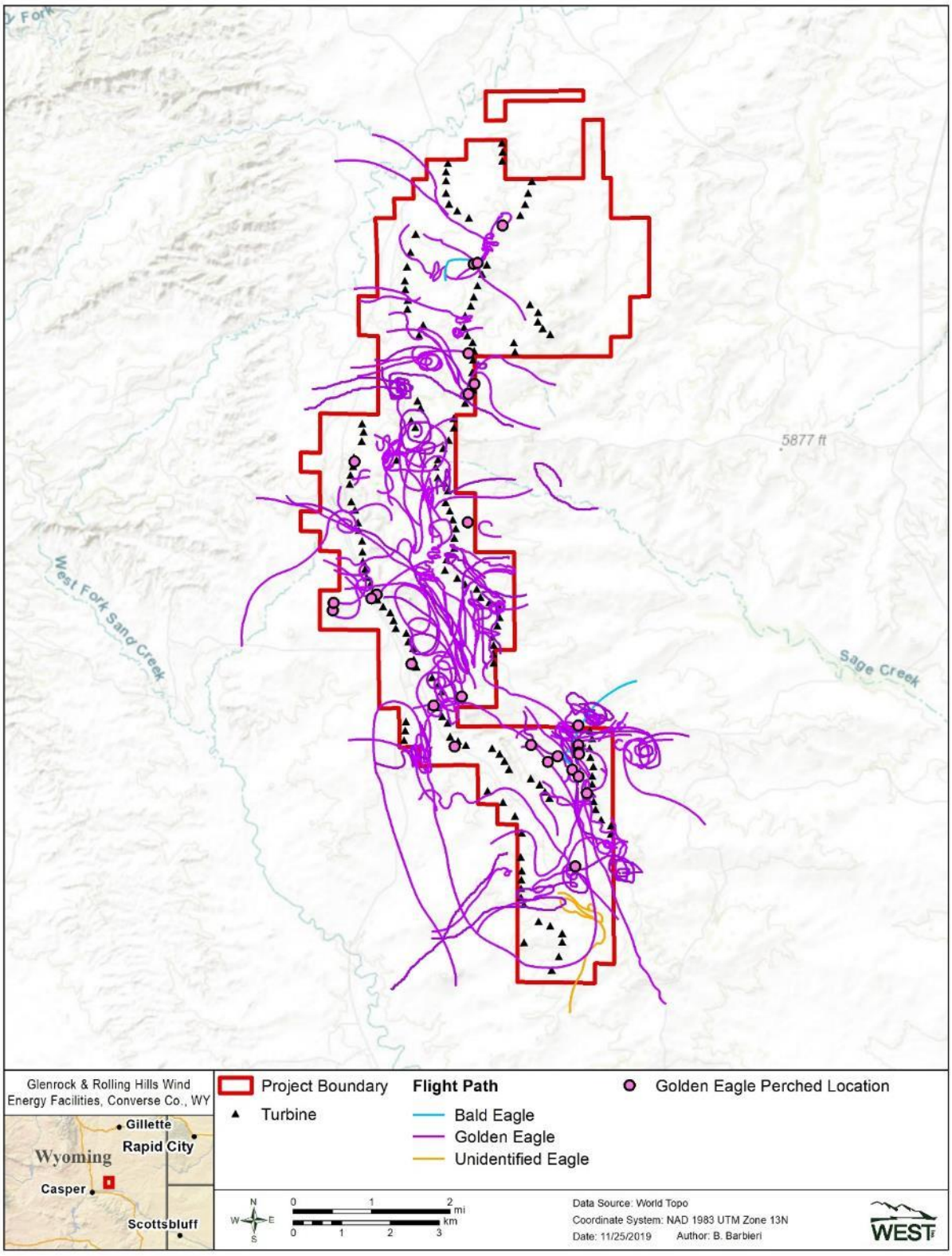

Figure 16. Eagle flight paths collected at the GRH Wind Energy Facility, Converse County, Wyoming during the eagle monitoring program (April 2010 – April 2011).

9.3 Ongoing Monitoring

Ongoing mortality monitoring was initiated in June 2012 after the three year study was completed and continues in the present. Multiple survey methods are included in the ongoing monitoring and further summarized below. PacifiCorp collaborated with the USFWS on mortality monitoring methods starting July 2013 through the present.

9.3.1 Second Monitoring Period

The second period (June 26, 2012 – May 30, 2013) was an informal monitoring after the standardized three-year PCM study was complete. No formal coordination occurred with the USFWS; however, PacifiCorp elected to continue some level of monitoring after the three-year PCM study concluded. A memo summarizing the survey is provided in Appendix G4.

9.3.1.1 Methods

Turbine plot searches were conducted once a month in February, March, July, August, September, October and November, and twice a month in January, April, May, June, and December. These months were selected for two surveys based on the dates of previous golden eagle discoveries. The searches originally included 51 turbines (Figure 17) but an additional 13 turbines were added throughout the year whenever a golden eagle discovery occurred in a previously unidentified area (Figure 17). Surveyors walked a single meandering transect around each turbine included in the search list. Drive by checks occurred at all other turbines each search round. All mortalities were documented per the WIRHS. No bias trials were conducted as part of this effort. A brief memo was prepared describing the search methods and results (Appendix G4).

9.3.1.2 Results

A total of 1,028 turbine plot searches occurred during the second monitoring period. Four golden eagle mortalities and one injured golden eagle were discovered during this period (See Figure 21b in Section 9.5). The injured eagle was transported to a rehab center by the WGFD, but died prior to arrival. Only one eagle was discovered at a searched turbine. All other eagles were found incidentally by operations and WEST staff.

9.3.2 Third Monitoring Period

The third period (July 26, 2013 – December 29, 2015) involved standardized monitoring focused on eagle detections. PacifiCorp initiated conversations with the USFWS to determine the appropriate search method during this period. Wider transect spacing was identified as an appropriate change and an effort to be consistent with previous search efforts was desired.

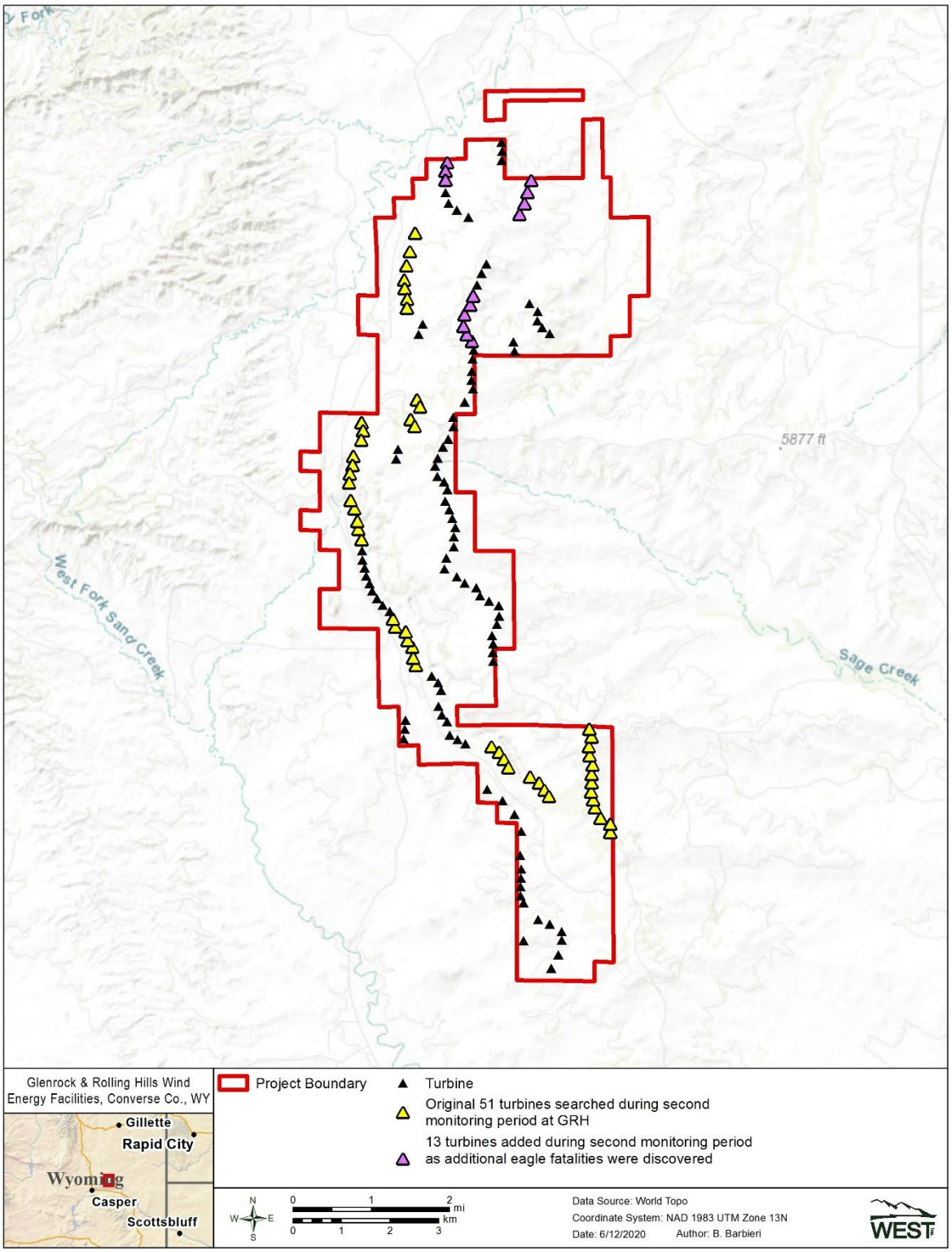

Figure 17. Turbines searched during the second monitoring period from June 26, 2012 – May 30, 2013 at the GRH Wind Energy Facility, Converse County, Wyoming.

9.3.2.1 Methods

Turbine plot searches occurred twice a month at the turbines searched as part of the original PCM study (54 turbines). A 160 x 160 m plot was searched and 20-m transect spacing was implemented. The remaining turbines were surveyed informally via pad checks (also known as eagle scans). Searcher efficiency trials were conducted at searched and non-searched turbines to evaluate whether the wider transect spacing was appropriate and to determine if eagle scans were adequate to detect eagles. These trials used turkey decoys wrapped with real feather skins to pose as a surrogate for eagles. A total of 63 trial decoys were placed including 28 on searched turbines and 35 on non-searched turbines. Additionally, detection of trial decoys was encouraged for all staff present onsite and trial decoys were found by personnel not specifically involved in turbine plot searches. This method was implemented to make early-stage determinations on the validity of incidental monitoring at the site. Because many of the staff were involved in multiple tasks (e.g., searching, curtailment, raptor nest surveys, etc.), a reported trial decoy was removed from the field regardless of whether searchers had an opportunity to search the turbine and locate the trial decoy. Carcass removal trials were not conducted. All mortalities were documented per the WIRHS. No formal reports were developed beyond the required SPUT reporting.

9.3.2.2 Results

A total of 3,081 turbine plot searches occurred during the third monitoring period. Seven golden eagle mortalities and one bald eagle mortality were discovered during this period (see Figure 21a and 21b in Section 9.5). One detection was found during standardized searches at search turbines, one detection was found incidentally at a search turbine, two detections were found during a scheduled turbine search at an adjacent non-search turbine, one detection was found during an eagle scan at a non-search turbine, and three detections (including the bald eagle) were found incidentally at non-search turbines. Of the 63 trial turkey decoys placed during the monitoring period, 73% were discovered by field staff conducting activities onsite (e.g., fatality searches, turbine curtailment, raptor nest surveys). This included 65.7% of the trial decoys placed at non-searched turbines and 85.7% of the trial decoys placed at searched turbines.

9.3.3 Fourth Monitoring Period

The fourth period (January 2016 – present) also involved standardized monitoring focused on eagle detections. This monitoring is ongoing; however, the results only include data through April 2020. Method used were similar to the previous monitoring efforts but included searches at 100% of the turbines. The methods were approved through discussions and letter correspondence with USFWS representatives (Appendix C).

9.3.3.1 Methods

Turbine plot searches occurred once a month at all 158 turbines. A 160 x 160 m plot was searched and 20-m transect spacing was implemented. Qualified biologists were used for all search efforts and training was provided prior to kicking off the search effort.

Searcher efficiency trials also were conducted used turkey decoys to calculate detection rates. Real feather skins (Turkey Skinz) wrapped around a foam decoy were used for the trials (Figure

18). The goal of the trials was to evaluate the effectiveness of detecting eagles during the monitoring period at searched turbines. Incidental detection of trial decoys was not an objective of the monitoring study, but was tracked as detections were reported. Trials were conducted throughout each search year and 513 trial decoys were placed from January 2016 – April 2020 (487 were available to be found). No additional carcass persistence trials (beyond those conducted during the 2009 – 2011 studies) have been completed for the Project to date.

9.3.3.2 Results

A total of 10,088 turbine plot searches occurred during the fourth monitoring period and 13 golden eagle mortalities were discovered (see Figure 21a and 21b in Section 9.5). Ten eagle mortalities were found during scheduled turbine plot searches while five were found incidentally. Approximately 77% of the trial decoys were discovered during search efforts. Twenty-six trial decoys were determined to be unavailable.

Figure 18. Photo of a representative Turkey Skinz decoy used for searcher efficiency trials at GRH Wind Energy Facility starting March 2014.

9.4 Eagle Nest Surveys and Banding

9.4.1 Methods

Past Nest Surveys and Banding (2007-2019)

The methods implemented to survey raptor nests have been modified throughout the Project's duration. Modifications have been made to increase nest survey proficiency and follow protocols and naming conventions recommended by the USFWS. Nest surveys completed during the three-

year PCM study (2010 – 2012) are detailed in the PCM reports (Appendix G), and subsequent nest surveys are detailed in annual technical memos (Appendix H).

The Project as well as a surrounding 2-mile buffer were searched for all raptor nests, including bald and golden eagles, during the three years of post-construction monitoring (2010, 2011, and 2012). One objective of the raptor nest surveys was to determine the occupancy of eagle nests in and near the study area to compare to pre-construction data on nesting eagles obtained during the 2007 baseline study. Similar to searches in 2007, nest surveys were ground-based in 2010 and 2011. One round of nest surveys was completed in May 2010. Nest surveys specifically targeted previously identified nests; however, efforts were made to locate additional nests in suitable habitat (e.g., rocky out crops/cliffs, trees, etc.). Prior to 2011 nest surveys, historic raptor nest data were requested by PacifiCorp from the BLM. Two data sets were received. This information was used during annual surveys. Three rounds (May, June, and July) of nest surveys were conducted in 2011 to determine occupancy and nest success. Nest surveys were only conducted on land owned by PacifiCorp or as authorized by private landowners. The property west of the Project was not accessible for nest ground checks during any survey year due to private landownership.

In 2012, both aerial helicopter and ground surveys were conducted. Initial ground checks of previously identified golden eagle nests were conducted in early April. Aerial surveys were conducted in late April. Aerial surveys were conducted along north/south meandering transects throughout the Project area and extended slightly beyond the 2-mile buffer. All known nest data (WEST and BLM historic data) were loaded onto a GPS unit to ensure all historic nests were surveyed. While conducting aerial surveys, suitable nesting habitat was searched for potentially unknown or new nests. Follow-up ground surveys were continued in May, June, and July. In addition to these surveys, the three golden eagle artificial nest platforms that had previously been moved approximately 10 miles (16 km) south of the project prior to turbine construction were checked to determine nesting activity.

In 2013, the Project area and a 2.5-mile buffer were surveyed, again using both aerial and ground surveys. Initial occupation surveys were completed regularly throughout April using ground surveys. Due to the number of WEST observers present daily at GRH, occupation checks were conducted in conjunction with eagle observation surveys. Aerial surveys were conducted from a helicopter on May 7, 2013. Aerial surveys were originally planned for late April; however, inclement weather required surveys to be postponed. Follow up ground checks were conducted throughout the nesting season, with fledge success checks occurring in July.

In 2011 and 2012, efforts were made to band golden eagle chicks located in the vicinity of the Project. The purpose of banding the chicks was to uniquely mark them to determine if golden eagles fledged from nests in the vicinity of the Project are susceptible to mortality in the Project area.

Survey methods for 2014, 2015, 2016, 2017, 2018, and 2019 were designed to identify potentially occupied eagle nests and track eagle nest activities throughout the nesting season, with a goal

of determining nest success (i.e., did chicks fledge?). This included the identification of unoccupied eagle nests.

In 2015, a formal raptor nest survey protocol was developed in conjunction with the USFWS and this plan was followed through 2019. The methods detailed in this plan were agreed upon by PacifiCorp and USFWS and are provided below.

PacifiCorp will conduct annual eagle nest surveys within 2.5 miles of the Project (subject to weather conditions, safety, and landowner access to nests). The primary objectives of the raptor nest surveys are to: 1) identify all eagle and ferruginous hawk nests present in the defined survey area that were identified in previous years; 2) locate potentially new eagle and ferruginous hawk nests during the current nesting season; 3) monitor the occupied eagle and ferruginous hawk nest status throughout the nesting season (January 1 – August 31); and 4) determine the productivity and nest success for all occupied nests.

Modifications to this protocol may be warranted over time as new information becomes available. Occupancy determinations will follow the guidance as outlined in the USFWS Eagle Conservation Plan document:

“Occupied nest – a nest used for breeding in the current year by a pair. Presence of an adult, eggs, or young, freshly molted feathers or plucked down, or current years’ mutes (whitewash) suggest site occupancy. In years when food resources are scarce, it is not uncommon for a pair of eagles to occupy a nest yet never lay eggs; such nests are considered occupied.”

Nest survey schedules may be modified based on weather and logistic issues. Ground checks will only be completed at nests where property access has been granted and these will be clearly identified. Aerial surveys will check all known (historic) and potentially new nests during each nesting season. Ground surveys will only check known nests or nests determined to be occupied during the current year’s surveys. These methods will apply to eagle and ferruginous hawk nests. Nests that are determined to not be occupied in the current year will not be checked during subsequent checks. However, even for these nests at least two nest checks will still be made prior to April 1 of each nesting season. If a nest is determined, through the nest checks, to not be occupied as of April 1, then there will be no further monitoring of this nest during the current nesting season. Similarly, if a nest is determined to be occupied early in the season (e.g. March), but an incubating adult is not documented prior to April 1, this nest will not be included in the check for chicks or fledge success.

Survey Methods

The raptor nest surveys will follow the guidelines provided below:

January 1 – mid-February: Informal ground checks will be completed to verify potential occupation at known nest locations. A nest will be considered potentially occupied if it meets the definition provided above. These checks will be completed in coordination with other site activities.

Mid-February – late-March: The first round of aerial surveys will be conducted from a helicopter. The goal of this survey will be to document all eagle nests (potentially new and historic) and determine if the nests are occupied. Ferruginous hawk nests will be visited; however, based on the time of year, this species is not likely to be present. One qualified WEST biologist and the helicopter pilot will fly the survey area (2.5-mile turbine buffer). Known nest data will include previous WEST survey data and BLM nest data. Features within the survey area where nests are likely to occur (e.g., rocky outcrops, trees, man-made structures) will be investigated for potential new nests.

Late-March – April: Ground checks will be completed at all occupied eagle nests (based on the results of the previous surveys). The goal of this survey will be to identify occupied eagle nests with incubating adults. Ferruginous hawks nests (historic) will also be surveyed during this effort to verify nest status. The timing of surveys will be triggered by the presence of an incubating adult at a highly visible nest (e.g., eagle nest visible from public road). It is assumed one check will be completed at each occupied nest.

May: The second round of aerial surveys will be conducted from a helicopter. The goal of this survey will be to identify chicks at eagle nests that had incubating adults (based on previous surveys) and the status of ferruginous hawk nests (assume incubating adults with eggs or chicks). This survey will be conducted at least 60-days after the first aerial survey. Only eagle nests where an incubating adult was observed (unless property access did not allow a March-April check) will be checked. All ferruginous hawk nests (historic and potentially new) will be checked.

June – August: Ground checks will be completed at eagle and ferruginous hawk nests that have continued to be occupied and eggs or chicks were observed or assumed to be present during previous surveys. The goal of this survey will be to identify eagle and ferruginous hawk fledge success. It is assumed one check will be completed at each nest where chicks were present. Timing of surveys will be triggered by the fledge success confirmation at a highly visible nest (e.g. eagle or ferruginous hawk nest visible from a public road). Success is assigned by confirmation of fledglings.

9.4.2 Results

In 2010, one occupied golden eagle nest (35752101) was located just outside the 2-mile buffer of the survey area (Figure 19, Table 7). Two golden eagle nests (35740601 and 36740601) were classified as inactive, but did not have occupation designations conducted as part of the survey. No golden eagle activity was observed at the three golden eagle artificial nest platforms after they were moved approximately 10 miles (16 km) south of the Project site. No eagle use surveys similar to those conducted prior to construction were conducted after these platforms were moved from the Project site. Therefore, it is not possible to determine what affect moving these artificial nest platforms had on subsequent eagle use of the Project area.

In 2011, two occupied golden eagle nests were identified. Two chicks fledged from nest 35752101 and one chick fledged from nest 36740601 (Figure 19, Table 7). These three chicks were banded

prior to fledging. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2012, four occupied golden eagle nests were identified. Two chicks fledged from nest 35750801 and one chick fledged from nest 35752101 (Figure 19, Table 7). These three chicks were banded prior to fledging. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2013, three occupied golden eagle nests were identified (Figure 19, Table 7). Nest 35752101 produced one offspring; however, the chick died prior to fledging. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved approximately 10 miles (16 km) south of the Project site.

In 2014, seven occupied golden eagle nests were identified. Two chicks fledged from nest 35752101 and one chick fledged from nests 37742901 and 35750801 (Figure 19, Table 7). Fledge success could not be confirmed for nest 36750501 due to access restrictions. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2015, nine occupied golden eagle nests were identified. Two chicks were observed at nest 35740601; however, only one fledgling was confirmed (Figure 19, Table 7). Two chicks fledged from nest 35752101. Although nests 37742901 (1 chick), 36750401 (2 chicks), and 35752802 (1 chick) had chicks, fledge success could not be confirmed due to access restrictions. Nest 36741801 had and incubating adult, but no confirmed chicks. Nest 35750801, 36750501, and 36751701 were classified as occupied due to early season activity near nests; however, no incubating adults or chicks were observed. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2016, 10 occupied golden eagle nests were identified. Two chicks fledged from nests 36741801 and 35740601 (Figure 19, Table 7). Four nests (37742901 [1], 36750502 [2], 35750801 [2], and nest 35752802 [2]) had chicks, but fledge success could not be confirmed (Figure 18). Nest 35752802 produced one chick, but the chick died before fledging. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2017, eight occupied golden eagle nests were identified. Two chicks fledged from nest 36740601 (Figure 19, Table 7). Two offspring were identified at nest 35752101, but only one chick successfully fledged. Four nests (37742901 [1], 36750501 [1], 35750801 [1], and 35752802 [2]) had chicks, but fledge success could not be confirmed. Two chicks were observed at nest 35740601 during aerial flights, but were not seen in follow up checks. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2018, six occupied golden eagle nests were identified. Two chicks fledged from nest 35752101 (Figure 19, Table 7). Nest 35752802 had at least one chick, but fledge success could not be confirmed. Four nests (36750501, 36740601, 36741801, 35750801) were determined to be unsuccessful. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

In 2019, eight occupied golden eagle nests were identified. One chick fledged from nest 35752101 (Figure 19, Table 7). Nests 35752802 and 35752802 had one chick, but fledge success could not be confirmed. Five nests (37742901, 36750501, 36740601, 36741801, 35740601) were determined to be unsuccessful. No golden eagle activity was observed at the three golden eagle artificial nest platforms moved 10 miles (16 km) south of the site.

Future Nest Surveys
Nest monitoring for 2020 is ongoing (results pending so not included in this document) Future eagle nest surveys will occur as required by an issued permit and/or coordination with the USFWS.

9.4.3 Summary

Eleven different eagle nests were identified as occupied from 2010 – 2019 (Table 7). The greatest number of occupied nests identified in any one year was 10 in 2016. Seven of the 10 nests produced offspring, suggesting as many as seven different nesting territories existed around the Project. Occupied nest numbers have fluctuated between four and 10 since implementing the rigorous and standardized survey protocol (2014 – 2019). No bald eagle nests have been identified during the eagle nest surveys. Additionally, six golden eagle chicks were banded in 2011 and 2012.

It should be noted that the methods used to search for eagle nests between 2010 and 2019 have varied in terms of the timing and number of such surveys, the number of ground-based and aerial surveys per year, and the size of the buffer around the Project used for the survey effort. Because of changes in the survey protocol, direct comparisons of survey results over time is limited in multiple ways, although all eagle nest surveys have used a consistent, standardized protocol since 2014.

Annual eagle nest monitoring is ongoing in 2020 and be conducted as required by an issued permit or based on coordination with the USFWS in the future..

Table 7. Eagle nest survey summary for the GRH Wind Energy Facility for 2007 and 2010 through 2019.

NEST ID	2007		2010		2011		2012	
	Occupied (Y/N)	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*
37742901	NS	-	NS	-	NS	-	NS	-
36750502	NA	-	NA	-	NA	-	NA	-
36750501	NS	-	NS	-	NS	-	N	-
36740601	Y	Unknown	Unknown	N	Y	Y	Y	N
36751701	NS	-	NS	-	NS	-	N	-
36741801	NS	-	N	-	N	-	N	-
35740601	NS	-	Unknown	N	N	-	Y	N
35750802	NA	-	NA	-	NA	-	NA	-
35750801	NS	-	NS	-	NS	-	Y	Y
35752101	NS	-	Y	Unknown	Y	Y	Y	Y
35752802	NS	-	NS	-	NS	-	NS	-
NEST ID	**2013**		**2014**		**2015**		**2016**	
	Occupied (Y/N)	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*
37742901	NS	-	Y	Unknown	Y	Unknown	Y	Unknown
36750502	NA	-	NA	-	Y	Unknown	Y	N
36750501	N	-	Y	Unknown	Y	N	Y	Unknown
36740601	Y	N	Y	N	N	-	Y	N
36751701	N	-	Y	N	Y	N	N	-
36741801	N	-	N	-	Y	N	Y	Y
35740601	Y	N	Y	N	Y	Y	Y	Y
35750802	NA	-	NA	-	NA	-	Y	Unknown
35750801	N	-	Y	Y	Y	Unknown	Y	N
35752101	Y	Y	Y	Y	Y	Y	Y	N
35752802	NS	-	N	-	Y	Unknown	Y	Unknown

NEST ID	2017		2018		2019	
	Occupied (Y/N)	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*	*Occupied (Y/N)*	*Successful (Y/N)*
37742901	Y	Unknown	N	-	Y	N
36750502	N	-	N	-	N	-
36750501	Y	Unknown	Y	N	Y	N
36740601	Y	Y	Y	N	Y	N
36751701	N	-	N	-	N	-
36741801	Y	N	Y	N	Y	N
35740601	Y	N	N	-	Y	N
35750802	N	-	N	-	N	-
35750801	Y	Unknown	Y	N	Y	Unknown
35752101	Y	Y	Y	Y	Y	Y
35752802	Y	Unknown	Y	Unknown	Y	Unknown

*NS = Not surveyed

**NA = Not applicable because nest was not present

- = not applicable because nest was either not surveyed, not present or not occupied

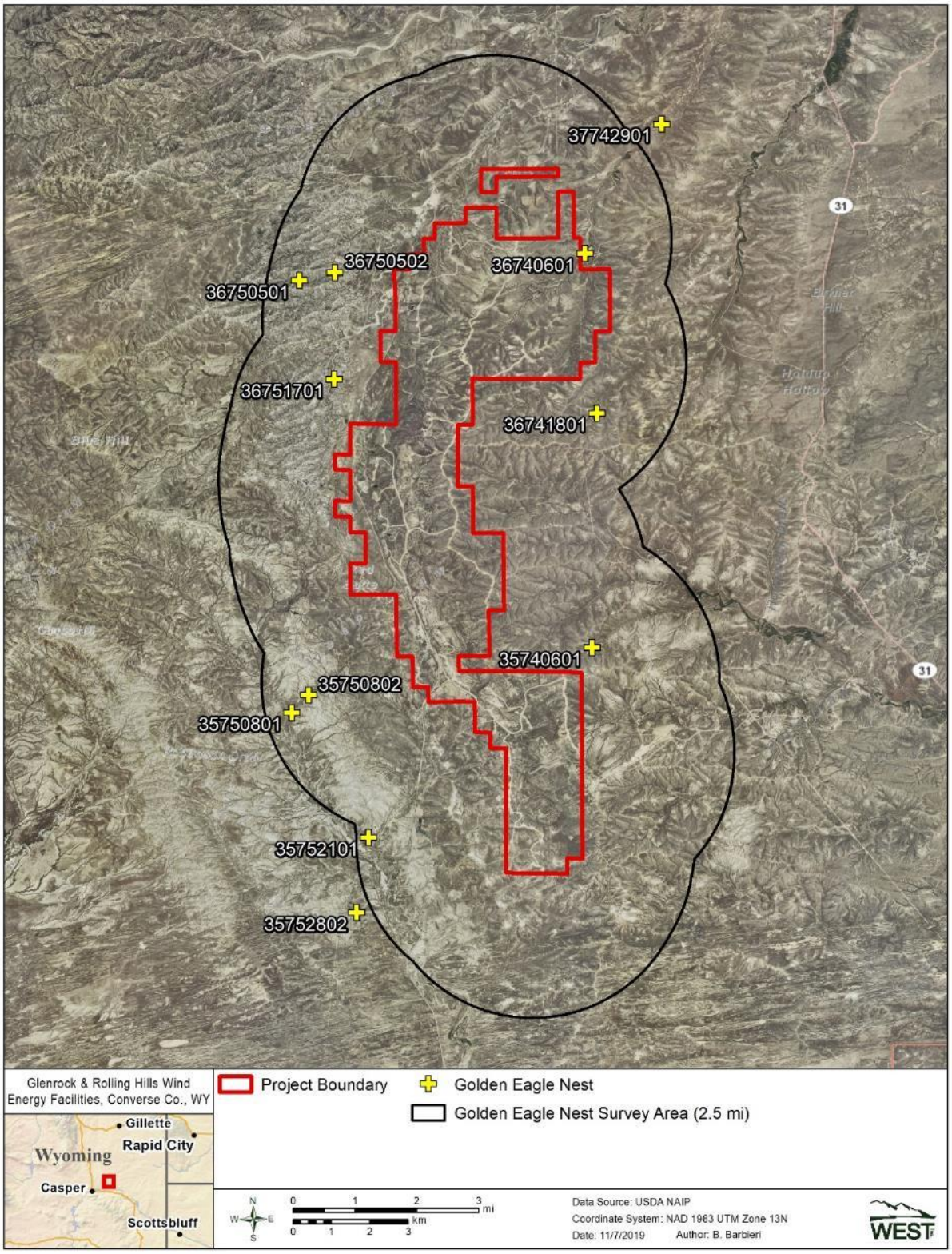

Figure 19. GRH Wind Energy Facility eagle nest locations from 2009 through 2019, Converse County, Wyoming. The figure does not include the historic nest platforms that were removed in 2009 under USFWS issued permit.

9.4.4 Inter-Nest Distance for Project Eagle Nests

Based on the eagle nest surveys conducted for the Project and surrounding 1-mile buffer in 2007, the Project and a 2-mile buffer in 2010, 2011, 2012, and 2013, and the Project and a 2.5-mile buffer in 2014, 2015, 2016, 2017, 2018 and 2019 there have been as many as nine golden eagle nests located within 2.5 miles of Project turbines and two golden eagle nests just outside the buffer (Figure 19). In 2016, 10 golden eagle nests were identified as occupied. This is the highest number of golden eagle nests identified in any one year based on the data available. Seven of the 10 nests produced offspring in 2016.

The approach used in the ECPG for approximating eagle territories and evaluating the distance for monitoring potential disturbance/displacement impacts calls for measuring nearest neighbor distances from occupied nests in a single nesting year (USFWS 2013b). It should be noted that the ECPG recommends a 10-mile survey area be used to inform this calculation and only an approximately 2.5-mile buffer was used for the Project. Using the 10 occupied golden eagle nests located in the vicinity of the Project in 2016, the mean inter-nest distance is 3.14 miles and ½ the mean inter-nest distance or approximate territory radius is 1.57 miles (Figure 20).The use of 10 nests is a conservative approach given that surveys were limited at some nests (i.e., access restrictions). There is a potential that some nests were alternatives and therefore the MIND may be modified.

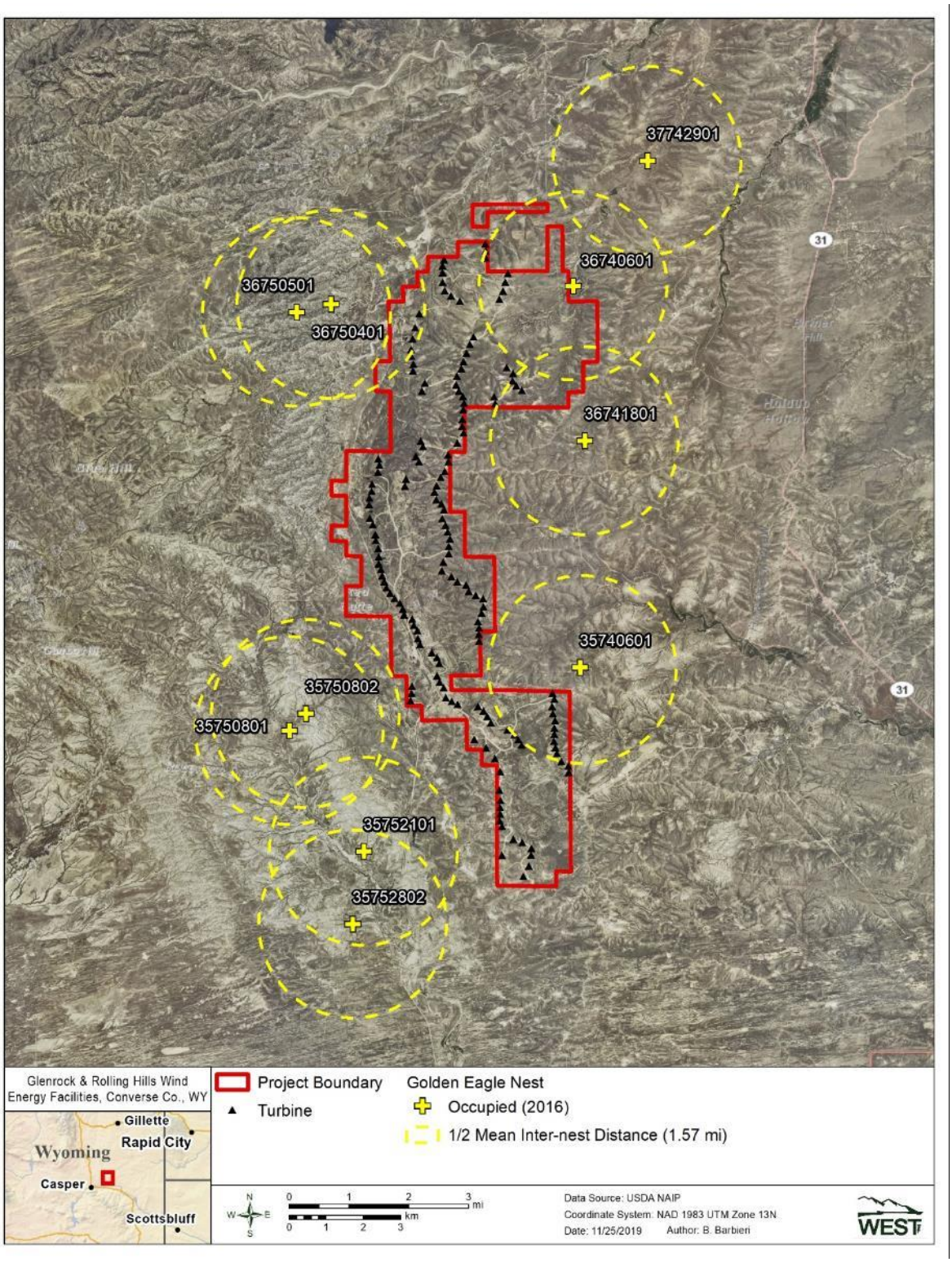

Figure 20. Approximate golden eagle territories occupied in 2016 based on golden eagle nest surveys in the 2.5 mile vicinity of the GRH Wind Energy Facility, Converse County, Wyoming. A buffer distance of 1.57 miles was used based on half the mean inter-nest distance between the occupied golden eagle nests identified in 2016 (the year with the greatest number of occupied nests identified).

9.5 Eagle Mortalities or Injuries to Date for the Project

As of April 31, 2020, 39 eagle carcasses and one injured golden eagle have been discovered at the Project during the operation phase (January 2009 – April 2020; Figure 21a&b; Table 8). The injured golden eagle was found in August 2012 by operations staff but died while being transported to a rehabilitation facility and is therefore treated as a fatality in this ECP. Of the 38 eagle fatalities, all but one were golden eagles. One bald eagle fatality was found on October 2, 2015.

Twenty-four (60.0%) eagle fatalities were found at search plots used to conduct fatality surveys and the remaining 16 (40.0%) were found outside of these mortality search plots (note, search plots have been modified based on the monitoring period). Sixteen (66.7%) of the 24 eagle fatalities found on mortality search plots were found during a scheduled carcass search whereas eight (33.3%) were found at search plots but not during scheduled search events.

Table 8. Reported eagle mortality summary for the GRH Project; Converse County, Wyoming (January 2009–April 2020).

Date	Species	Turbine	Search Plot (Yes/No)	Incidental or Scheduled Search
08/12/2009	Golden Eagle	GR3-603	No	Incidental
09/07/2009	Golden Eagle	RH3-409	Yes	Scheduled search
12/15/2009	Golden Eagle	GR3-605	Yes	Scheduled search
01/04/2010	Golden Eagle	RH1-206	No	Incidental
02/02/2010	Golden Eagle	RH3-410	No	Incidental
06/23/2010	Golden Eagle	RH1-202	Yes	Scheduled search
12/09/2010	Golden Eagle	RHI-301	No	Incidental
12/13/2010	Golden Eagle	RHI-205	No	Incidental
01/12/2011	Golden Eagle	GR3-608	Yes	Incidental
08/02/2011	Golden Eagle	RH1-112	Yes	Scheduled search
12/30/2011	Golden Eagle	GR1-506	No	Incidental
01/30/2012	Golden Eagle	GR1-502	No	Incidental
07/25/2012	Golden Eagle	GR1-110	Yes	Scheduled search
08/09/2012	Golden Eagle*	RH1-603	No	Incidental
11/13/2012	Golden eagle	GR1-104	No**	Incidental
11/14/2012	Golden Eagle	RH1-105	No**	Incidental
03/14/2013	Golden Eagle	GR3-601	Yes	Incidental
07/30/2013	Golden Eagle	RH1-117	No	Incidental
07/30/2013	Golden Eagle	RH1-117	No	Incidental
02/03/2014	Golden Eagle	GR1-118	No	Incidental
02/18/2014	Golden Eagle	RH1-305	Yes	Scheduled search
03/12/2014	Golden Eagle	RH1-612	No	Incidental
3/16/2015	Golden Eagle	RH1-508	Yes	Incidental
10/02/2015	Bald Eagle	RH1-507	No	Incidental
12/28/2015	Golden Eagle	RH1-609	No	Incidental***
05/09/2016	Golden Eagle	RH1-611	Yes	Incidental
11/28/2016	Golden Eagle	RH1-603	Yes	Scheduled search
02/07/2017	Golden Eagle	RH1-116	Yes	Scheduled search
03/14/2017	Golden Eagle	RH1-116	Yes	Scheduled search

Table 8. Reported eagle mortality summary for the GRH Project; Converse County, Wyoming (January 2009–April 2020).

Date	Species	Turbine	Search Plot (Yes/No)	Incidental or Scheduled Search
08/24/2017	Golden Eagle	RH1-201	Yes	Scheduled search
08/31/2017	Golden Eagle	RH1-605	Yes	Scheduled search
11/17/2017	Golden Eagle	RH3-403	Yes	Scheduled search
11/26/2017	Golden Eagle	GR3-604	Yes	Scheduled search
01/15/2018	Golden Eagle	RH1-505	Yes	Incidental
02/7/2018	Golden Eagle	RH1-206	Yes	Scheduled search
03/28/2018	Golden Eagle	RH1-606	Yes	Scheduled search
05/16/2018	Golden Eagle	RH1-201	Yes	Scheduled search
04/25/2019	Golden Eagle	RH1-614	Yes	Incidental
02/10/2020	Golden Eagle	RH1-106	Yes	Incidental
02/24/2020	Golden Eagle	RH1-302	Yes	Incidental

*Injured golden eagle that died while being transported to a rehabilitation facility
**Added to search list as a result of eagle discovery
***Eagle scan

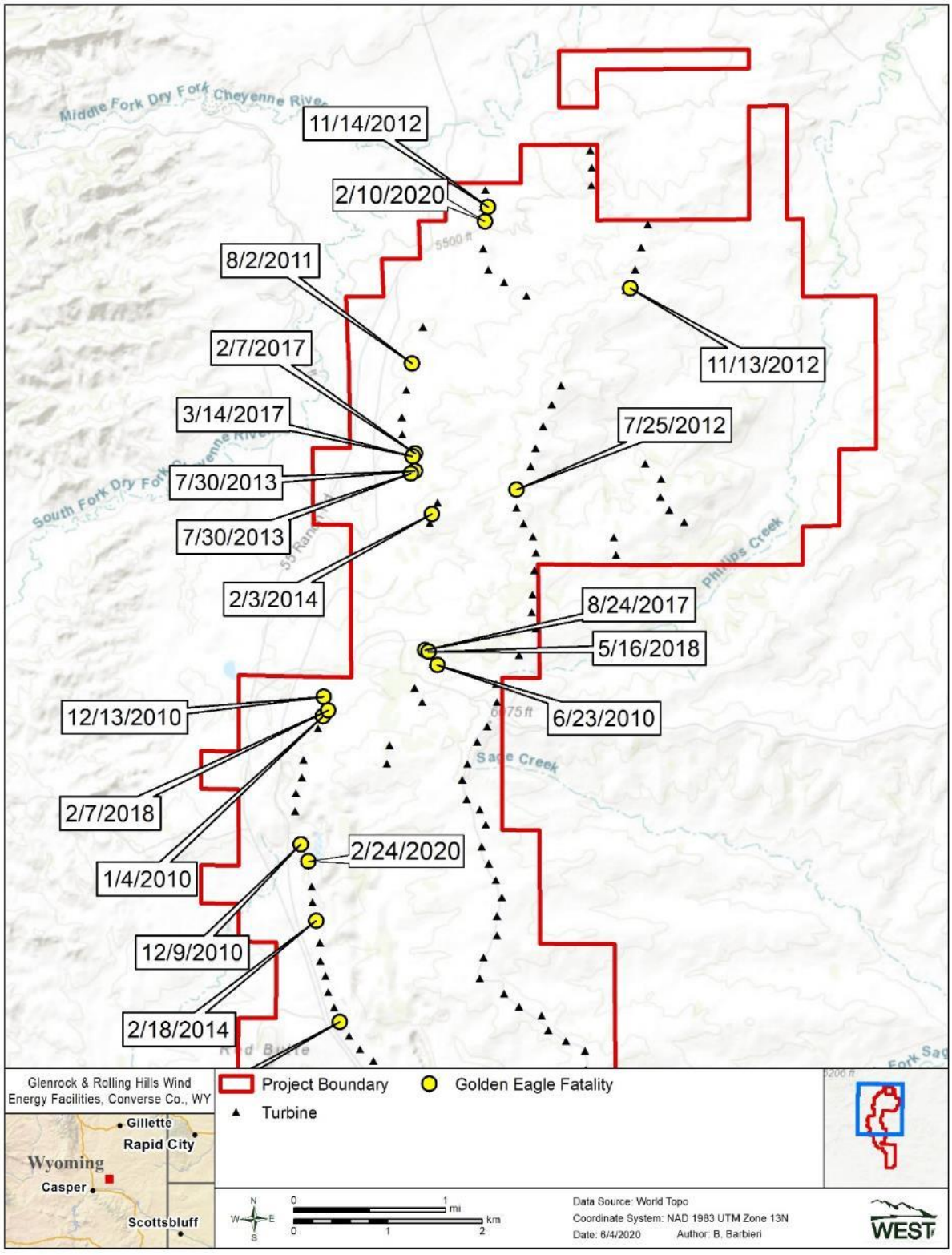

Figure 21a. Location of eagle carcasses found to date at the GRH Wind Energy Facility, Converse County, Wyoming (May 2009 through April 2020). The golden eagle found on August 9, 2012 was alive but injured, and collected and transported by the WGFD.

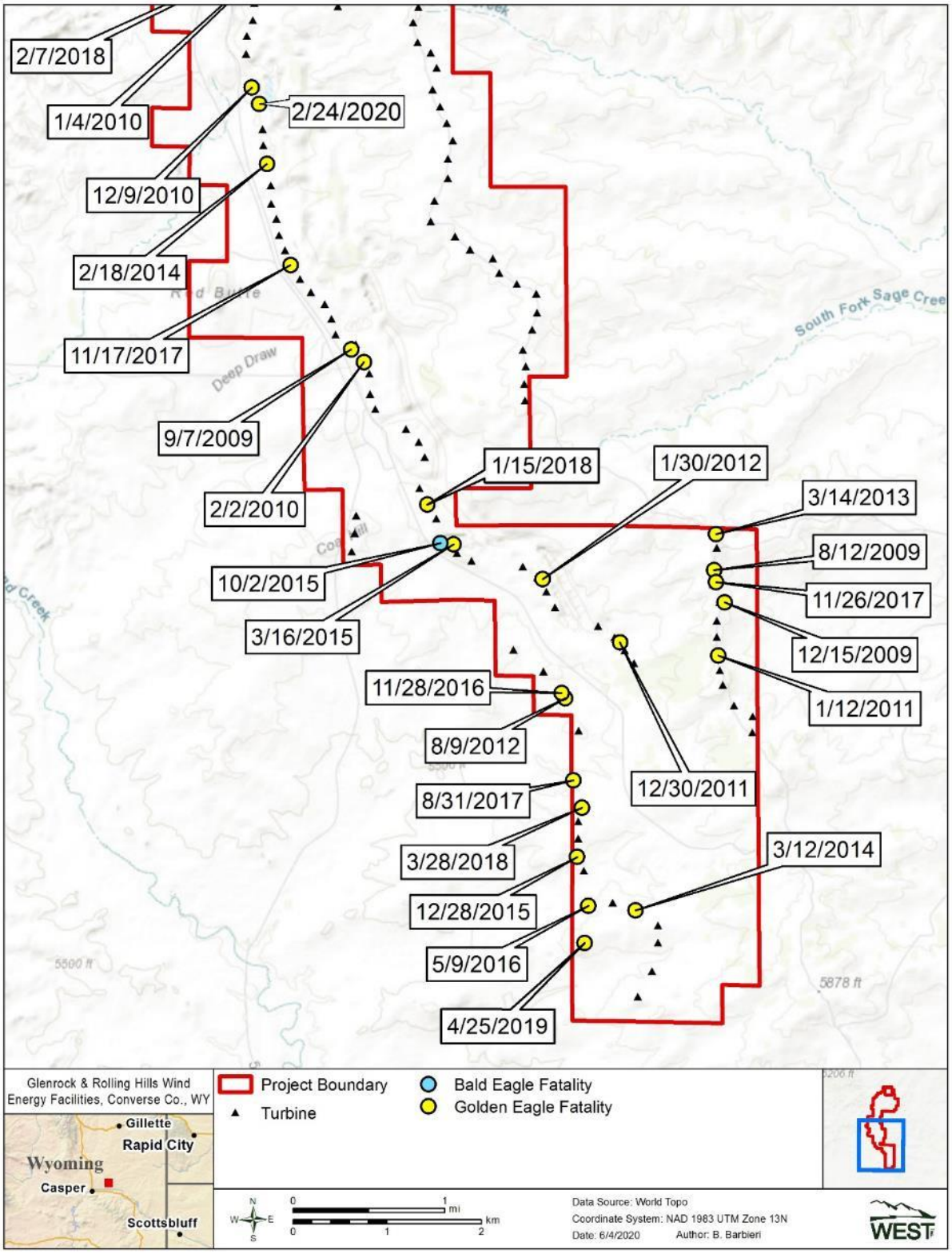

Figure 21b. Location of eagle carcasses found to date at the GRH Wind Energy Facility, Converse County, Wyoming (May 2009 through April 2020). The golden eagle found on August 9, 2012 was alive but injured, and collected and transported by the WGFD.

9.5.1 Mortality Modeling – Informed (Post-Construction)

The ECP Guidance recommends post-construction monitoring data be used to inform take predictions for an operational wind facility. As part of this ECP, additional take prediction modeling has also been completed that includes only post-construction mortality monitoring data. The mortality predictions presented in this section of the ECP are calculated using the Evidence of Absence (EoA) analysis. The EoA analysis was not used in conjunction with the USFWS Collision Risk Model (and associated pre-construction data) to predict eagle take, and hence it should only be used to understand take during the specific study periods.

The EoA framework utilizes a statistical hierarchical model to estimate the actual number of fatalities from the number found and probability of discovery. The EoA estimator assumes the number of fatalities found during searches follows a binomial distribution,

$$X \sim \text{binomial}(M,g)$$

where X is the count of fatalities found during standardized carcass searches, M is the (unknown) number of eagle fatalities, and g is the site-wide probability that a carcass is available to be found and detected by searchers. The site-wide probability that a carcass is available to be found and detected by searchers is based on the following GRH specific data (see Sections 9.1 – 9.3 above and Appendix G for additional details):

- Two monitoring periods were defined and analyzed separately. These two periods used standardized methods and did not have significant adaptive management changes implemented during the periods.
  - First monitoring period (2009 – 2012): Three year standardized post-construction monitoring period (see section 9.2 for details). This period included standardized monitoring conducted prior to implementation of adaptive management activities (e.g. curtailment) and was designed to evaluate all birds and bats, not eagles specifically.
  - Fourth monitoring period (2016 – 2017): Two year standardized monitoring period (see section 9.3.3 for details). This period included standardized monitoring after and/or during implementation of adaptive management activities (see section 9.7 for details) and was designed specifically to evaluate eagles.
- Searcher efficiency expressed as the proportion of placed carcasses (and verified as available) found by searchers during searcher efficiency trials. The searcher efficiency trials only include the use of mallards for the first monitoring period and only Turkey Skinz trials for the fourth monitoring period.
- Non-removal rates expressed as the estimated average probability a carcass was expected to remain in the study area and be available for detection by the searchers during removal trials. The persistence trials only occurred during the first

monitoring period and used mallards. No carcass persistence trials have been conducted during the ongoing monitoring periods; therefore, the non-removal rate from the first monitoring period was used to inform both analyses. These rates may result in an overestimate of take, due to increased removal rates associated with mallards compared with golden eagles.

- Search area adjustment based on the relative carcass density within search areas and outside of search areas. The Hull and Muir distribution model was used to correct for potential search area bias. This was applied consistently for both analyses.
- Search area correction also adjusted the estimate based on the number of turbines searched; this was 54 of 158 during the first monitoring period and 158 of 158 for the fourth monitoring period.

The statistical hierarchy of models inherent in EoA assumes the total number of eagle fatalities (M) follows a Poisson distribution,

$$M \sim \text{Poisson}(\lambda),$$

where λ is the rate that eagle fatalities occur at the Project. A further step in the model hierarchy assumes λ is a Jeffreys prior, and g follows a beta distribution,

$$g \sim \text{beta}(\alpha,\beta).$$

The parameter of interest, λ, is estimated using Bayesian methods. Under these methods, the posterior distribution for λ is estimated using a direct calculation. The reported prediction is the mean of the posterior for λ, while 80th credible interval for λ is the upper 80% quantile from the posterior.

During the first study period, no bald eagle and 12 golden eagle carcasses were found. Of these, five golden eagle detections were located inside search plots. The EoA 50% credible interval and 80% credible interval are provided for each study year and the combined three year period (Table 7) as well as the annual average for a single year (Table 9). Additionally, the adjustment factor (g-value) is also provided in both tables.

Individual year's take predictions for golden eagles show variability with estimates ranging from approximately 12 to 38 (50% credible interval) over the three year period. Bald eagles show less variability with estimates ranging from approximately four to eight (Table 8). The annual average of the multiple year period for golden eagles was 18.65 fatalities per year at the 50% credible interval and 24.82 fatalities per year at the 80% credible interval (Table 10).

Table 9. Evidence of absence results for estimated yearly take based on data gathered during the three years of post-construction mortality monitoring conducted from May 2009 – May 2012, at the GRH Wind Energy Project, Converse County, Wyoming.

Study Year	Eagle Mortalities Included in the Estimate	g-value	Average Annual Take (λ)	Annual take (λ) - 80th credible bound
Golden Eagles				
Year 1 (2009 – 2010)	2	0.107	23.56	34.36
Year 2 (2010 – 2011)	2	0.065	38.42	56.03
Year 3 (2011 – 2012)	1	0.123	11.96	18.88
Bald Eagles				
Year 1 (2009 – 2010)	0	0.107	4.71	7.73
Year 2 (2010 – 2011)	0	0.065	7.68	12.61
Year 3 (2011 – 2012)	0	0.123	3.99	6.67

λ = lambda, annual take

Table 10. Evidence of Absence results for estimated annual take based on data gathered during the three years of post-construction mortality monitoring conducted from May 2009 – May 2012, at the GRH Wind Energy Project, Converse County, Wyoming.

Species	g-value	Average Annual Take (λ)	Annual take (λ) - 80th credible bound
golden eagles	0.098	18.65	24.82
bald eagles	0.098	1.69	2.78

λ = lambda, annual take

During the fourth study period, no bald eagle and eight golden eagle carcasses were found inside search plots and included in fatality estimate calculations. The EoA 50% credible interval and 80% credible interval are provided for each study year and the combined two year period (Table 11) as well as the annual average for a single year based on multiple years of data (Table 12). The adjustment factor (g-value) is also provided in both tables.

The individual year's take predictions for golden eagles shows variability ranging from approximately five to 12 fatalities (50% credible interval) between the two years. Bald eagle estimates were identical for both years (Table 11), as zero were found in both years. The annual multi-year average for golden eagles was 8.02 fatalities per year at the 50% credible interval and 10.22 fatalities per year at the 80% credible interval (Table 12). Bald eagle fatality estimates were less than one.

Table 11. Evidence of absence results for estimated yearly take based on data gathered during the two years of eagle specific mortality monitoring conducted from January 2016 – December 2017, at the GRH Wind Energy Project, Converse County, Wyoming. Informed curtailment (among other adaptive management actions) was conducted during this period.

Study Year	Eagle Mortalities Included in the Estimate	g-value	Average Annual Take (λ)	Annual take (λ) - 80th credible bound
Golden Eagles				
Year 1 (2016)	2	0.532	4.74	6.90
Year 2 (2017)	6	0.531	12.32	16.05
Bald Eagles				
Year 1 (2016)	0	0.532	0.95	1.55
Year 2 (2017)	0	0.531	0.95	1.55

λ = lambda, annual take

Table 12. Evidence of Absence results for estimated annual take based on data gathered during the two years of post-construction mortality monitoring conducted from January 2016 – December 2017, at the GRH Wind Energy Project, Converse County, Wyoming. Informed curtailment (among other adaptive management actions) was conducted during this period.

Species	g-value	Average Annual Take (λ)	Annual take (λ) - 80th credible bound
golden eagles	0.532	8.02	10.22
bald eagles	0.532	0.47	0.77

λ = lambda, annual take

9.5.1.1 Local Area Population and Cumulative Impacts

USFWS Region 6 will complete the local area population (LAP) analysis for the Project using their cumulative effects tool and proprietary data on known eagle mortality within the LAP area for each eagle species. This is not an analysis that Project proponents are expected to complete.

The USFWS analysis will provide a cumulative impacts assessment for both golden and bald eagles at the LAP scale within the 109 mile and 86 mile species-specific buffers. A primary purpose of this USFWS analysis is to evaluate eagle take permitted by USFWS within the Project LAP for each eagle species. USFWS will determine what the total of eagle take previously authorized by USFWS plus the predicted eagle take associated with the Project for both eagle species. Further USFWS will assess what this total take number is for both eagle species relative to the 1% and 5% benchmarks established by USFWS for LAPs. The USFWS LAP analysis will also consider unpermitted take. To accomplish this USFWS will review other available eagle mortality records from other existing wind energy facilities, as well as all other sources of known mortality such as electrocution, collisions, shootings, poisonings, etc. USFWS will assess what the annual average unpermitted eagle take is relative to the 10% benchmark established for unpermitted take. This information, and the accompanying analysis, will be fully presented in the Environmental Assessment (EA) USFWS will complete for the Project. The information resulting from the LAP analysis will be used by USFWS Region 6 in the decision making process about

whether or not to issue a programmatic eagle take permit for the Project and the level of take for golden and bald eagles that could potentially be authorized.

9.6 Compensatory Mitigation

With the implementation of the AMMs described above, some unavoidable eagle mortalities have occurred and are expected to still occur in the future. PacifiCorp has been mitigating for eagle mortalities at the site since 2015 as part of the MBCP. Additional compensatory mitigation will be necessary to ensure that the standard of no net loss to the population is achieved whenever golden eagles are taken at the Project. The Project was operational as of January 2009 and hence it is part of the environmental baseline in the USFWS FEA of April, 2009. As such, compensatory mitigation will not be required for take predicted for the original Project, but will be required for the additional take resulting from the repower (i.e., the difference between original Project take prediction and repowered Project take prediction). PacifiCorp will prepare a separate Project-specific power pole retrofit plan using a template provided by the USFWS, Mountain Prairie Region Office.

Based on recommendations under the ECPG, utility pole retrofits are currently the mitigation approach preferred by USFWS. The requirements for *bird-safe* utility poles are well known and are being implemented by PacifiCorp and other utilities. The reduction of electrocutions will benefit eagle productivity directly by reducing this source of mortality.

PacifiCorp will retrofit, to meet or exceed current APLIC guidance (APLIC 2006), enough electric utility poles to provide full compensatory mitigation for the golden eagle take that would require mitigation (i.e., difference between pre- and post-repower predicted take) as identified in a USFWS authorized EITP; if this permit is issued for the Project. The number of utility pole retrofits per eagle carcass discovery beyond the baseline will be based on a resource equivalency analysis (REA) conducted by USFWS (USFWS 2013a). All power pole retrofits will be monitored in accordance with the protocols established in the Rocky Mountain Power APP. If additional monitoring is necessary it will be developed in accordance with permit requirements.

9.7 Adaptive Management

The ECPG recommends that a project developer or operator collect information to determine potential conservation measures that can be employed to avoid and/or minimize the predicted risks at a given site (Stage 4). PacifiCorp has evaluated and implemented a number of adaptive management techniques during the Project's operation beyond the WIRHS system (see section 9.9 below). PacifiCorp will continue to evaluate the need for adaptive management following the plan described below. The adaptive management plan includes ongoing and future strategies (i.e., mitigation and conservation measures) to avoid and minimize impacts to avian resources.

9.8 Adaptive Management Plan

PacifiCorp has developed this ECP including the following adaptive management framework based on the Project specifics and data available to monitor for impacts and avoid, minimize and mitigate impacts to eagles and other avian species.

PacifiCorp's adaptive management framework (1) evaluates the mortality rates reported based on post-construction monitoring; (2) evaluates triggers to monitor the potential effects of various avoidance, minimization, and mitigation measures that may be implemented; and (3) reviews and implements, as appropriate, recommendations from the USFWS related to resource avoidance, minimization, and mitigation measures designed to reduce Project impacts on eagles.

Further discussion on adaptive management implemented to date is included below. PacifiCorp will work with the USFWS to develop a formal adaptive management plan for the Project that include specific triggers, thresholds, and actions based on an issued permit.

9.8.1 Bald and Golden Eagles Discoveries

Upon discovery of a bald or golden eagle carcass at the Project, the following actions will be taken:

- PacifiCorp will tarp the carcass and fill out the appropriate WIRHS reporting form.
- PacifiCorp will notify the designated USFWS office consistent with permit requirements and observe all requirements for submission of these eagles to USFWS.
- PacifiCorp will, if requested by USFWS, meet and confer with the USFWS to help determine the circumstances under which the carcass was discovered.
- PacifiCorp will work with the USFWS to evaluate available carcass discovery data and, as appropriate, implement additional monitoring measures, or implement measures to help reduce potential risks to eagles.

9.9 Adaptive Management to Date

PacifiCorp has worked through the adaptive management plan and implemented a number of actions during the Project operation phase. This section discusses each action taken and provides support information.

9.9.1 Habitat Modification

PacifiCorp has evaluated and conducted a number of habitat modification actions in an effort to reduce eagle attraction to the Project. The largest undertaking was removal of artificial rock piles created as part of the mine reclamation process. These rock piles were identified as potential attractants to eagles due to use by prey species and observations of eagles hunting around rock pile concentration areas.

In 2012 and 2013, PacifiCorp initiated their plan to remove the rock piles including conducting a rock pile inventory to understand the number, size and locations of rock piles throughout the site; formally communicated with the WYDEQ to amend the reclamation plan and allow modifications to move forward; communicated with WGFD and USFWS to ensure both parties were supportive of the habitat modification actions and allow the agencies to provide feedback; and issued bid requests from contractors to complete the work. Response letters from the USFWS identified a potential concern for increased attraction during the habitat modification process and requested

PacifiCorp develop a plan to address these concerns. PacifiCorp worked with WEST to ensure a biological monitor was present throughout the habitat modification process, and that the biomonitor was able to actively curtail turbines and/or shut down habitat modification activities if an increased risk to eagles was observed.

In total, PacifiCorp removed 168 rock piles from the interior Project area. All activities were completed by the end of 2014. WEST conducted surveys at each rock pile location during and immediately after the removal to document prey activity and to remove any prey-species indicators. Follow up surveys were completed at least one month after the removal occurred to verify no continued use of the locations by prey species.

In addition to the rock pile removal, PacifiCorp also removed trees planted throughout the site below turbines. These trees were identified as potential perch and future nesting opportunities. As such, PacifiCorp removed the trees from the Project area.

These habitat modifications were part of PacifiCorp's' larger adaptive management strategy to reduce Project impacts on eagles. No research-level studies were conducted before/after the adaptive management; therefore, direct comparisons on eagle activity and subsequent risk at the Project cannot be made. However, it is believed that these actions, in combination with other adaptive management strategies, have resulted in less risk to eagles and fewer eagle mortalities at the Project.

9.9.2 Experimental and Informed Curtailment

One of the larger adaptive management strategies PacifiCorp has implemented to date for the Project is curtailment of wind turbines (Appendix I). During active curtailment monitoring periods, a biomonitor actively surveys for eagles and then shuts down turbines when an eagle is deemed at risk. Two curtailment phases have occurred (or are ongoing) at the Project; experimental and informed.

The first curtailment phase was an experiment curtailment period initiated in November 2012 and continued through March 2015. PacifiCorp worked with WEST to develop and implement a curtailment plan with the goal of reducing risk to eagles at the Project. Curtailment surveys were conducted five days a week in November and December 2012, then seven days a week starting in late December 2012 and continuing throughout 2013 and 2014. During curtailment surveys, three biomonitors documented turbine curtailment events and eagle observations. Biomonitors were stationed in vehicles and radioed to the O&M building where personnel were monitoring radio traffic and manually shutting down turbines as requests for turbine curtailments came in.

Data collected during the experimental curtailment phase were analyzed and a report was developed (Appendix I). The results of the analysis were used to identify trends in eagle use and risk observed during the experimental curtailment phase. The analysis specifically evaluated eagle use and curtailment trends throughout a day, throughout the year, spatially across the Project, relative to Project slopes, wind conditions, and distance to turbines. These metrics were discussed and used to move the curtailment program into the informed curtailment phase.

The informed curtailment phase officially kicked off in October 2015. The informed curtailment plan includes the use of two biomonitors, seven hours per day (0900 – 1600) for a six month period (October – March) each year (Appendix I). PacifiCorp conducted additional evaluations to

target two locations within the Project area where observation towers would be constructed and biomonitors would be stationed during curtailment surveys. The locations were selected to maximize the biomonitors viewshed across the Project area and were placed near locations where high eagle use had been identified. The towers also allowed biomonitors to have access to the SCADA systems and the ability to manually curtail turbines without the need to radio to the O&M staff. The informed curtailment phase has continued from October 2015 through March 2020.

In line with PacifiCorp's adaptive management plan, changes to the informed curtailment program occur on an as needed basis based on the best available data. As eagle activity changes at the Project, PacifiCorp will evaluate the need to add additional biomonitors or start curtailment activities earlier than October or extending the surveys beyond the defined March end date.

This adaptive management occurred during the winter 2017/2018 period, when PacifiCorp initiated curtailment surveys in September and continued curtailment surveys through April and May. Additionally, a third biomonitor was added to increase the Project area coverage. This change was made due to an increase in eagle activity, resulting in eagle mortalities.

9.9.3 Technology Investigation

As part of the adaptive management plan and in discussion with the USFWS, PacifiCorp evaluated technology that could potentially reduce eagle impacts at the Project. PacifiCorp contracted WEST to evaluate an experimental detection and deterrence system at the Project. The WindSafeFlight™ system developed by BirdsVision Ltd. was the focus of this study. The WindSafeFlight™ system (WSF) system consists of various monitoring and detection sensors including cameras and radars, as well as acoustic and visual deterrents. Three systems (or nodes) were deployed at the Project. All three systems were mounted on turbine GR3-606. Only the IR camera components were evaluated as part of this study. The study plan included multiple independent periods, with the first period starting in May 2014 and final period ending in January 2015 (these period do not include planning or reporting). The study plan and report are not included as an appendix to this document due to confidentially concerns. A summary of the study is provided below.

The WSF system study included three parts: (1) 60-day system operation and remote monitoring [December 2014 – January 2015]; (2) video review; and (3) direct observations [20 days in May 2014 and 20 days in December 2014-January 2015]. Events triggered by a bird underwent further review. The primary goal of the video review was to determine if a change in behavior occurred after the deterrent activated to examine the effectiveness of the deterrence. WEST biomonitors completed 40 days of direct observations. Twenty days of direct observation were completed before the WSF system was installed (May 2014) and 20 days were completed after the system was installed and operational (December 2014 and January 2015). Observations were completed four hours per day (1000 to 1400). All large birds observed were documented. Flight paths were annotated on topographic or aerial maps for each observation.

Detection accuracy was analyzed by dividing the total number of bird only detection events that occurred during the 60-day study period by the total number of detection events that occurred during the same periods. Detection accuracy was also calculated for the direct observation period.

The deterrent effectiveness was evaluated by completing two analyses. The first analysis used the video data. From these data, the number of bird events in which a response was observed was compared to the number of events in which a response was not observed. Qualitative evaluations on behavior and response were also completed. The second analysis used the flight path data collected by the biomonitors to evaluate bird use during pre-treatment and treatment periods. Each turbine was buffered with a series of distance bands (i.e., 500 m, 400 m, 300 m, 200 m, 150 m, 100 m, 75 m, 50 m, 25 m, and 10 m), and the number of flights penetrating each buffer was tabulated. The study design permitted comparison of a pre-installation period and a post-installation period at turbine 606 where the system was installed, as well as at adjacent turbines that did not have the system installed; in other words it was a before-after-control-intervention (BACI) design. The plots were reviewed to determine if a difference in bird flight paths occurred between pre-treatment and treatment as well as between the target and reference turbines.

During the 60-day operational period, the IR cameras were used for detection and the acoustic deterrents were used for deterrence. The other system components were not evaluated as part of this study.

A total of 525 system detections occurred during the 60-day study period. Of these, 279 system detections occurred between sunrise and sunset. A total of 25 system detections were birds. As stated in the methods above, the term birds refers to all large birds. Less than 5% of all detections were triggered by birds and less than 8% of daylight detections were triggered by birds. The false-positive events were triggered by sun glare, clouds, snow, and other unknown factors.

A total of 30 system detections occurred during the second 20-day direct observation period, of which three were birds. Sun glares and clouds were the most common false-positive events that occurred during the direct observation period. Biomonitors recorded 127 birds within 500 m of turbine GR3-606 during the same period. During the direct observation period, two birds detected by the WSF system were also observed by the biomonitors; the third bird detection was not confirmed by the biomonitors. Video review confirmed one bird observed by both biomonitors and the system that did not respond to the deterrent; the second bird observed did respond to the deterrent. In this instance the biomonitor recorded changes in flight direction. At a qualitative level, WEST biomonitors did not note any changes in eagle activity near the target turbine over the 60-day study period or during the direct observation period.

Twenty-five system bird detection videos were evaluated. Of the 25 videos where detection occurred during the 60-day study period, over half displayed a behavior change. The most common behavior change recorded was a change in flight direction with flapping wings. Direct flight was the most common behavior recorded for birds that did not display a behavioral change. Based on the WEST video review, 16 videos were identified as probable golden eagles. Of the 16 probable golden eagles, 11 (69%) appeared to display a behavioral change.

During the pre-treatment period 31 flights were included in the analysis, and during the treatment period 149 flights were included in the analysis. These data included all large birds observed (golden eagle and other species) within 500 m of turbines, regardless of flight height. Plots of relative flight path density near target and reference turbines did not suggest any change in use between the pre-treatment and treatment periods. A comparison of only golden eagle flight paths was also completed. The plots from this analysis also did not suggest a change in golden eagle use associated with the target turbine and WSF system activation when compared to the reference turbines.

BirdsVision's WSF system showed varied success during the study period. The systems were able to detect birds and record videos and activated deterrents upon detection. However, the system's detection capabilities were inconclusive. A large number of birds observed in the vicinity of the system were not detected and a large number of false-positive detections occurred, primarily sun glare, cloud, and snow related. Video evidence suggests a behavioral response did occur when a bird was detected and the deterrent was activated.

The results of the study were shared with the USFWS and the system's viability as a risk reduction option was evaluated. Ultimately, PacifiCorp did not feel the system was far enough along in the development process to deploy at the Project.

9.9.4 Infrastructure Modification and other Miscellaneous Actions

PacifiCorp has performed a number of adaptive management activities on Project infrastructure, primarily during the operational period. These actions have included broad-scale approaches to reduce use and minimize risk across the Project and targeted approaches for areas where reoccurring impacts have been document. The overall goal of these activities is to support PacifiCorp's adaptive management plan and reduce eagle use and potential risk across the Project. PacifiCorp has performed the following actions:

- Removal of nest platforms from the interior Project area (pre-construction)
- Removal of historic snow fences that were known golden eagle perch locations and other miscellaneous materials that provided small mammal (potential eagle prey) shelter
- Installation of new snow fences (slat-style) that provide minimal small mammal cover and limit perch opportunities
- Removal of unused historic wood fence posts that provide eagle perch opportunities
- Selective installation of perch deterrents on wood fence posts to reduce perch opportunities
- Removal of unused historic wire fence lines that could result in impacts to prey (specifically young pronghorn)
- Selective installation of perch deterrents on overhead lines to reduce perch opportunities; specifically near turbines
- Covered culvert ends with grates to minimize small mammal use (eagle prey)
- Selective reconstruction of overhead lines near turbines that included retrofitting with cover-ups and in some instances placing the line underground

- Modified natural rock features that were common perch locations in an effort to make them less desirable
- Targeted effort to remove rabbit carcasses across the site after large die-off was identified
- Transitioned from gamebird trial carcasses (specifically mallards) to artificial decoys to both provide a more accurate detection rate and reduce potential attractants

10.0 Permits and Reporting

10.1 USFWS Eagle Incidental Take Permit

If PacifiCorp obtains an eagle incidental take permit, they will follow all stipulations required by the permit. If an eagle incidental take permit is issued to PacifiCorp for the Project then USFWS will include a condition in the eagle incidental take permit which requires post-construction mortality monitoring for eagles at the Project. Some form of post-construction mortality monitoring will be required under a USFWS permit for all years of the permit, although the type of mortality monitoring, and the rigor and extent of such monitoring is expected to vary over the duration of the permit. PacifiCorp understands that if an eagle incidental take permit is issued for the Project the USFWS will provide advance notice of the type of requirements for post-construction mortality monitoring that will be included in the permit. Incidental reporting will continue as described in the PacifiCorp WIRHS. Additionally, for the life of the Project quarterly checks at all turbines will be completed.

10.2 USFWS Special Purpose Utility Permit (SPUT)

PacifiCorp applied for and received a MBTA 21.27 Special Purpose Utility Permit (SPUT) renewal from the USFWS on April 3, 2020 (MB00467B-0). This permit is valid through March 31, 2023. The SPUT authorizes PacifiCorp to collect, transport, and temporarily possess migratory birds found dead or injured at the Project. Sub-permittees and employees directly reporting to the sub-permittees are also authorized under the permit. The permit does not allow eagles and federally listed threatened and endangered species to be collected. PacifiCorp will apply for a permit renewal as necessary throughout the duration of the Project. Under the conditions of this SPUT, PacifiCorp will report to USFWS all birds found dead or injured at the Project.

10.3 Wyoming State Permits

PacifiCorp has applied for and received Chapter 10 (No. 1545) and Chapter 33 (No. 696) Permits from the Wyoming Game and Fish Department (WGFD). Permits have been authorized for the present calendar year and will be updated as warranted for the life of the Project. The Chapter 10 permit authorizes PacifiCorp to import, possess, confine, transport, sell and/or dispose of live wildlife. The Chapter 33 permit is a scientific resource, education/display or special purposes permit that allows PacifiCorp to possess and remove bird and mammals on and within one mile of the Project area. As a stipulation of the permit, PacifiCorp will provide annual reports to the WGFD. PacifiCorp will renew permits as necessary to complete the Project activities.

11.0 References

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Appendix A. PacifiCorp's RESPECT Corporate Policy

Appendix B. Turbine Repower List

Appendix C. Technical Advisory Committee Meetings

Appendix D. USFWS Mortality Monitoring Recommendations

Appendix E. Pre-Construction Technical Report

Appendix F. Wildlife Incident Report and Handling System

Appendix G. Post-Construction Monitoring Reports

G1- Monitoring Plan

G2 – Year 1 – 3 Report

G3 – Golden Eagle Monitoring Study

G4 – June 2012 – May 2013 Memo

Appendix H. Post-Construction Nest Reports

Appendix I. Curtailment Documents