Appendix H

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APPENDIX H

Relevant Correspondence

This appendix, Appendix H, contains relevant correspondence between PCW and USFWS related to the development of this Phase I ECP. This Appendix is not intended to be a comprehensive record of all correspondence between PCW and USFWS. This Appendix, however, does provide additional context regarding the information in the Phase I ECP and the long history of coordination between PCW and USFWS on the CCSM Project, including Phase I. The correspondence in this Appendix at times refers to avoidance and minimization measures, turbine layouts, and turbine counts that differ in some respect from those presented in this final Phase I ECP being submitted to the USFWS with PCW's formal ETP applications. These differences are attributable to the fact that this final Phase I ECP and the final Phase I wind turbine layout it addresses are the result of more than four years of coordination between PCW and USFWS and over three years of intensive data collection and monitoring. The development of the Phase I wind turbine layout and the final avoidance and minimization measures was an iterative process that continually evolved to take into account the site-specific data, the most recent regulatory guidance, recommendations of USFWS and the requirements of the BLM's Record of Decision on the CCSM Project. This Phase I ECP sets forth the final avoidance and minimization measures and the major revisions to the Phase I wind turbine layout; however, it was not practical to present every revision that PCW made to the CCSM Project as a result of these factors in this Phase I ECP. To the extent the information presented in this Appendix differs from the information and commitments contained in this Phase I ECP, the information and commitments presented in this Phase I ECP supersedes the information in this Appendix as it represents the most current information.

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Power Company of Wyoming LLC
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Tel 303.298.1000
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December 21, 2010

Clark McCreedy
U.S. Fish and Wildlife Service
Wyoming Ecological Services Office
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

Travis Sanderson
U.S. Fish and Wildlife Service
Wyoming Ecological Services Office – Rawlins
1300 North 3rd Street
Rawlins, Wyoming 82301

Re: Chokecherry and Sierra Madre Wind Energy Project

Dear Messrs. McCreedy and Sanderson:

Thank you for meeting with us on December 10, 2010 for a discussion of the Chokecherry and Sierra Madre Wind Energy Project. This letter is to confirm our understanding with respect to the draft Avian Monitoring Protocols for the Project.

As you know, Power Company of Wyoming LLC plans to construct and operate the 2,000 to 3,000 MW Chokecherry and Sierra Madre Wind Energy Project in Carbon County, Wyoming. The Project involves public lands under the management of the Bureau of Land Management, private lands and a small number of State lands. PCW has applied for a wind energy development right-of-way grant for the public lands. The Bureau of Land Management is analyzing the potential impacts of the Project under an environmental impact statement in compliance with its obligations under the National Environmental Policy Act.

As a part of the EIS process, the BLM through a third party environmental contractor conducted avian point count surveys of the Project between June 2008 and June 2009. We understand these data have been provided to the Service. As we have discussed, the Service and PCW believe that additional avian monitoring data will be useful in evaluating potential Project impacts to bald and golden eagles, as well as other migratory bird species. In conjunction with the efforts to collect additional avian monitoring data, receiving early technical advice from the Service with respect to site-specific metrics and methods by which potential Project impacts to bald and golden eagles will be evaluated is critical.

Attached as Exhibit A to this letter are draft Avian Monitoring Protocols for the Chokecherry and Sierra Madre Wind Energy Project. Marine radar technology has been identified by the Service and BLM as a desired method to map areas of high avian use. The Protocols; therefore, combine marine radar surveys with standard point count and breeding bird methodologies to determine raptor and other avian use across the Project area. The study design follows recommendations made by the Service, BLM, and Wyoming Game and Fish Department. The marine radar technology will also enable better identification of bat use areas and relative densities of bats in the Project area.

We understand that you will review the adequacy and appropriateness of these Protocols and provide to us your comments, suggestions and recommendations for revising and implementing the Protocols. Upon completion of the Service's review, additional evaluations of bald and golden eagle use of the Project will be made on a site-specific basis using these Protocols. We further understand that data from the 2008 and 2009 point count surveys, data generated from the implementation of these Protocols, and any additional site-specific data provided to PCW by the Service during implementation of these Protocols will be adequate to characterize site-specific eagle activities, develop an Avian Protection Plan, identify impacts from construction and operation of the Project on eagles, and identify avoidance, minimization, and mitigation efforts upon which the Service will evaluate the APP.

We have been informed that the Service is developing and will soon release for public comment guidance for APPs for wind energy projects. PCW's intent is to develop an APP based upon the following:

1. The APP will address conservation measures to avoid, minimize and mitigate direct and indirect impacts of the Project compatible with the Service's management objectives for bald and golden eagles.

2. The eagle use areas upon which impacts from construction and operation of the Project are to be evaluated shall be nests within four miles of the Project site, and breeding territories, communal roosts, and important foraging areas within the Project site.

3. The APP will identify practicable means by which impacts to eagles from the Project may be avoided, minimized, and mitigated, and in particular:

    a. the APP shall include, but shall not be limited to, the avoidance measure of prohibiting the construction of a turbine within 825 feet of an active eagle nest[1];

[1] Bureau of Land Management. 2008. *Record of Decision and Approved Rawlins Resource Management Plan.* pg. 2-53.

b. the APP shall include, but shall not be limited to, the minimization measure of implementing the recommendations of the Avian Power Line Interaction Committee[2];
c. the APP may include effective on- or off-site mitigation measures.

4. The APP will identify those adaptive management techniques that PCW will implement if post-construction monitoring demonstrates a statistically meaningful difference between estimated and actual levels of impact from the operation of the Project.

As discussed at our meeting, PCW is prepared to proceed with implementing the Protocols, including the purchase and deployment of a Merlin Avian Radar System, upon receipt of the Service's written concurrence confirming the appropriateness of the Protocols for the Chokecherry and Sierra Madre Wind Energy Project.

Thank you very much for your time and consideration and we look forward to hearing from you.

Sincerely,

Garry L. Miller
Director – Land and Environmental Affairs

cc: Jon Kehmeier, SWCA Environmental Consultants
Roxane Perruso, PCW

[2] Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.* Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

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EXHIBIT A

PRELIMINARY DRAFT

Avian and Bat Monitoring Protocols for the Chokecherry and Sierra Madre Wind Energy Development Project

Prepared for:

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Prepared by:

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October 2010

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In accordance with the U.S. Fish and Wildlife Service (USFWS) Wind Turbine Guidelines Advisory Committee *Recommendations on Developing Effective Measures to Mitigate Impacts to Wildlife and Their Habitats Related to Land-Based Wind Energy Facilities* (USFWS 2010), the Wyoming Department of Game and Fish (WGFD) *Wildlife Protection Recommendations for Wind Energy Development in Wyoming* (WGFD 2010), and the Bureau of Land Management (BLM) Rawlins Field Office *Wildlife Survey Protocols for Wind Energy Development*, an analysis of biological surveys conducted for the proposed Chokecherry and Sierra Madre Wind Energy Development Project (Project) has been completed to determine compliance with the recommended protocols of each agency.

As part of the BLM's NEPA process for the Project, WEST, Inc. (WEST) conducted avian point surveys of the Chokecherry and Sierra Madre wind resource areas between June 26, 2008 and June 15, 2009. A portion of these data are analyzed in WEST's report, "*Baseline Avian Use Studies for the Chokecherry and Sierra Madre Wind Resource Areas, Carbon County, Wyoming: Final Summer and Fall Interim Report, June 26-October 14, 2008*" (Johnson et al. 2008). WEST also prepared a report summarizing bat surveys conducted between July 13 through October 13, 2008 titled, "*Bat Surveys for the Chokecherry and Sierra Madre Wind Resource Areas, Carbon County, Wyoming: Final Report*" (Solick et al. 2008). SWCA has completed additional analyses of all data collected in 2008 and 2009 to determine compliance with the agency monitoring recommendations.

Between June 2008 and June 2009, avian use data were collected for much of the Project area as part of the BLM National Environmental Policy Act (NEPA) process [Johnson et al. 2008]. Data were collected using standard point count methods at 19 locations in all months except January and February when much of the project area was inaccessible due to adverse weather conditions. All sites except for three were visited 31 times during the survey period.

Data collected during the 2008 and 2009 surveys are sufficient to provide estimates of avian use of the Project area as well as to provide initial estimates of the frequency of each species at rotor-swept heights. Horned lark (*Eremophila alpestris*) was predominantly the most common avian species detected in the 2008 and 2009 surveys, having over 800 individual detections. The next most common species were the common raven (*Corvus corax*) with less than 200 detections, and vesper sparrow (*Pooecetes gramineus*) with less than 150 detections. Golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis),* and common raven were most commonly observed within the rotary height of the turbines.

In their recommendations to the Secretary of Interior, the Wind Turbine Guidelines Advisory Committee (Committee) recommends using standard sampling methods to determine avian use of a project area, the presence of sensitive species and other species of interest, and to provide a baseline for assessing displacement effects and habitat loss. The Committee further recommends that the sampling frequency, type, and duration be sufficient to account for variability of avian use between and within sampling periods. When more precise estimates of density are required for a special status species, other methods, including radar or nocturnal surveys are recommended. However, the Committee does not recommend using these types of special surveys unless high risks for collision are expected for migrating songbirds or special status species.

Similarly, the Bureau of Land Management (BLM) Rawlins Field Office Wildlife Survey Protocols for Wind Energy Development recommends that surveys be sufficient to detect temporal and spatial use patterns within the project area. Special emphasis is placed on surveys for raptors and sensitive avian species. BLM survey protocols recommend weekly, 20-minute point counts to record avian use of a project area. Survey times are recommended to be varied weekly to ensure that avian use during daylight hours is adequately documented. In addition to weekly surveys, marine radar is recommended to avian foraging, dispersal, and migration paths.

Wyoming Game and Fish Department's (WGFD) Wildlife Protections Recommendations for Wind Energy Development in Wyoming recommend sufficient numbers of weekly point count surveys during spring and fall migration periods following similar protocols as specific by BLM with survey periods of twenty minutes at each point. WGFD recommends that four surveys be conducted during winter months to capture overwintering avian species. For raptor species, WGFD recommends nest surveys and weekly day-long surveys during spring and fall migration periods.

Data collected during 2008 and 2009 comply with BLM, WGFD, and Committee wind energy survey recommendations and serve as one of the two years of suggested pre-construction monitoring data. Data collected for purposes of NEPA compliance provide estimates of collision risk and enable determination of avian use of the Project area, the presence of sensitive species and other species of interest, as well as providing a baseline for assessing displacement effects and habitat loss.

To supplement the 2008-2009 dataset and to better identify concentrated avian use areas, an intensive one-year survey will be used to better identify avian use areas in the Project area. A combination of marine radar surveys and standard point count surveys will be used to determine raptor use across the Project area. Marine radar technology has been identified by the BLM and USFWS as a desired method to map areas of high avian use. The study design will follow recommendations made by the USFWS, BLM, and WGFD by combining marine radar surveys with standard point count and breeding bird methodologies. The marine radar technology will also enable better identification of bat use areas and relative densities of bats in the Project area.

A single DeTect Merlin Avian Radar System will be used to map avian use across the Project area. The DeTect Merlin radar system is a trailer-mounted system with a 200-watt horizontal solid-state S-band radar and a 10–kilowatt (kW) vertically operating magnetron X-band open array radar. The horizontal radar has a range of 2 to 4 miles in a 360-degree pattern around the unit. The vertical radar has a 24-degree beam width and detects flight paths 0.75 to 2.00 miles above the unit.

Marine radar systems require weekly maintenance and fueling and cannot be moved over extremely rough terrain on a regular basis. Additionally, the system will not differentiate between large raptors such as golden eagles and other large birds including geese, other large raptors, and possibly even ravens and should be used in conjunction with field surveys to validate radar recorded data. However, the radar system, when coupled with point count verification of avian use, will allow for accurate horizontal and vertical mapping of avian use in the wind development area. The marine radar system will also enable mapping of high use areas for bat species.

A combination of raptor and point surveys and breeding bird surveys would be conducted in concert with the marine radar system. The intent of this study design is to provide intensive survey information regarding avian use patterns within the radar survey perimeter for each season. Raptor and point counts and breeding bird surveys will be used to validate the radar data and provide estimates of species-specific use patterns. Point count surveys will record the location, flight path, approximate height, and time of use for any individual observed from the point location. Point count locations will be surveyed for eight hours per day during periods with the highest likelihood for detection of migrating birds and/or large raptors. Timing of survey at each location will be varied to determine patterns of avian use during daylight hours.

In addition to the point count and radar surveys, breeding bird surveys will be completed at 15 locations across the wind development areas. Breeding bird surveys will be conducted following the grid monitoring protocols published by the Rocky Mountain Bird Observatory (RMBO) (Hanni et al. 2010). Grid survey locations will be randomly selected using a generalized random tessellation stratified design to ensure a spatially balanced design stratified by major vegetation and habitat types in the Project area. Data collected as part of the grid monitoring efforts would also be used to validate radar data and better determine avian species use to the extent possible. As part of the breeding bird surveys, waterfowl and water bird use surveys would be conducted three times annually (springs, summer, and fall) to identify migrating and resident species.

Locations for placement of the radar and for conducting point count surveys (Figure 1) and breeding bird surveys were determined using a four-tiered approach:

- Tier 1 – Survey areas should determine avian use within the wind development areas.
- Tier 2 – Survey areas should overlap possible foraging areas for large raptors (winter range areas, prairie dog towns, waterfowl use areas, etc.).
- Tier 3 – Survey areas should be in locations to allow for detection of avian movement into and out of the Project area.
- Tier 4 – Survey areas should capture variability in habitat and topography.

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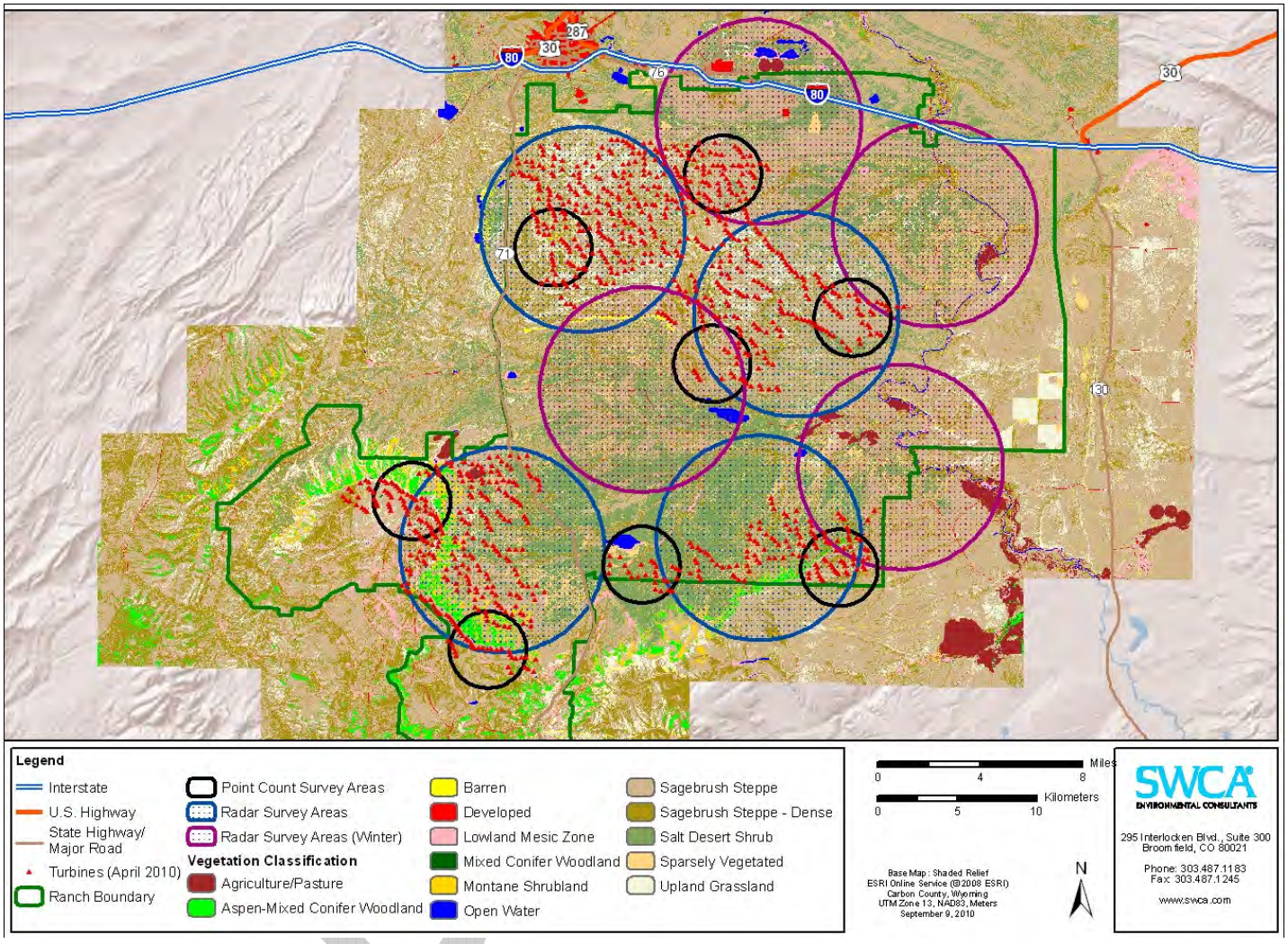

Figure 1. Approximation of area surveyed using avian radar and traditional point count methodologies with respect to possible wind turbine locations. Spring, summer, and fall radar installation locations are the center point of the large blue circles. Proposed point count locations are the center points of the small black circles. Potential winter radar locations are the center points of the large purple circles. Final locations for survey will be determined in coordination with BLM, WGFD, and USFWS.

The radar unit will be placed a 5 locations within the Project area (Figure 1) to cover as many of the turbine locations as possible. Point counts will be completed at nine additional locations to map avian use patterns when radar coverage is not possible. Eight of these point counts will be completed at permanent sampling locations. The ninth point count location will be completed at the radar site to validate the data being collected by the radar unit. This survey date will also be used to service the radar system and will require two technicians. During winter months, the radar will be placed in a location that has high probability of access on a weekly basis. As much of the project area will be covered in snow and large drifts, radar placement in winter will likely be near the Bolton Ranch headquarters, south of I-80 near the North Platte River, on the Bolton Road east of Teton Reservoir, or on the north side of the Chokecherry project area (Figure 1). Winter point count survey locations will also be adjusted as needed to account for winter weather conditions, access issues, and safety concerns.

Based on a four mile radius for radar surveys and a one mile radius for point count surveys, approximately 90-93% of the turbine locations, depending on winter radar placement, will be directly surveyed. It is likely that this percentage is higher than 90-93% for large raptors including bald and golden eagles as many of the point count locations have visibility of several miles. Point count locations outside of the radar survey perimeters have been placed to allow for detection of raptors moving into the project area and between radar surveyed zones.

This protocol assumes that BLM will conduct nest activity and productivity surveys for all known nests in the vicinity of the wind development areas. Incidental observations will be made of nest activity as part of this protocol; however, no formal nest activity or productivity surveys will be completed. Additionally, this protocol assumes that any additional point count surveys beyond the 9 per week specified above would be completed by BLM or USFWS.

The protocols and schedule outlined below will be followed for monitoring and mapping avian and bat use across the wind development area using the marine radar system, point counts, and breeding bird surveys.

1. Fall 2010 – Final radar deployment locations, point count survey locations, and breeding bird survey locations will be identified for all areas of the wind development areas. When possible, point count locations or radar locations will be collocated or closely aligned with the data points surveyed in 2008 and 2009. Radar locations will consider suitable road access for movement of the radar system. Point count locations will be positioned along ridgelines to the extent possible to allow for detection of the highest number of migrating passerines and raptors. Breeding bird survey locations will be determined using a Generalized Random Tessellation Stratified (GRTS) (McDonald 2004; Stevens and Olsen 2004) design with oversampling. This design ensures a spatially balanced random design across all vegetation and habitat types.

2. Winter 2010/2011 – Radar construction, programming, and training. The Draft Avian Protection Plan (APP) will be delivered to USFWS, BLM, and WGFD for review. Among other descriptive sections, the preliminary plan will contain the detailed sampling protocols, preliminary mitigation and avoidance measures, and detailed adaptive management protocols.

3. Spring and Early Summer 2011 – Radar surveys begin in the southern portion of the project area. The radar system will be moved once during the spring migration period to capture as much data as possible during this period. During the migration period, weekly migratory bird counts and raptor use surveys will be conducted at the eight point counts identified in Figure 1 as well as at the point where the radar system is placed. Breeding bird surveys will be completed at 15 locations across the wind development areas. Surveys for waterfowl and other waterbirds will be conducted once during the spring migration at Kindt, Rasmussen, Sage Creek, and Teton reservoirs. Analysis of the radar data will be used to identify areas with high avian and bat use. The following schedule will be used for spring and early summer 2011 surveys:

    a. March 1 – May 15, 2011: Radar system will be initialized and debugged prior to main migratory period. Initial installation will occur in an area south of the Bolton Ranch headquarters in the southeastern-most radar survey location identified on Figure 1. This survey location will detect migrating birds in areas adjacent to the Platte River corridor and along the ridgeline north of the Jack Creek road. Weekly point count locations will be completed at the eight point count locations identified in Figure 1 as well as at the radar location south of the Bolton Ranch headquarters.

    b. May 15–July 31, 2011: Radar system will be moved to a location approximately 2 miles east of Miller Hill in the southwestern-most portion of the wind development area (Figure 1). This survey location will detect migrating birds in areas adjacent to and along the ridgeline of Miller Hill as well as in the basin east of Miller Hill. Between May 15 and June 30, weekly point surveys will be conducted at the eight locations identified on Figure 1 as well as at the radar location east of Miller Hill. During the month of July, the point count locations will only be visited twice instead of every week in compliance with BLM and WGFD recommendations. Additionally, this time is between migratory periods and typically bird movements are lower because of nesting activities. A point count will be conducted weekly at the radar installation location during this period during routine maintenance activities.

    c. May 25–June 30, 2011: Breeding bird surveys will be completed once at each of 15 locations across the wind development areas to determine relative abundance, species richness, and habitat use patterns. Breeding bird surveys will follow RMBO grid survey protocols (Hanni et al. 2010). Bird flight patterns will be documented to better define risks of wind development activities. All raptors as well as their flight paths and heights will be recorded at all breeding bird locations regardless of whether the raptor falls within the grid survey area.

    d. May 1, 2011: A revised draft APP will be delivered to the agencies for a 30-day review and comment period. The revised draft will contain some preliminary analyses of radar data from early spring migration to allow for more informed discussions of possible mitigation measures.

4. Late Summer – Fall 2011: The radar system will be moved to the Chokecherry portion of the wind development area on August 1, 2011. The radar system will be moved once during the fall migration period to capture as much data as possible during this period. During the migration period, weekly migratory bird counts and raptor use surveys will be conducted at the eight point counts identified in Figure 1 as well as at the point where the radar system is placed. Waterfowl and wading bird surveys will be conducted once during late summer to detect nesting activity and once during fall migration at Kindt, Rasmussen, Sage Creek, and Teton reservoirs. Analysis of the radar data collected during spring and early summer will be completed to evaluate bird and bat use and to identify appropriate mitigation measures that could be implemented. The following schedule will be used for late summer and fall 2011 surveys:

    a. August 1: A Final APP will be delivered to the agencies for review and approval. The final APP will contain the mitigation measures that will be applied to remove or minimize risks to avian species. The final APP will also identify the final adaptive management process that will be followed to update the APP and apply additional site-specific mitigation measures as additional data are obtained prior to, during and after construction. An interim report of radar data trends and observations will also be provided with the final APP.

    b. August 1– September 30, 2011: Radar system will installed at the western radar location in the Chokecherry project area radar survey location identified on Figure 1. This survey location will detect migrating birds in the western portion of Chokecherry as well as along the rim of Chokecherry and the basin between Chokecherry and Atlantic Rim. During the month of August, the point count locations will only be visited twice instead of every week. A point count will be conducted weekly at the radar installation location during August as part of routine maintenance activities. During September, weekly point count locations will be completed at the eight point count locations identified in Figure 1 as well as at the radar location.

    c. October 1–November 15, 2011: Radar system will be moved to a location southwest of the initial Chokecherry installation location (Figure 1). This survey location will detect birds along the southern rim of Chokecherry and the eastern half of the Chokecherry project area. Weekly point count surveys will be conducted at the eight locations identified on Figure 1 as well as at the radar location.

5. Winter 2011/2012 (November 16, 2011–March 30, 2012) – The radar system will be deployed in a location near the Bolton Ranch headquarters (Figure 1) or north of the Chokecherry project area to ensure weekly maintenance is possible during winter months. Weekly bird observations will be recorded during routine maintenance activities at the radar location. Weather permitting, monthly counts will be conducted at the point count locations in Figure 1.

6. Spring 2012 – PCW and the agencies will initiate the adaptive management process identified and approved in the final APP to incorporate site-specific mitigation and

avoidance measures into final project designs and the Final Environmental Impact Statement and Record of Decision. A final report documenting the results of the radar and point count efforts will be provided at least two weeks prior to the initiation of the adaptive management process to ensure adequate review time prior to discussions.

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U.S. Fish and Wildlife Service [USFWS]. 2010. Recommendations on developing effective measures to mitigate impacts to wildlife and their habitats related to land-based wind energy facilities. Submitted to the Secretary of the Interior by the Wind Turbine Guidelines Advisory Committee.

Wyoming Game and Fish Department [WGFD]. 2010. Wildlife protection recommendations for wind development in Wyoming. Commission approved version (4-23-2010). 70pp.

DRAFT

From: Jon Kehmeier
Sent: Tuesday, March 22, 2011 2:25 PM
To: Travis_Sanderson@fws.gov; HCline@blm.gov
Cc: Garry Miller
Subject: PCW Revised Draft Avian Monitoring Plan

Travis and Heath,

I have attached the revised avian monitoring plan to address some of the concerns that Travis made re: the schedule of completing the APP/ECP. Travis, I pushed the development of the final APP into 2012 with some language in there that would allow us to finalize earlier than that if possible. Thanks for taking a look at this. Since we talked a few weeks ago the loaner radar unit was installed above Severson Flats on the eastern portions of Chokecherry. The current install location is about the only place we could get the unit given the road and snow conditions in the project area. PCW's actual unit will be delivered in about 3 weeks and will be initialized in a different location that corresponds with the preliminary locations identified in the attached plan. Depending on snow conditions and field observations we might shift the final placement a bit to decrease clutter and increase detectability of avian targets. Once we have it up and running we will have to do a field tour to check out the radar and the avian observation points. We plan to start survey at the avian points during the first week of April.

Jon

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Avian and Bat Monitoring Protocols

for the

Chokecherry and Sierra Madre Wind Energy Project

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March 2011

Review of Agency Recommendations

The following protocols have been developed in accordance with the following agency recommendations:

U.S. Fish and Wildlife Service (USFWS)
Wind Turbine Guidelines Advisory Committee *Recommendations on Developing Effective Measures to Mitigate Impacts to Wildlife and Their Habitats Related to Land-Based Wind Energy Facilities* (USFWS 2010)
USFWS Draft Land-Based Wind Energy Guidelines (USFWS 2011a)
Draft Eagle Conservation Plan Guidance (USFWS 2011b)

Wyoming Department of Game and Fish (WGFD)
Wildlife Protection Recommendations for Wind Energy Development in Wyoming (WGFD 2010)

Bureau of Land Management (BLM)
Rawlins Field Office *Wildlife Survey Protocols for Wind Energy Development*,

Generally, UFWS survey recommendations (USFWS 2010, 2011a, and 2011b) include using standard sampling methods to determine avian use of a project area, fatality risk in a project area, the presence of sensitive species and other species of interest, and to provide a baseline for assessing displacement effects and habitat loss. USFWS recommends that sampling frequency, type, and duration be sufficient to account for variability of avian use between and within sampling periods. When more precise estimates of density are required for a special status species, other methods, including radar or nocturnal surveys have been recommended when risks for collision are expected.

Similarly, the Bureau of Land Management (BLM) Rawlins Field Office Wildlife Survey Protocols for Wind Energy Development recommends that surveys be sufficient to detect temporal and spatial use patterns within the project area. Special emphasis is placed on surveys for raptors and sensitive avian species. BLM survey protocols recommend weekly, 20-minute point counts to record avian use of a project area. Survey times are recommended to be varied weekly to ensure that avian use during daylight hours is adequately documented. In addition to weekly surveys, marine radar is recommended to better define avian foraging, dispersal, and migration paths.

Wyoming Game and Fish Department's (WGFD) Wildlife Protections Recommendations for Wind Energy Development in Wyoming recommend sufficient numbers of weekly point count surveys during spring and fall migration periods following similar protocols as specific by BLM with survey periods of twenty minutes at each point. WGFD recommends that four surveys be conducted during winter months to capture overwintering avian species. For raptor species, WGFD recommends nest surveys and weekly day-long surveys during spring and fall migration periods.

Review of Existing Data

In compliance with its obligations under the National Environmental Policy Act of 1969 (NEPA), BLM is preparing an environmental impact statement (EIS) analyzing the potential impacts of the Chokecherry and Sierra Madre Wind Energy Project (Project) on lands and resources within the Project area. Between June 2008 and June 2009, avian use data were collected for much of the Project area as part of the BLM NEPA process [Johnson et al. 2008]. Data were collected using standard point count methods at 19 locations in all months except January and February when much of the Project area was inaccessible due to adverse weather conditions. All sites except for three were visited 31 times during the survey period.

WEST, Inc. (WEST) conducted avian point surveys of the Project area between June 26, 2008 and June 15, 2009. A portion of these data are analyzed in WEST's report, "*Baseline Avian Use Studies for the Chokecherry and Sierra Madre Wind Resource Areas, Carbon County, Wyoming: Final Summer and Fall Interim Report, June 26-October 14, 2008*" (Johnson et al. 2008). WEST also prepared a report summarizing bat surveys conducted between July 13 through October 13, 2008 titled, "*Bat Surveys for the Chokecherry and Sierra Madre Wind Resource Areas, Carbon County, Wyoming: Final Report*" (Solick et al. 2008). SWCA has completed additional analyses of all data collected in 2008 and 2009 to determine compliance with various agency monitoring recommendations.

Data collected during the 2008 and 2009 surveys are sufficient to provide estimates of avian use of the Project area as well as to provide initial estimates of the frequency of each species at rotor-swept heights. Horned lark (*Eremophila alpestris*) was predominantly the most common avian species detected in the 2008 and 2009 surveys, having over 800 individual detections. The next most common species were the common raven (*Corvus corax*) with less than 200 detections, and vesper sparrow (*Pooecetes gramineus*) with less than 150 detections. Golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis)*, and common raven were most commonly observed within the rotary height of the turbines.

Data collected during 2008 and 2009 comply with the agency wind energy survey recommendations described in the previous section and serve as one year of suggested pre-construction monitoring data. Data collected for purposes of NEPA compliance provide estimates of collision and fatality risk and enable determination of avian use of the Project area, the presence of sensitive species and other species of interest, as well as providing a baseline for assessing displacement effects and habitat loss.

Project-Specific Protocols

To supplement the 2008-2009 dataset and to better identify concentrated avian use areas for development of a Project-specific Avian Protection Plan (APP) and an Eagle Conservation Plan (ECP), an intensive one-year survey will be used to better identify avian use areas in the Project area. Protocols have been developed following the various agency recommendations discussed above and in coordination with local USFS, BLM, and WGFD biologists. The protocols are consistent with agency recommendations and will provide more detailed site-specific use data than the protocols individually recommended by any of the agencies.

A combination of avian radar, raptor count stations, standard grid sampling, and point count surveys will be used to determine avian use across the Project area with emphasis on large raptors including golden eagles. Avian radar technology has been identified by the BLM and USFWS as a desired method to map areas of high avian use. The sampling design will follow recommendations made by the USFWS, BLM, and WGFD by combining radar surveys with standard point count and breeding bird methodologies. The radar technology will also enable better identification of bat use areas and relative densities of bats in the Project area.

A DeTect Merlin Avian Radar System will be used to map avian use across the Project area. The DeTect Merlin radar system is a trailer-mounted system with a 200-watt horizontal solid-state S-band radar and a 10–kilowatt (kW) vertically operating X-band open array radar. The horizontal radar has a range of 2 to 5 miles in a 360-degree pattern around the unit. The vertical radar has a 24-degree beam width and detects flight paths 0.75 to 2.00 miles above the unit.

The avian radar system requires weekly maintenance and fueling and cannot be moved over extremely rough terrain on a regular basis. Additionally, the system will not differentiate between large raptors such as golden eagles and other large birds including geese, other large raptors, and possibly even ravens and; therefore, will be used in conjunction with field surveys to validate radar recorded data. However, the radar system, when coupled with point count verification of avian use, will allow for accurate horizontal and vertical mapping of avian use in the Project area. The radar system will also enable mapping of high use areas for bat species.

A combination of raptor and point surveys and breeding bird grid surveys will be conducted in concert with the radar survey. This design will provide intensive survey information regarding avian use patterns within the radar survey perimeter for each season. Raptor count stations, point counts, and breeding bird surveys will be used to validate the radar data and provide estimates of species-specific use patterns. Raptor stations and point count surveys will record the location, flight path, approximate height, and time of use for any individual observed from the count location. Raptor count locations will be surveyed for 8-12 hours per day during periods with the highest likelihood for detection of migrating birds and/or large raptors. Standard 20-minute point counts will be completed at each raptor count location. Timing of point count surveys at each location will be varied to determine patterns of avian use during daylight hours.

In addition to the raptor, point count, and radar surveys, breeding bird surveys will be completed at 15 locations across the Project area. Breeding bird surveys will be conducted following the grid monitoring protocols published by the Rocky Mountain Bird Observatory (RMBO) (Hanni et al. 2010). Grid survey locations will be randomly selected using a generalized random tessellation stratified design to ensure a spatially balanced design stratified by major vegetation and habitat types in the Project area. Data collected as part of the grid monitoring efforts will also be used to validate radar data and better determine avian species use. As part of the breeding bird surveys, waterfowl and water bird use surveys will be conducted three times annually (springs, summer, and fall) to identify migrating and resident species.

Locations for placement of the radar and for conducting point count surveys (Figure 1) and breeding bird surveys were determined using a four-tiered approach:

- Tier 1 – Survey areas should determine avian use within the Project area.

- Tier 2 – Survey areas should overlap possible foraging areas for large raptors (winter range areas, prairie dog towns, waterfowl use areas, etc.).
- Tier 3 – Survey areas should be in locations to allow for detection of avian movement into and out of the Project area.
- Tier 4 – Survey areas should capture variability in habitat and topography.

Locations of radar placement were refined following attendance at DeTect's radar training courses and during coordination with DeTect's radar placement specialists. Figure 1 reflects the revised radar locations. Final placement of the radar unit and final point locations for survey will be determined in early spring 2011 following radar unit delivery.

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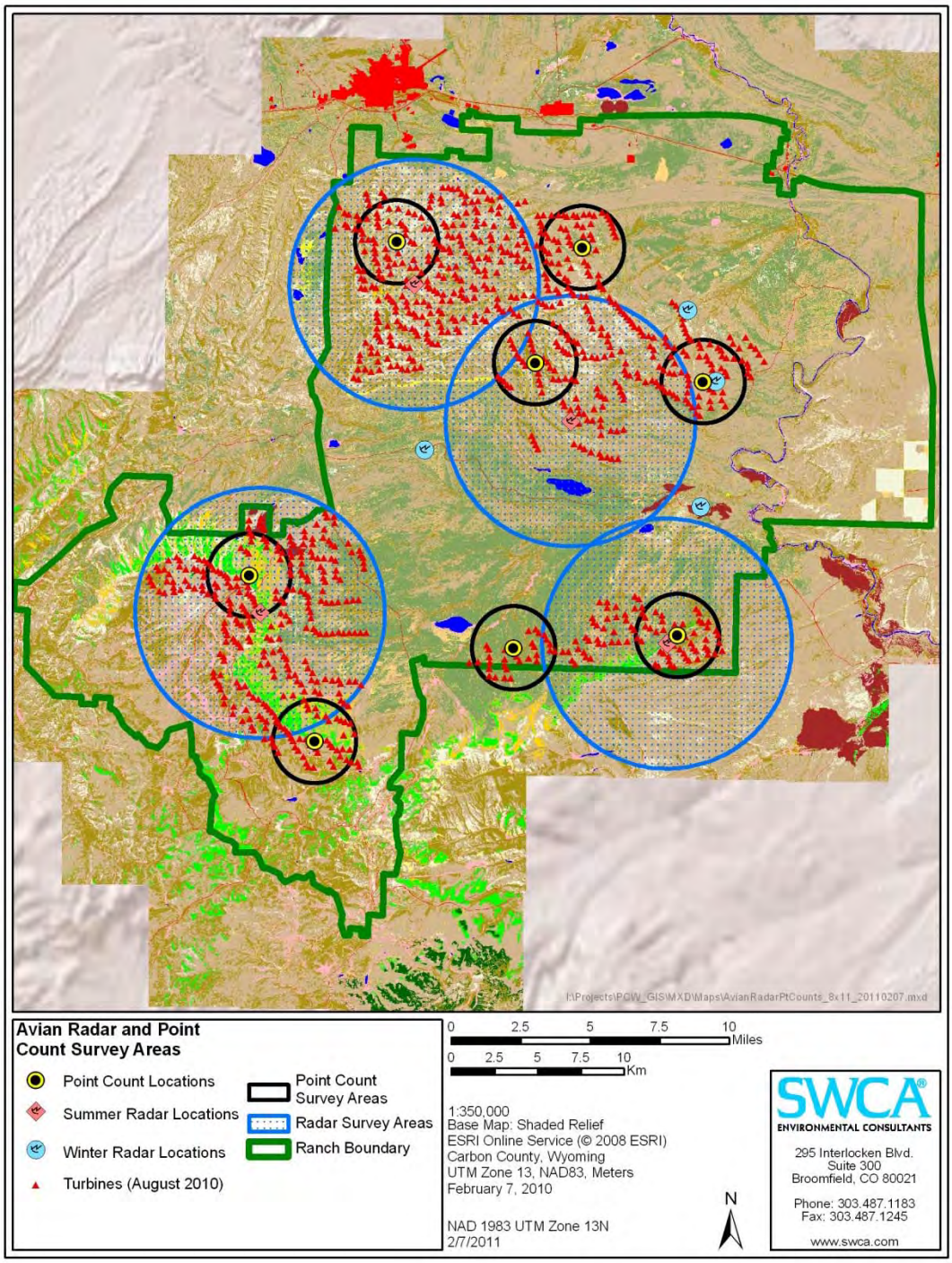

Figure 1. Approximation of area surveyed using avian radar and traditional point count methodologies with respect to possible wind turbine locations. Spring, summer, and fall radar installation locations are the center point of the large blue circles. Proposed point count locations are the center points of the small black circles. Potential winter radar locations are the four blue points. Final locations for survey will be determined in coordination with BLM, WGFD, and USFWS.

The radar unit will be placed at five locations within the Project area (Figure 1). Point counts will be completed at nine additional locations to map avian use patterns where radar coverage is not possible. Eight of these point counts will be completed at permanent sampling locations. The ninth point count location will be completed at the radar site to validate the data being collected by the radar unit. During winter months, the radar will be placed in a location that has high probability of access on a weekly basis. Much of the project area is covered in snow and large drifts during winter; therefore, radar placement in winter will likely be near the Bolton Ranch headquarters, south of I-80 near the North Platte River, on the Bolton Road east of Teton Reservoir, or on the north side of the Chokecherry project area (Figure 1). Winter point count survey locations will also be adjusted as needed to account for winter weather conditions, access issues, and safety concerns.

Based on a four mile radius for radar surveys and a one mile radius for point count surveys, approximately 90-93% of the turbine locations, depending on winter radar placement, will be directly surveyed. It is likely that this percentage is higher than 90-93% for large raptors including bald and golden eagles as many of the point count locations have visibility of several miles and recent radar advancements may allow for detection of large raptors out to 5+ miles. Point count locations outside of the radar survey perimeters have been placed to allow for detection of raptors moving into the Project area and between radar surveyed zones.

Helicopter flights will be completed in mid-April or early May to document eagle nesting activity as well as nesting activity of other raptors that are incidentally observed. Aerial nest activity surveys will be completed in accordance with the recent draft eagle guidance (USFWS 2011b). Following identification of active eagle nests, follow-up productivity surveys will be completed from the ground above/below the nest to determine nesting and fledging success.

The protocols and schedule outlined below will be followed for monitoring and mapping avian and bat use across the Project area using the marine radar system, point counts, and breeding bird surveys.

1. Winter 2010/2011 – Radar construction, programming, and training. The Draft APP/ECP will be delivered to USFWS, BLM, and WGFD for review in late winter/early spring. Among other descriptive sections, the preliminary plan will contain the detailed sampling protocols, preliminary mitigation and avoidance measures, and detailed adaptive management protocols. Monthly reconnaissance surveys will be completed to document eagle use of the Project area during winter months and to help determine best locations for winter 2011/2012 deployment of the radar system.

2. Spring and Early Summer 2011 – Radar surveys will begin in the southern portion of the Project area. The radar system will be moved once during the spring migration period to capture as much data as possible during this period. During the migration period, weekly migratory bird counts and raptor use surveys will be conducted at the eight point counts identified in Figure 1 as well as at the point where the radar system is placed. Breeding bird surveys will be completed at 15 locations across the Project area. Surveys for waterfowl and other waterbirds will be conducted once during the spring migration at Kindt, Rasmussen, Sage Creek, and Teton reservoirs. Analysis of the radar data will be

used to identify areas with high avian and bat use. The following schedule will be used for spring and early summer 2011 surveys:

a. March 15 – May 15, 2011: Radar system will be initialized and debugged prior to main migratory period. Initial installation will occur at the southeastern-most radar survey location identified on Figure 1. This survey location will detect migrating birds in areas adjacent to the Platte River corridor and along the ridgeline north of the Jack Creek road. Weekly point count locations will be completed at the eight point count locations identified in Figure 1 as well as at the radar location.

b. May 15–July 31, 2011: Radar system will be moved to the northeastern survey location (Figure 1). This survey location will detect migrating birds adjacent to and along the Bolten Rim as well as in the basin below the Bolten Rim. Migratory use and raptor soaring locations within and adjacent to the ridgelines in this portion of Chokecherry will also be surveyed using the radar system. Between May 15 and June 30, weekly point surveys will be conducted at the eight locations identified on Figure 1 as well as at the radar location. During the month of July, the point count locations will be visited twice instead of every week in compliance with BLM and WGFD recommendations. Additionally, this time is between migratory periods and typically bird movements are lower because of nesting activities. A point count will be conducted weekly at the radar installation location during this period during routine maintenance activities.

c. May 25–June 30, 2011: Breeding bird surveys will be completed once at each of 15 locations across the Project area to determine relative abundance, species richness, and habitat use patterns. Breeding bird surveys will follow RMBO grid survey protocols (Hanni et al. 2010). Bird flight patterns will be documented to better define risks of wind development activities. All raptors as well as their flight paths and heights will be recorded at all breeding bird locations regardless of whether the raptor falls within the grid survey area.

d. May 1, 2011: An agency meeting will be scheduled to discuss preliminary analyses of radar data from early spring migration to allow for more informed use of the radar and survey data that will be used in the APP/ECP.

3. Late Summer – Fall 2011: The radar system will be moved once during the fall migration period to capture as much data as possible during this period. During the migration period, weekly migratory bird counts and raptor use surveys will be conducted at the eight point counts identified in Figure 1 as well as at the point where the radar system is placed. Waterfowl and wading bird surveys will be conducted once during late summer to detect nesting activity and once during fall migration at Kindt, Rasmussen, Sage Creek, and Teton reservoirs. Analysis of the radar data collected during spring and early summer will be completed to evaluate bird and bat use and to identify appropriate mitigation measures that could be implemented. The following schedule will be used for late summer and fall 2011 surveys:

a. August 1: A revised Draft APP/ECP will be delivered to the agencies for review and approval. The revised APPECP will contain the mitigation measures that will be applied to remove or minimize risks to avian species. The revised APP/ECP will also identify the adaptive management process that will be followed to update the APP/ECP and apply additional site-specific mitigation measures as additional data are obtained prior to, during and after construction. An interim report of radar data trends and observations will also be provided with the revised APP/ECP.

b. August 1– September 30, 2011: Radar system will be installed at the western radar location in the Chokecherry project area radar survey location identified on Figure 1. This survey location will detect migrating birds in the western portion of Chokecherry as well as along the rim of Chokecherry and the basin between Chokecherry and Atlantic Rim. During the month of August, the point count locations will be visited twice instead of every week. A point count will be conducted weekly at the radar installation location during August as part of routine maintenance activities. During September, weekly point count locations will be completed at the eight point count locations identified in Figure 1 as well as at the radar location.

c. October 1–November 15, 2011: Radar system will be moved to a location along the rim of Miller Hill in the southwestern portion of the project area (Figure 1). This survey location will detect birds in the Miller Hill area and below the Miller Hill rim in the Sage Creek Basin. Weekly point count surveys will be conducted at the eight locations identified on Figure 1 as well as at the radar location.

4. Winter 2011/2012 (November 16, 2011–March 30, 2012) – A preliminary Final APP/ECP will be delivered to the agencies for review. The preliminary Final APP/ECP will identify the avoidance, minimization, and mitigation measures to reduce threats to eagles and other avian species. The radar system will be deployed in a suitable location to ensure weekly maintenance is possible during winter months. Weekly bird observations will be recorded during routine maintenance activities at the radar location. Weather permitting, monthly counts will be conducted at the point count locations in Figure 1.

5. Spring 2012 – PCW and the agencies will initiate the adaptive management process identified in the preliminary Final APP/ECP to incorporate site-specific mitigation and avoidance measures into final project designs and the Final Environmental Impact Statement and Record of Decision. A final report documenting the results of the radar and point count efforts will be provided at least two weeks prior to the initiation of the adaptive management process to ensure adequate review time prior to discussions. The final APP/ECP would be completed following the spring 2012 agency coordination process.

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Re: Chokecherry and Sierra Madre Wind Energy Project
Summary Report for 2011 Nest Surveys

Dear Messrs. Carpenter and Sanderson:

Power Company of Wyoming LLC (PCW) proposes to construct and operate the 2,000 to 3,000 MW Chokecherry and Sierra Madre Wind Energy Project in Carbon County, Wyoming (the Project). The Project involves public lands under the management of the Bureau of Land Management, private lands owned by The Overland Trail Cattle Company LLC (a PCW affiliate) and a small number of State lands. PCW has applied for a wind energy development right-of-way grant for the public lands. The BLM is analyzing the potential impacts of the Project under an environmental impact statement in compliance with its obligations under the National Environmental Policy Act. The draft EIS was issued by BLM on July 22, 2011 (DEIS).

BLM Instruction Memorandum No. 2010-156 (July 9, 2010) provides that if a proposed project has the potential to impact golden eagles or their habitat, an Avian Protection Plan (APP) will be required by the BLM as a condition of the right-of-way grant. The APP is to be developed by the applicant, in coordination with the U.S. Fish and Wildlife Service (FWS) and the BLM, to evaluate options to avoid and minimize the project impacts. The APP may also include measures for bats (an ABPP).

PCW, as the applicant, is developing an ABPP for the Project. In December 2010 PCW submitted to the FWS draft Avian Monitoring Protocols for the Project. A copy of the Protocols was also provided to BLM. The FWS and BLM have verbally provided comments on those protocols which PCW incorporated.

Consistent with the agreed upon Protocols, in May and June of this year PCW engaged SWCA Environmental Consultants to conducted raptor nest surveys within the Project development footprint and in suitable nesting habitats within a 5-mile buffer (approximately 700 square miles) surrounding the Project. The selection of a 5-mile turbine buffer was made through consultation with the FWS and the BLM.

Enclosed is a Summary Report for 2011 Nest Surveys for the Chokecherry and Sierra Madre Wind Energy Project. I am also providing GIS files showing the location of each nest located and the helicopter flight paths taken during the survey. In addition to the helicopter flights, ground surveys were completed in some areas where leaves on trees or terrain features made helicopter surveys impractical or unsafe. Follow-up visits were made to all active eagle nests and many buteo nests to confirm fledging of young or abandonment of the nest structure. In summary, 23 active raptor nests and 158 inactive raptor nests were identified within the surveyed area. In addition, all ferruginous hawk nests within the Project area and identified within the BLM's dataset were visited and the condition of the nest documented. No active ferruginous hawk nests were found during the 2011 surveys.

Our findings are consistent with those disclosed in the DEIS. During its 2008-2009 surveys WEST found 24 active raptor nests (DEIS at pg. 3.14-19) and no active ferruginous hawk nests (DEIS at pg. 3.15-11) within the Application Area.

If you should have any questions regarding the enclosed report and data, please let me know.

Sincerely,

Garry L. Miller
Director – Land and Environmental Affairs

cc: Heath Cline, BLM
Jon Kehmeier, SWCA Environmental Consultants
Pam Murdock, BLM

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Summary Report for 2011 Nest Surveys
Chokecherry and Sierra Madre Wind Energy Project

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October 6, 2011

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INTRODUCTION

In May and June 2011, SWCA Environmental Consultants (SWCA) conducted raptor nest surveys within the Chokecherry and Sierra Madre Wind Energy Project (Project) development footprint and in suitable nesting habitats within a 5-mile buffer (approximately 700 square miles) surrounding the Project. The selection of a 5-mile turbine buffer was made through consultation with the U.S. Fish and Wildlife Service (USFWS) and the Bureau of Land Management (BLM). This buffer was agreed upon since the existing BLM raptor nest database could be used as a basis for where to search for nests, and because terrain features that had high potential for nesting raptors were well known and established. A 5-mile turbine buffer was also deemed acceptable due to the robust avian monitoring efforts already underway within the Project area, which could also assist in identifying potential nesting raptors. Additionally, BLM regularly conducts raptor nest monitoring in areas that fall outside of the 5-mile turbine buffer. Data from those BLM monitoring efforts will be considered during development of the Avian Protection Plan and Eagle Conservation Plan.

Three types of survey methods were used to identify nests, determine nest condition and activity, and assess nesting success. Helicopter surveys were used to evaluate all known nests and all potential nesting habitats along cliff bands, on steep slopes, and along the North Platte River corridor. Ground surveys were used to identify nests not readily identified from helicopter surveys and to assess nests that were not identified or observable during the helicopter survey flight path. All ferruginous hawk (*Buteo regalis*) nests in the Project footprint were visited to assess current condition. Multiple nest monitoring visits were made to all active eagle nests and many of the active *Buteo* nests identified during helicopter and ground surveys. Nest monitoring visits were made until fledging was confirmed or until juveniles were no longer present on the nest. All nest survey and monitoring activities were conducted in accordance with the protocols submitted to and accepted by the USFWS.

AERIAL SURVEYS

During aerial nest surveys, two biologists and a pilot flew in a Bell 206B3 helicopter on May 25 and June 10. Surveys on May 25 were completed primarily for the Chokecherry portion of the Project and the North Platte River corridor. Surveys on June 10 were completed for the Sierra Madre portion of the Project area as well as the Atlantic Rim. During the June 10 flight, several of the active nests identified during the May 25 surveys were revisited to assess nest activity and the development stage of the chick(s) on the nest.

Nineteen hours were spent flying the Project area and associated buffer. SWCA biologists used historic nest locations provided by the BLM Rawlins Field Office (RFO) for guidance in surveying existing and undocumented nest locations. Aerial surveys focused on known and potential nesting habitat for golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), and ferruginous hawk, as well as previously documented nest locations for these species and other large *Buteos*, falcons, and accipiters. These habitat types included cliff bands, rock outcrops and promenades, steep slopes, riparian zones and river corridors, and forested areas with large trees capable of supporting large nest structures. While the focus of the nest flights was on the three previously mentioned species, any active raptor nest that was

encountered during the course of the flights was documented. Additionally, all inactive or historic nests in poor condition that were observed during aerial surveying efforts were recorded. Data collected at each nest site included documentation of the nest substrate and location, nest condition, nest status (e.g., active or inactive, number of nestlings, etc.), global positioning system (GPS) location, and photo documentation of the nest when feasible and safe.

GROUND SURVEYS

Ground surveys were used to evaluate potential nesting habitat that could not be surveyed or readily observed during aerial flights. Ground surveys focused on treed habitats with known nesting structures that could not be observed during helicopter surveys as well as selected known *Buteo* and accipter nests in the Project area. Ground surveys also identified a previously unknown bald eagle nest. Due to an abundance of late season snowpack, areas around the base of Miller Hill were inaccessible until late spring, at which time the groves of quaking aspen (*Populus tremuloides*) had fully leafed out. While locating nests in these groves proved mostly unsuccessful, any raptor activity occurring in these areas would be captured by the four raptor monitoring points located around Miller Hill. Ground surveys also included visits to all historic ferruginous hawk nests in the Project area to evaluate current nest condition and determine when the nest had last been active. All ferruginous hawk nests in the survey area were inactive in 2011 and many of the historic nests identified in the BLM datasets were no longer viable for nesting activities (Appendix A). All ground survey locations were accessed on foot or with trucks and all-terrain vehicles. Data collected during ground surveys were identical to the data recorded during aerial surveys.

In total, 23 active raptor nests were located within the Project area and associated 5-mile buffer (Figure 1). The species composition of the active raptor nests were as follows: eight golden eagle, four bald eagle, six red-tailed hawk (*Buteo jamaicensis*), three prairie falcon (*Falco mexicanus*), one unknown *Buteo* (likely red-tailed hawk), and one American kestrel (*Falco sparverius*). An additional three active non-raptor nests were located during the flights and included one turkey vulture (*Cathartes aura*), one common raven (*Corvus corax*), and one unknown large species. The unknown large species nest was a medium-sized stick nest in a crevice of a cliff band, and was likely either a *Buteo* species or a common raven. All active golden eagle and bald eagle nests were located outside of the wind development footprint although three of the eagle nests (two golden eagle and one bald eagle) were located within 1 mile of potential turbine locations. Most active eagle nests were located east and southeast of the Chokecherry portion of the Project along cliff bands on the Bolten Rim and the North Platte River. One active eagle nest was located on the Sierra Madre portion of the Project. The remaining active eagle nests were located south of Middlewood Hill along Jack Creek and in the south Sage Creek Basin. All of the active golden eagle and bald eagle nests were observed to have one to two nestlings present, while the majority of the other active raptor nests appeared to be in the incubation or brooding stages. Appendix B contains representative photographs of the types of active and inactive nests that were observed during surveys.

NEST MONITORING

Follow-up ground surveys were completed to document nest activity and fledging success for all eagle nests and many other raptor nests in the Project area between July 5 and August 2. By July 20, four golden eagle and two bald eagle nests were confirmed as fledged or inactive. Additionally, three other *Buteo* and falcon nests were confirmed as fledged or inactive. As of August 2, the final four golden eagle and two bald eagle nests were confirmed as fledged or inactive. Of the remaining active *Buteo* and falcon nests, four were confirmed as fledged or inactive. Two red-tailed hawk nests remained active as of August 2, and two falcon nests were unable to be relocated during ground surveys due to the nests being built into cavities and tight crevasses along cliff bands.

SUMMARY

In addition to the 23 active raptor nests, 158 inactive nests were also located and documented during the nest flights and other nest searching activities. These nests were located across the Project area and associated buffer; however, the vast majority were located along the Bolten Rim and around the perimeter of the Chokecherry plateau. While all nests observed during the nest flights were documented, it is possible that nests of certain species (e.g., American kestrel, prairie falcon, common raven, etc.) were not able to be located due to the nature of aerial surveys, and because of the way their nests are structured (i.e., oftentimes built in cavities or tight crevasses along cliff bands). All of the inactive nests marked were large in size and were considered potential raptor nests; however, as these nests were inactive, it is not possible to know exactly what species built and/or used the nest.

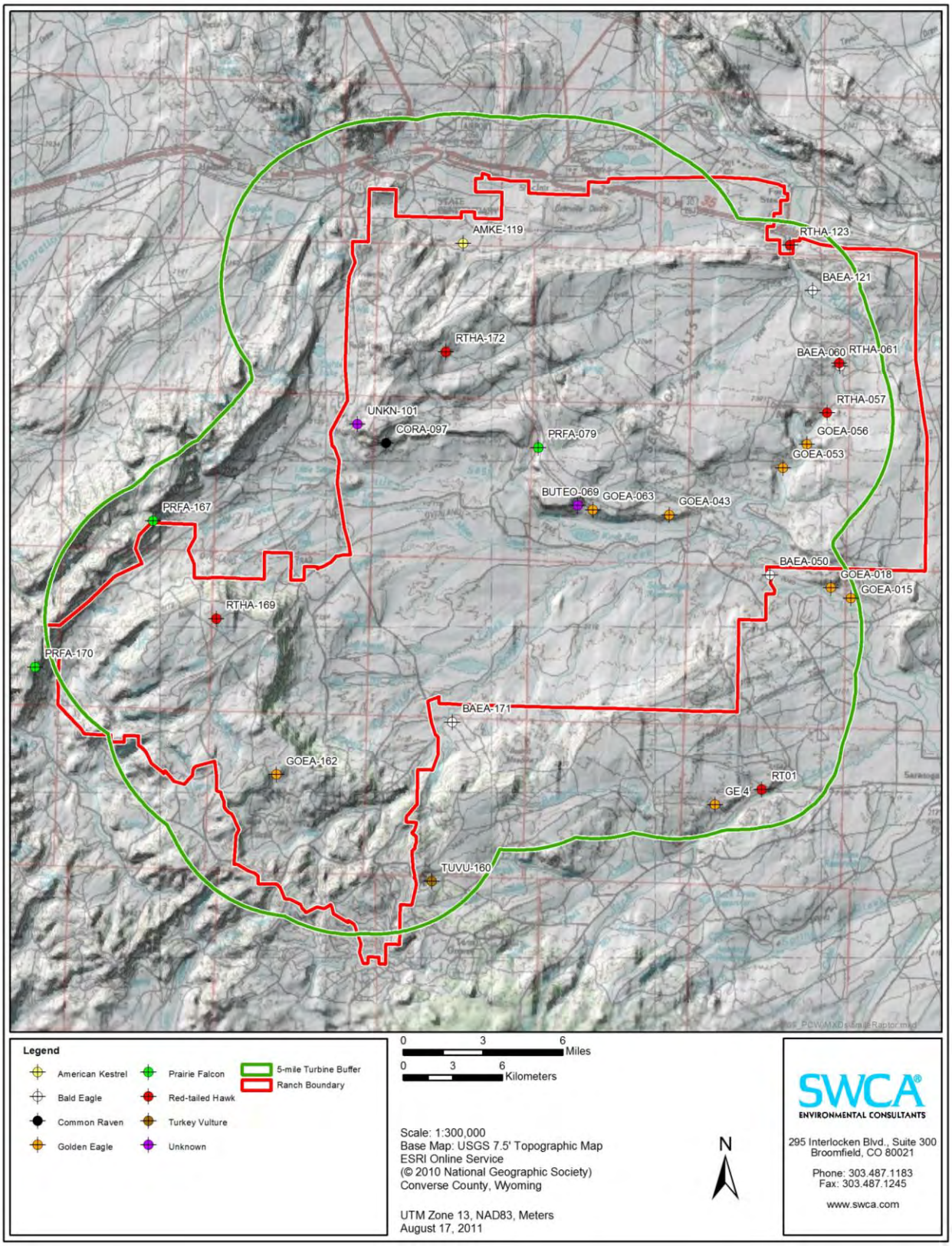

Figure 1. Project area boundary, 5-mile turbine buffer, and all active nests located within the 5-mile turbine buffer in 2011.

APPENDIX A
BLM Ferruginous Hawk Dataset

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BLM FERRUGINOUS HAWK DATASET

In May and June 2011, SWCA Environmental Consultants (SWCA) conducted raptor nest surveys within the Chokecherry and Sierra Madre Wind Energy Project (Project) development footprint and in suitable nesting habitats within a 5-mile buffer (approximately 700 square miles) surrounding the Project. As part of SWCA's nest survey and monitoring effort, ground surveys were conducted to determine the status and condition of all ferruginous hawk (*Buteo regalis*) nests documented by the Bureau of Land Management (BLM) within the Project footprint. Forty ferruginous hawk nest sites were identified in the Project area from data shared by the BLM, and each of these nest sites was visited during 2011 ground surveys (Figure A-1). Data collected included presence/absence of a nest at each site; a description of the state of the nest (if a nest was detected); a description of the habitat surrounding the site; photographs of the nest and surrounding habitat (photographs are provided in Appendix B); and the presence of other features that could suggest recent ferruginous hawk activity (e.g., feathers, whitewash, fresh nesting materials, etc.). Of the 40 nest sites identified from the BLM data, 15 nest structures in various stages of condition and quality were located, some with almost no structure remaining. Additionally, seven historic sites were observed that may have once supported a nest; however, now only a few deteriorated sticks remain. Few of these nest structures were located at the BLM sites; however, SWCA surveyed at minimum 100 meters (m) around each of the BLM sites for nest structures as they were likely marked during aerial surveys, which can lead to some degree of inaccuracy in each location. Results for each BLM ferruginous hawk nest site are listed below.

FH18851701: No nest was detected at this site, which is located on a rocky hilltop (Appendix B, Photo 14). An historic nest site is located approximately 22 m northwest of the BLM site (Universal Transverse Mercator [UTM] 13T 0334724, 4599927). The nest is in extremely poor condition with only a few sticks on a small rock outcrop (Appendix B, Photo 15). There were no signs of recent ferruginous hawk activity.

FH18870101: This site contains the remnants of an historic nest, mainly consisting of a few deteriorated sticks and a small amount of old whitewash, but no remaining nest structure (Appendix B, Photo 16). No signs of recent ferruginous hawk activity were observed.

FH18870201: This site is located in a drainage with no evidence of active or historic nests within 100 m of the site (Appendix B, Photo 17). No signs of recent ferruginous hawk activity were observed.

FH18870202: No nest was detected at this site. The site is located on a hillslope, and no signs of recent ferruginous hawk activity were present (Appendix B, Photo 18). A nest is located approximately 64 m north of the BLM site (UTM 13T 0320037, 4603851). This nest is located on a hillslope and is in fair condition; however, there were no other signs of recent ferruginous hawk activity (Appendix B, Photo 19).

FH19860301: A nest is located approximately 15 m east of this site (UTM 13T 0327708, 4612200). The nest is in good condition, likely used in the recent past (Appendix B, Photo 20), with a small amount of whitewash observed around the nest. This nest was also recorded during SWCA's flights across the Project area (nest FEHA-153).

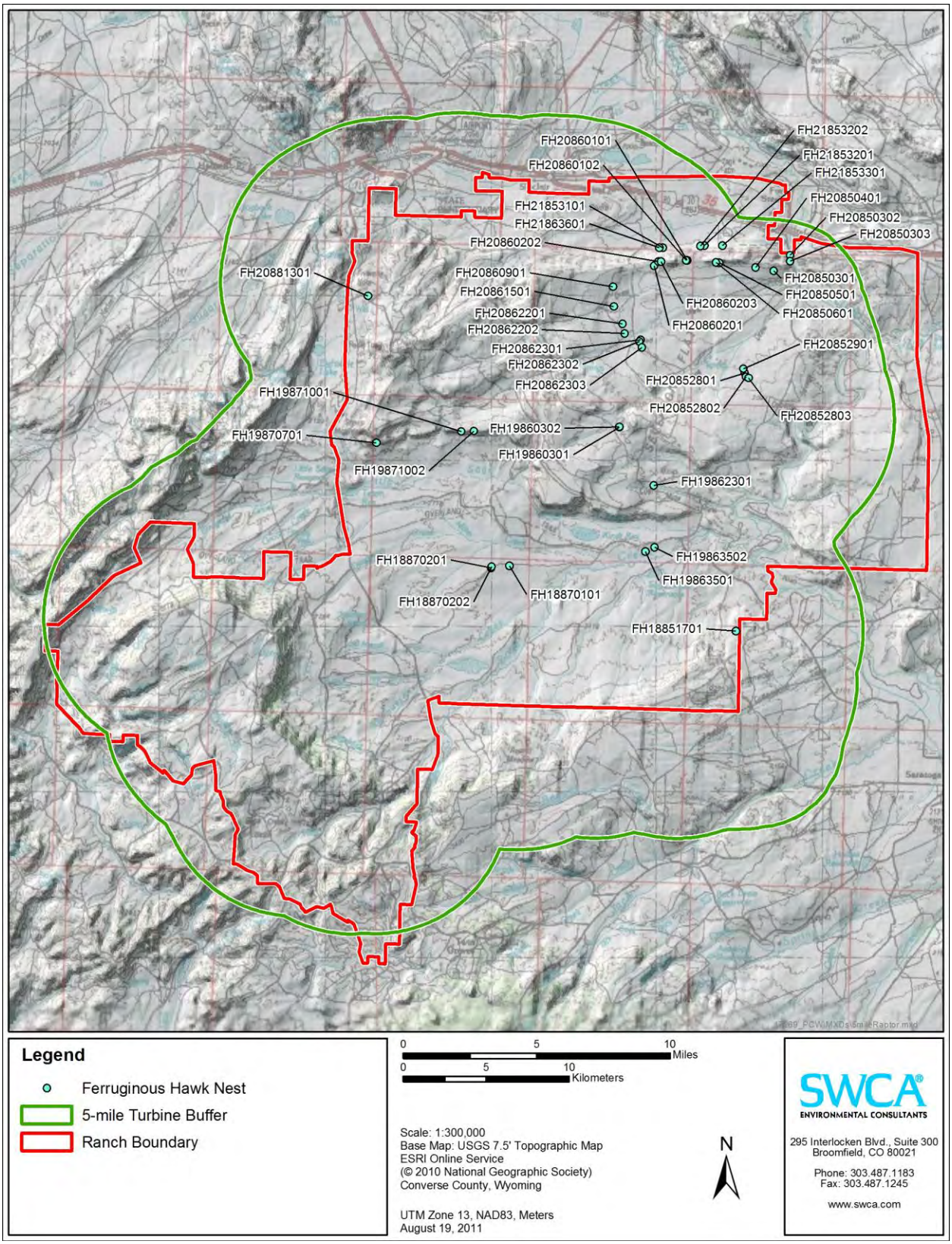

Figure A-1. Project area boundary, 5-mile turbine buffer, and all BLM ferruginous hawk nest sites within the Project area.

FH19860302: No nest was detected at this site. The site is on a rocky hilltop (Appendix B, Photo 21) and is located approximately 35 m north of FH1986031. The area surrounding both of these sites was searched, but no additional nests were detected. No signs of recent ferruginous hawk activity were observed.

FH19862301: No nest was detected at this site. This site is located in sagebrush and bare ground on a hillslope below a cliff band (Appendix B, Photo 22). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH19863501: A nest was detected approximately 20 m north of the BLM site (UTM 13T 0329290, 4604725). The nest is located on a hilltop and is in fair condition, likely having been used in recent years (Appendix B, Photo 23). No other signs of recent ferruginous hawk activity were observed. This nest was also recorded during SWCA's flights across the Project area (nest FEHA-154).

FH19863502: This site contains the remnants of an historic nest, mainly consisting of a few deteriorated sticks, but no remaining nest structure (Appendix B, Photo 24). No signs of recent ferruginous hawk activity were observed.

FH19870701: No nest was detected at this site, which is located partway down a cliff band (Appendix B, Photo 25). There were no signs of active or historic nests within 100 m of the site; however, some signs of recent whitewash were observed along the cliff wall.

FH19871001: No nest was detected at this site, which is located at the base of a cliff band above a rock outcrop (Appendix B, Photo 26). There were no signs of active or historic nests within 100 m of the site; however, some signs of recent whitewash were observed along the cliff wall.

FH19871002: No nest was detected at this site. The site is located at the base of a cliff band (Appendix B, Photo 27) with signs of recent whitewash along the cliff band. A nest is located approximately 84 m northwest of the BLM site (UTM 13T 0318857, 4612023). The nest is located at the base of the cliff band on a rock outcrop and is in poor condition (Appendix B, Photo 28). No other signs of recent ferruginous hawk activity were observed.

FH20850301: No nest was detected at this site. The site is located in sagebrush and a bare ground drainage at the base of a small hillslope (Appendix B, Photo 29). There were no signs of active or historic nests within 100 m of the site; however, some signs of recent whitewash were observed on a perch 70 m to the north.

FH20850302: This site contains a large nest on a rock outcrop near the North Platte River (Appendix B, Photo 30). The nest is in good condition with relatively fresh grass woven into the inner bowl of the nest; the nest was likely used in the recent past. No feathers, whitewash, or other signs of recent ferruginous hawk activity were observed.

FH20850303: A nest was detected approximately 25 m south of the BLM site. The nest is located on a rock outcrop near the North Platte River. The nest is in poor condition and

appeared to be falling off the rock shelf on which it was originally built, which led to the structure being compromised (Appendix B, Photo 31). No signs of recent ferruginous hawk activity were observed.

FH20850401: No nest was detected at this site. The nest site is located on bare ground at the base of a hillslope (Appendix B, Photo 32). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20850501: No nest was detected at this site. The nest site is located in sagebrush and bare ground on a hillslope (Appendix B, Photo 33). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20850601: No nest was detected at this site. The nest site is located in sagebrush and bare ground on a hillslope (Appendix B, Photo 34). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20852801: The remnants of an historic nest are located approximately 16 m west of the BLM nest site at the base of a rock outcrop. The site mainly consists of a few deteriorated sticks, but there is no remaining nest structure (Appendix B, Photo 35). A small amount of old whitewash was observed on the rock outcrop, but there were no signs of recent ferruginous hawk activity.

FH20852802: A nest is located approximately 18 m north of the BLM site (UTM 13T 0335323, 4615247) on a rock outcrop. The nest is in fair to good condition with good structure, but is slightly collapsed (Appendix B, Photo 36). There were no signs of recent ferruginous hawk activity.

FH20852803: No nest was detected at this site, which is located on bare ground in a basin (Appendix B, Photo 37). The remnants of an historic nest are located approximately 95 m east of the BLM site (UTM 13T 0335585, 4615203) on a rock outcrop. The nest is in very poor condition and is mainly a pile of deteriorated sticks (Appendix B, Photo 38). No signs of recent ferruginous hawk activity were observed.

FH20852901: No nest was detected at this site. The site is located on bare ground near saltbush and next to a creek bed (Appendix B, Photo 39). A nest is located approximately 200 m north of the BLM site (UTM 13T 0335189, 4615940) on a rock outcrop. The nest is in fair condition and has potential for reuse in the future (Appendix B, Photo 40). Old whitewash is present at the site, but no other signs of recent ferruginous hawk activity.

FH20860101: No nest was detected at this site, which is located on rocky ground on a hilltop (Appendix B, Photo 41). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20860102: No nest was detected at this site, which is located on rocky ground on a hillslope (Appendix B, Photo 42). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20860201: No nest was detected at this site, which is located on a rocky hillslope (Appendix B, Photo 43). A nest is located approximately 80 m northeast of the BLM site (UTM 13T 0329868, 4622032) on a small rock outcrop. The nest is in fair to good condition and has potential for reuse in the future (Appendix B, Photo 44). There were no signs of recent ferruginous hawk activity.

FH20860202: No nest was detected at this site, which is located on rocky ground on a hillslope (Appendix B, Photo 45). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20860203: No nest was detected at this site, which is located on a rock outcrop on a hilltop (Appendix B, Photo 46). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20860901: No nest was detected at this site, which is located in a sagebrush basin (Appendix B, Photo 47). There are signs of an historic nest on a rock outcrop located approximately 45 m northeast of the BLM site; however, the site mainly consists of a few deteriorated sticks. This site was also recorded during SWCA's flights across the Project area (nest FEHA-151). There were no signs of other nests or recent ferruginous hawk activity within 100 m of the site.

FH20861501: No nest was detected at this site, which is located in a sagebrush basin (Appendix B, Photo 48). There are signs of an historic nest on a rock outcrop located approximately 110 m south of the BLM site; however, the site mainly consists of a few deteriorated sticks. This site was also recorded during SWCA's flights across the Project area (nest FEHA-150). There were no signs of other nests or recent ferruginous hawk activity within 100 m of the site.

FH20862201: No nest was detected at this site, which is located in a sagebrush basin (Appendix B, Photo 49). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20862202: No nest was detected at this site, which is located in sagebrush at the bottom of a small hillslope (no photo available). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20862301: No nest was detected at this site, which is located in sagebrush at the base of a small rock outcrop. There are signs of an historic nest on a rock outcrop located approximately 78 m northwest of the BLM site. The nest is in very poor condition and consists a pile of sticks with no cohesive structure (Appendix B, Photo 50). This site was also recorded during SWCA's flights across the Project area (nest FEHA-149). There were no signs of other nests or recent ferruginous hawk activity within 100 m of the site.

FH20862302: This site contains a large nest beside a rock outcrop. The nest is in good condition with a discernable inner bowl, and was likely used in the recent past (Appendix B, Photo 51). Newer whitewash was observed on the outcrop near the nest, but no other signs of

recent ferruginous hawk activity were observed. This nest was also recorded during SWCA's flights across the project area (nest FEHA-148).

FH20862303: No nest was detected at this site, which is located at the bottom of a small hillslope/rock outcrop (no photo available). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH20881301: No nest was detected at this site, which is located in sagebrush at the bottom of a hillslope (Appendix B, Photo 52). A nest is located approximately 75 m southeast of the BLM site (UTM 13T 0312604, 4620081). The nest is in good condition and built on a small rock outcrop on a hillslope and has potential for reuse in the future (Appendix B, Photo 53). Old whitewash was observed around the nest; however, no other signs of recent ferruginous hawk activity were observed.

FH21853101: No nest was detected at this site, which is located on a rock outcrop on a hilltop (Appendix B, Photo 54). A nest is located approximately 329 m east of the BLM site (UTM 13T 0330639, 4623027). The nest is in good condition and built along the side of a rock outcrop, and likely has been used in the recent past (Appendix B, Photo 55). Some old whitewash was observed along the rock outcrop; however, no other signs of recent ferruginous hawk activity were observed.

FH21853201: No nest was detected at this site, which is located on the side of a hillslope/rock outcrop. A nest is located approximately 115 m east of the BLM site (UTM 13T 0332949, 4623131). The nest is in fair condition and built along a rock outcrop and has potential for reuse in the future (Appendix B, Photo 56). This site was likely recorded during SWCA's flights across the Project area (nest GOEA-125). Some old whitewash was observed along the rock outcrop; however, no other signs of recent ferruginous hawk activity were observed.

FH21853202: No nest was detected at this site, which is located along the side of a rock outcrop (no photo available). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

FH21853301: No nest was detected at this site, which is located on the side of a hillslope. A nest is located approximately 100 m southwest of the BLM site (UTM 13T 0333852, 4623124). The nest is in poor condition, mostly deteriorated, and built on the top of a rock outcrop (Appendix B, Photo 57). Some old whitewash was observed along the rock outcrop; however, no other signs of recent ferruginous hawk activity were observed.

FH21863601: No nest was detected at this site, which is located on rocky ground on a hilltop (Appendix B, Photo 58). There were no signs of active or historic nests within 100 m of the site, nor was there evidence of recent ferruginous hawk activity.

APPENDIX B
Photographs

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Photo 1. Active golden eagle nest GOEA-018. Adult and downy nestling are present.

Photo 2. Active golden eagle nest GOEA-043. One downy nestling is present.

Photo 3. Active golden eagle nest GOEA-053. One downy nestling is present.

Photo 4. Active golden eagle nest GOEA-056. One downy nestling is present and a smaller dummy nest is located just right of the active nest.

Photo 5. Active golden eagle nest GOEA-063. Adult is brooding a downy nestling.

Photo 6. Active golden eagle nest GOEA-162. One downy nestling is present.

Photo 7. Active bald eagle nest BAEA-171. One fully feathered nestling is present.

Photo 8. Inactive stick nest, classified as fair condition.

Photo 9. Inactive stick nest, classified as poor condition.

Photo 10. Inactive stick nest, classified as good condition.

Photo 11. Inactive stick nests. The upper nest is classified as fair to poor condition, the lower nest is classified as good condition.

Photo 12. Inactive stick nest, classified as good condition.

Photo 13. Inactive stick nest, classified as good condition.

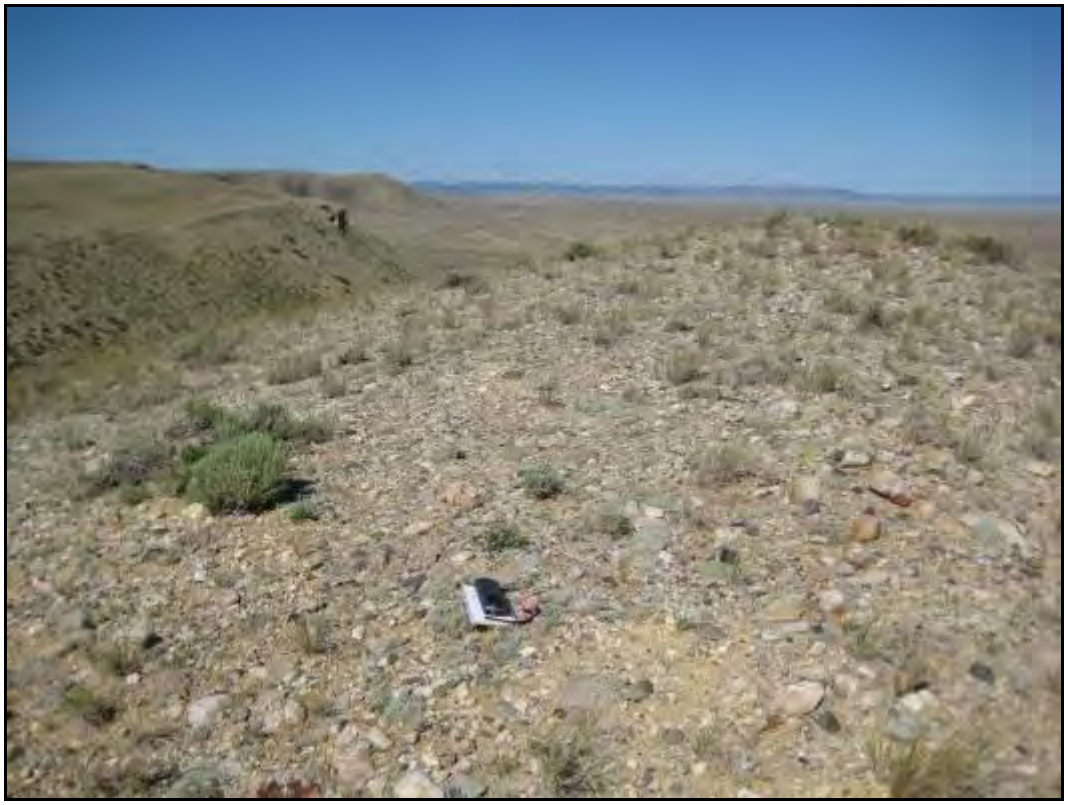

Photo 14. BLM nest site FH18851701. No nest is located at this site.

Photo 15. Remnants of a nest located 22 meters northwest of FH18851701.

Photo 16. BLM nest site FH18870101. Site consists of a small amount of deteriorated sticks, but no remaining nest structure.

Photo 17. BLM nest site FH18870201. No nest is located at or near this site.

Photo 18. BLM nest site FH18870202. No nest is located at this site.

Photo 19. Nest located 64 meters north of FH18870202.

Photo 20. A nest located 15 meters east of BLM nest site FH19860301.

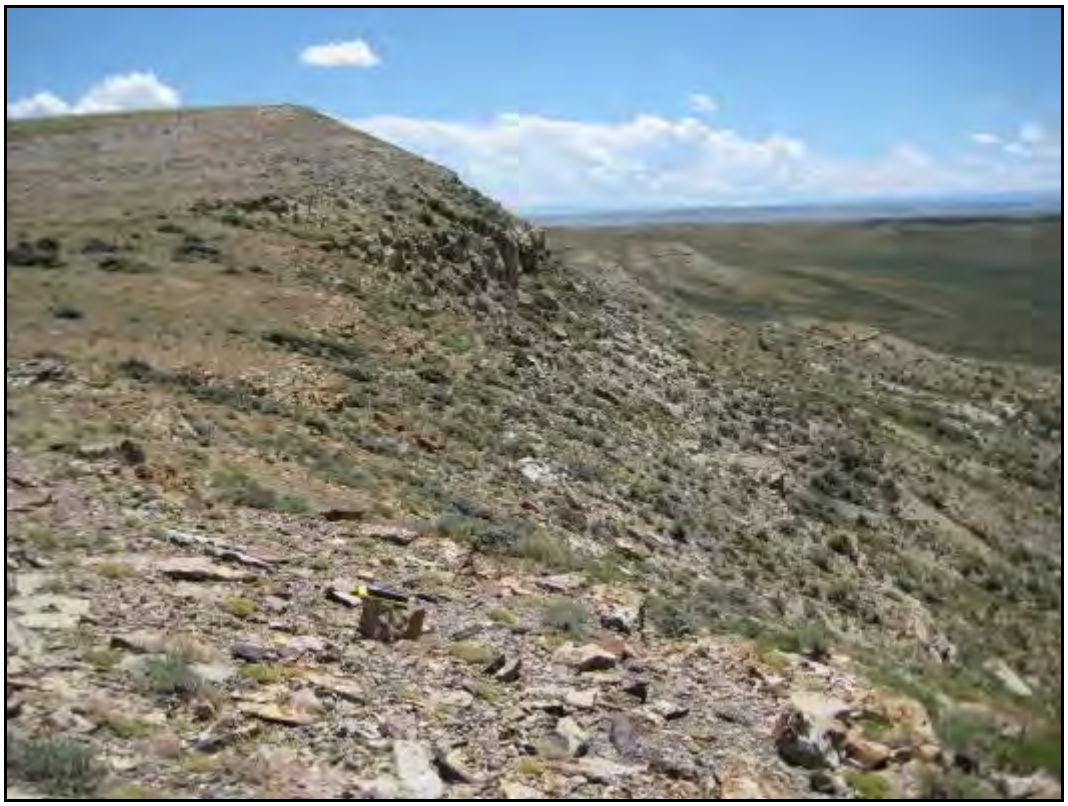

Photo 21. BLM nest site FH19860302. No nest is located at this site.

Photo 22. BLM nest site FH19862301. No nest is located at or near this site.

Photo 23. A nest located 20 meters north of BLM nest site FH19863501.

Photo 24. BLM nest site FH19863502. Site consists of a small amount of deteriorated sticks, but no remaining nest structure.

Photo 25. BLM nest site FH19870701. No nest is located at or near this site.

Photo 26. BLM nest site FH19871001. No nest is located at or near this site.

Photo 27. BLM nest site FH19871002. No nest is located at this site.

Photo 28. Nest located 84 meters northwest of FH19871002.

Photo 29. BLM nest site FH20850301. No nest is located at or near this site.

Photo 30. Nest located at BLM site FH20850302. Nest is in good condition and was likely used in the recent past.

Photo 31. Remnants of a nest located at BLM site FH20850303. Nest is in poor condition and falling off of the rock shelf on which it was built.

Photo 32. BLM nest site FH20850401. No nest is located at or near this site.

Photo 33. BLM nest site FH20850501. No nest is located at or near this site.

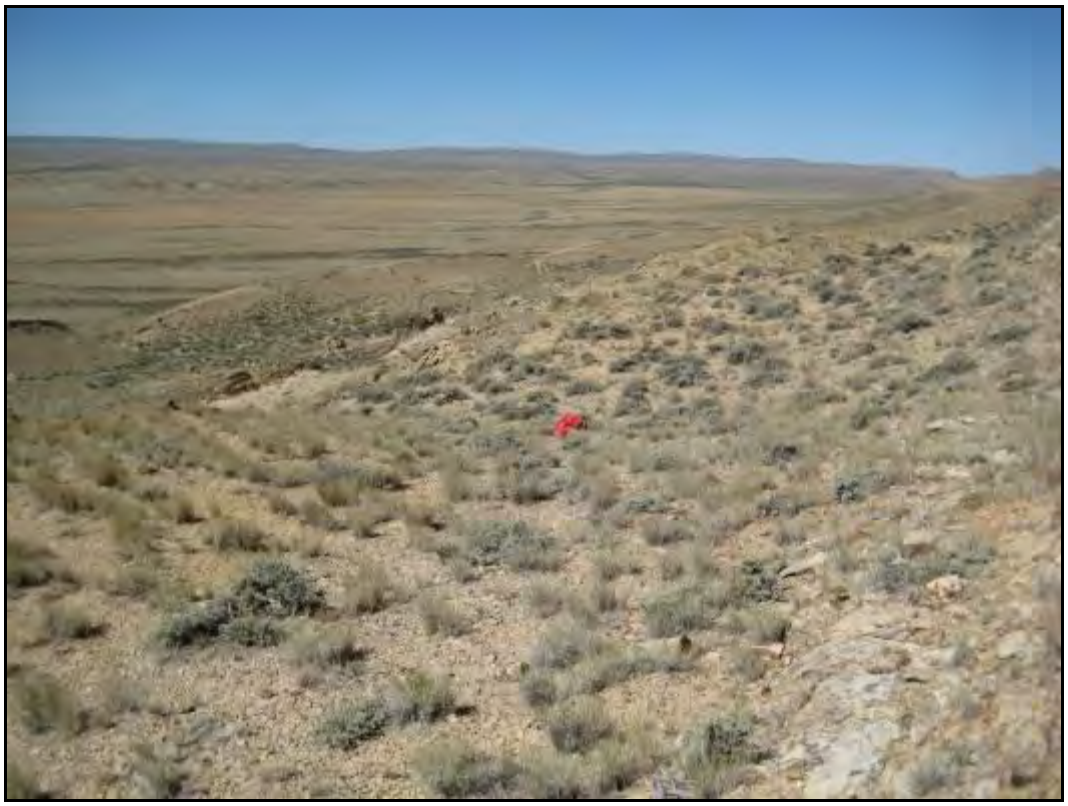

Photo 34. BLM nest site FH20850601. No nest is located at or near this site.

Photo 35. Remnants of a nest located 16 meters west of BLM site FH20852801. Site consists of some deteriorated sticks, but no remaining nest structure.

Photo 36. Nest located 18 meters north of FH20852802.

Photo 37. BLM nest site FH20852803. No nest is located at this site.

Photo 38. Remnants of a nest located 95 meters east of FH20852803.

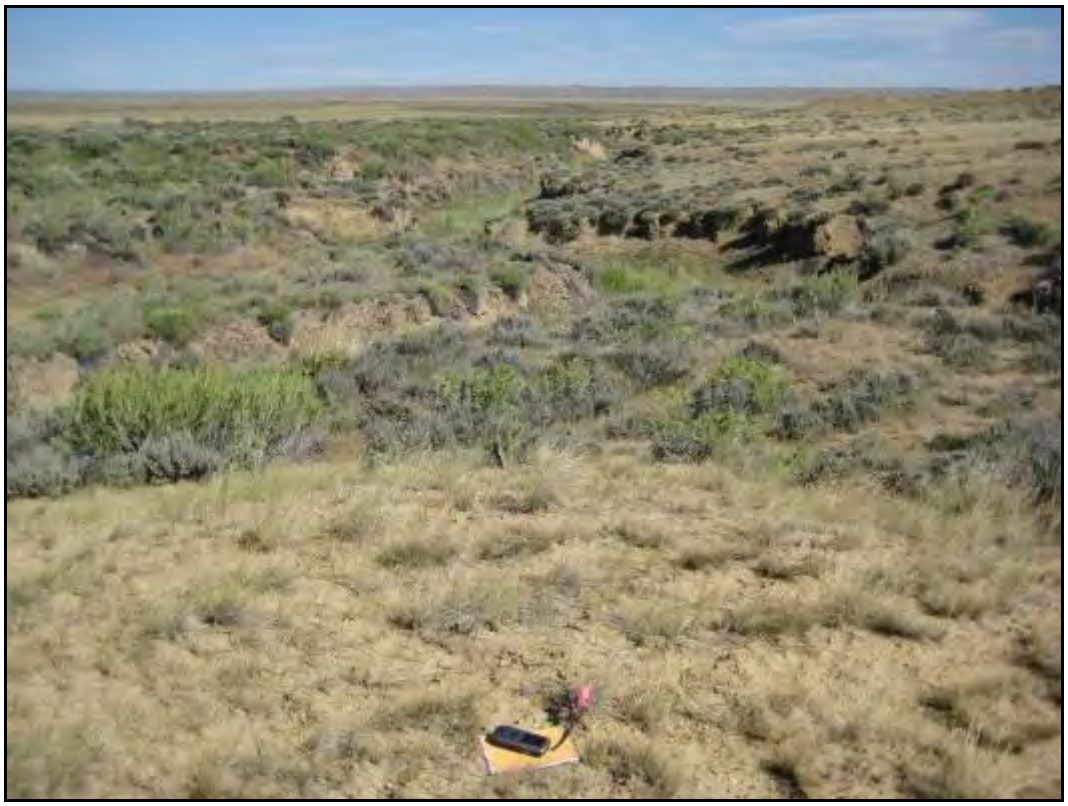

Photo 39. BLM nest site FH20852901. No nest is located at this site.

Photo 40. Nest located 200 meters north of FH20852901.

Photo 41. BLM nest site FH20860101. No nest is located at or near this site.

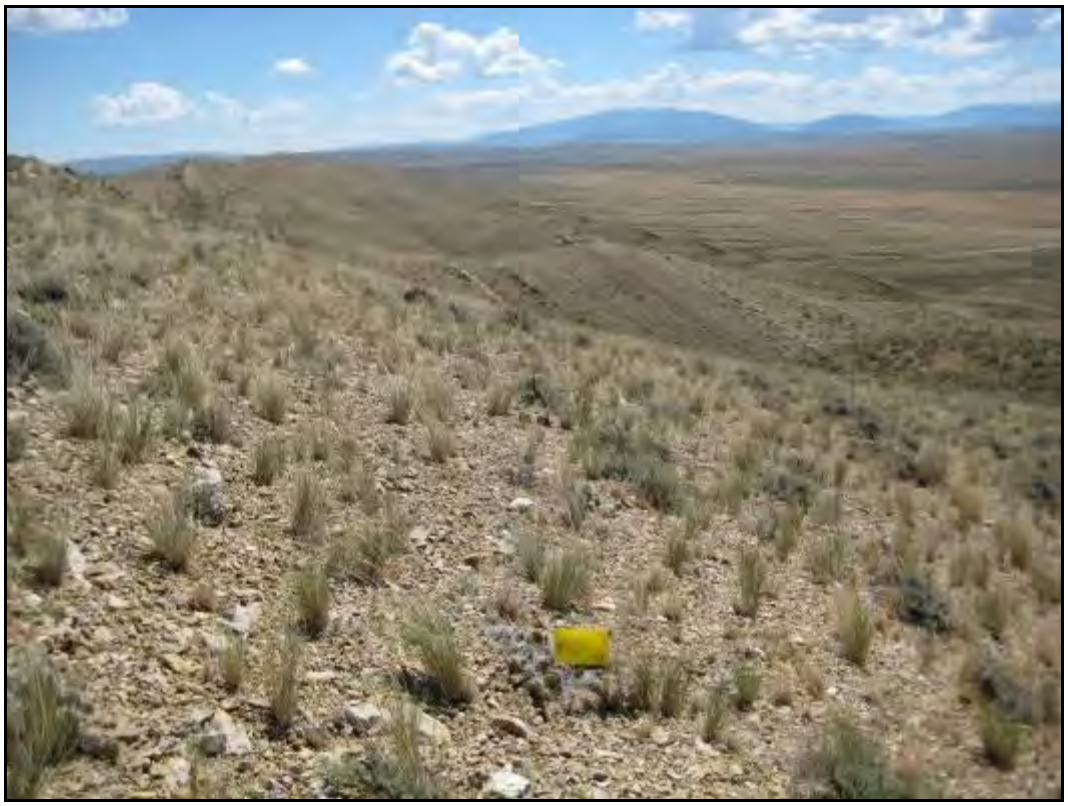

Photo 42. BLM nest site FH20860102. No nest is located at or near this site.

Photo 43. BLM nest site FH20860201. No nest was found at this site.

Photo 44. Nest located 80 meters northeast of FH20860201.

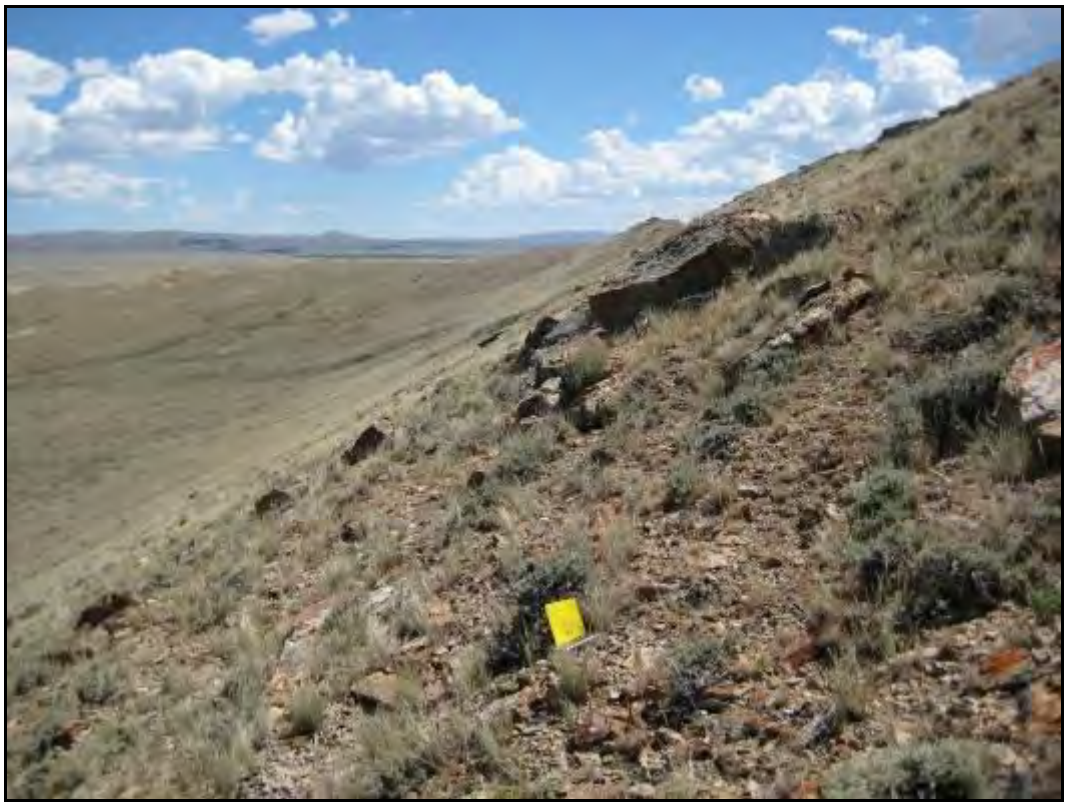

Photo 45. BLM nest site FH20860202. No nest is located at or near this site.

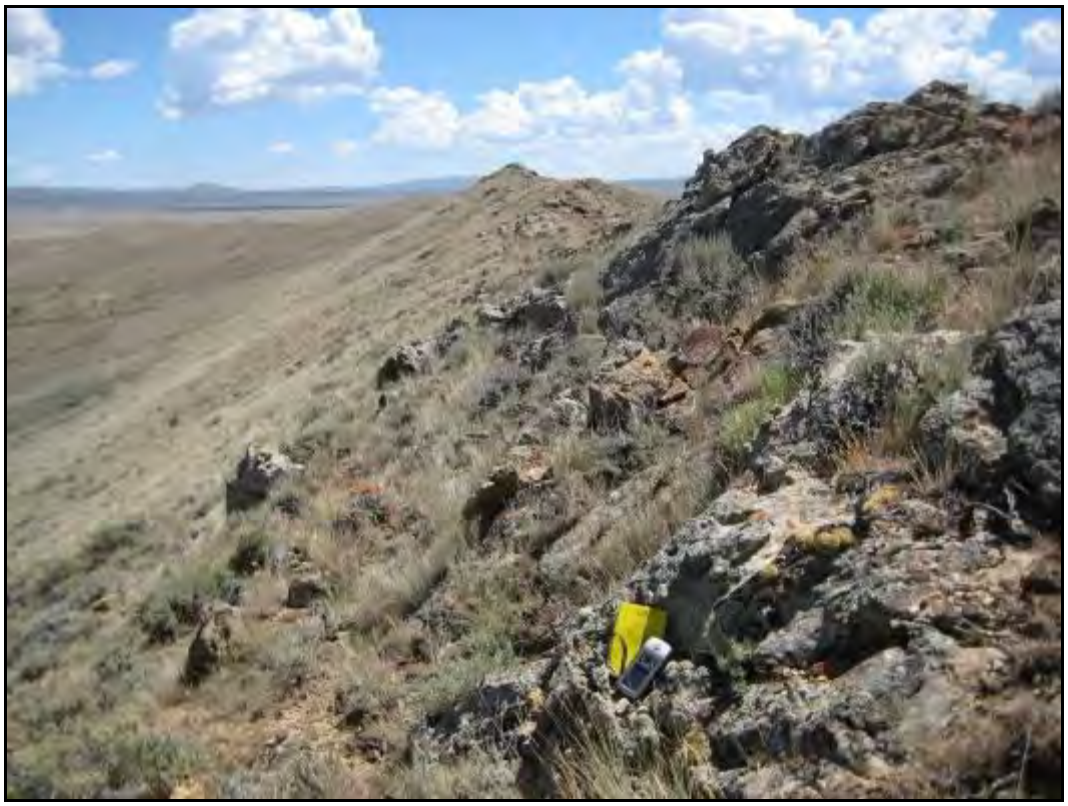

Photo 46. BLM nest site FH20860203. No nest is located at or near this site.

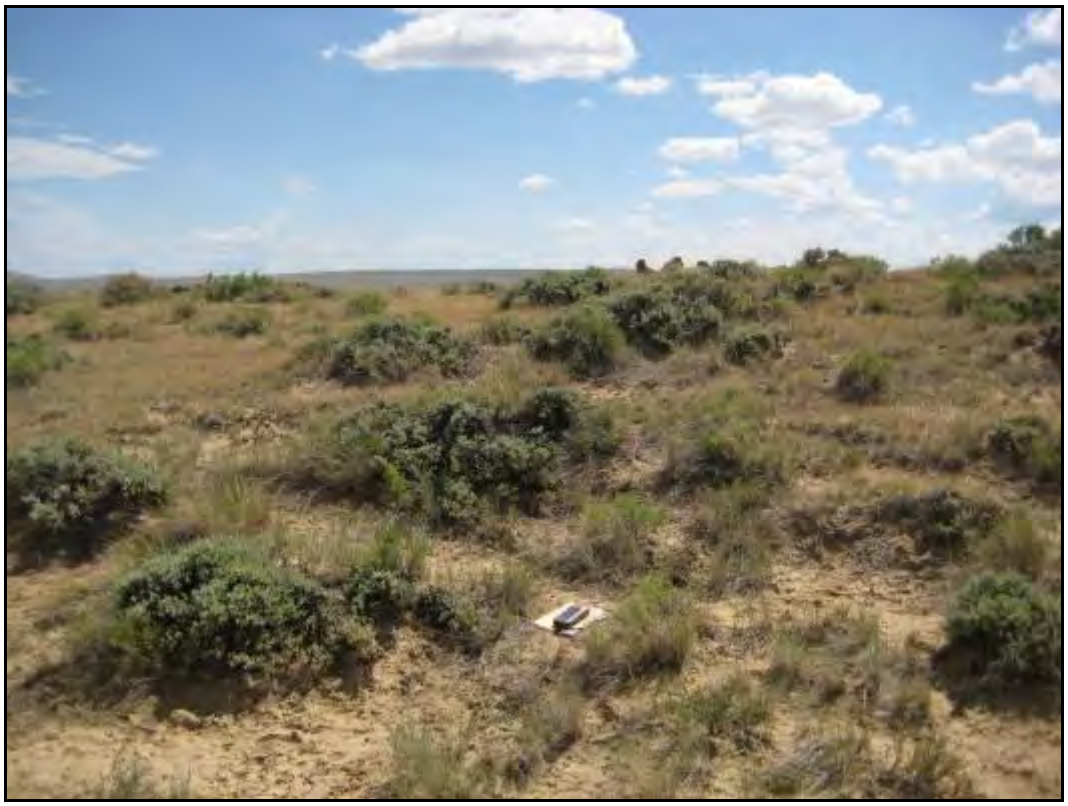

Photo 47. BLM nest site FH20860901. No nest is located at or near this site.

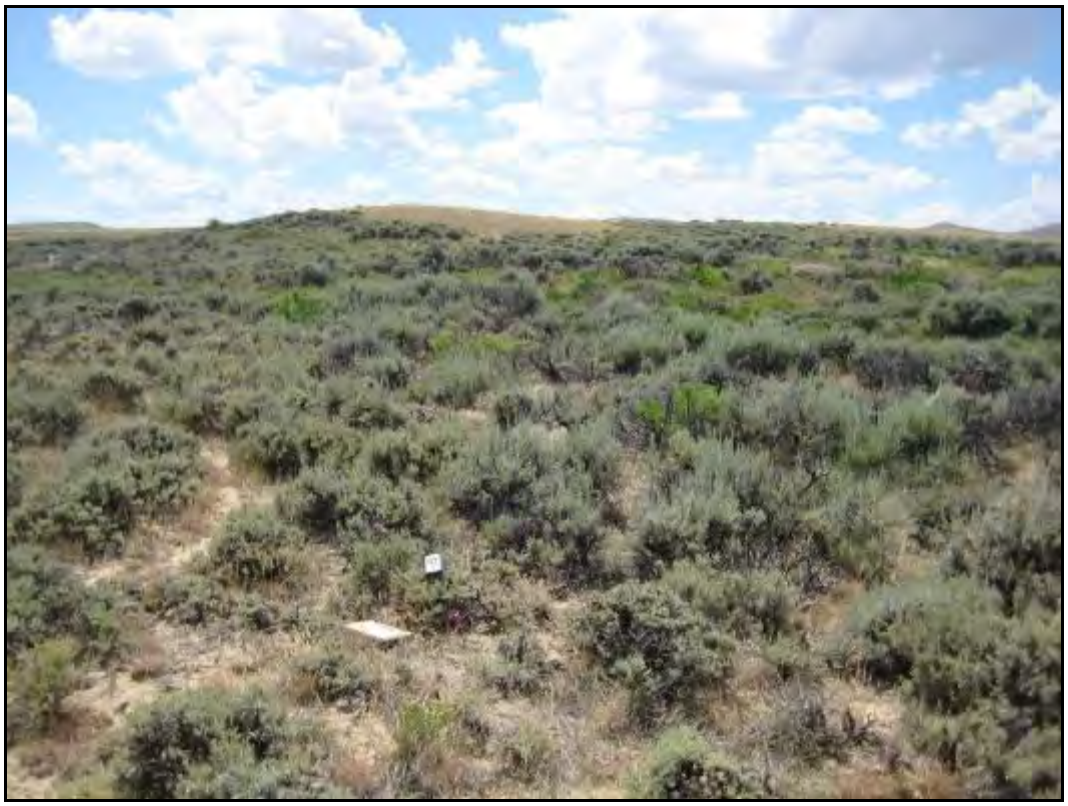

Photo 48. BLM nest site FH20861501. No nest is located at or near this site.

Photo 49. BLM nest site FH20862201. No nest is located at or near this site.

Photo 50. Remnants of a nest located 78 meters northwest of FH20862301. Photo taken during SWCA's nest flights.

Photo 51. Nest located at BLM site FH20862302.

Photo 52. BLM nest site FH20881301. No nest is located at this site.

Photo 53. Nest located 75 meters southeast of FH20881301.

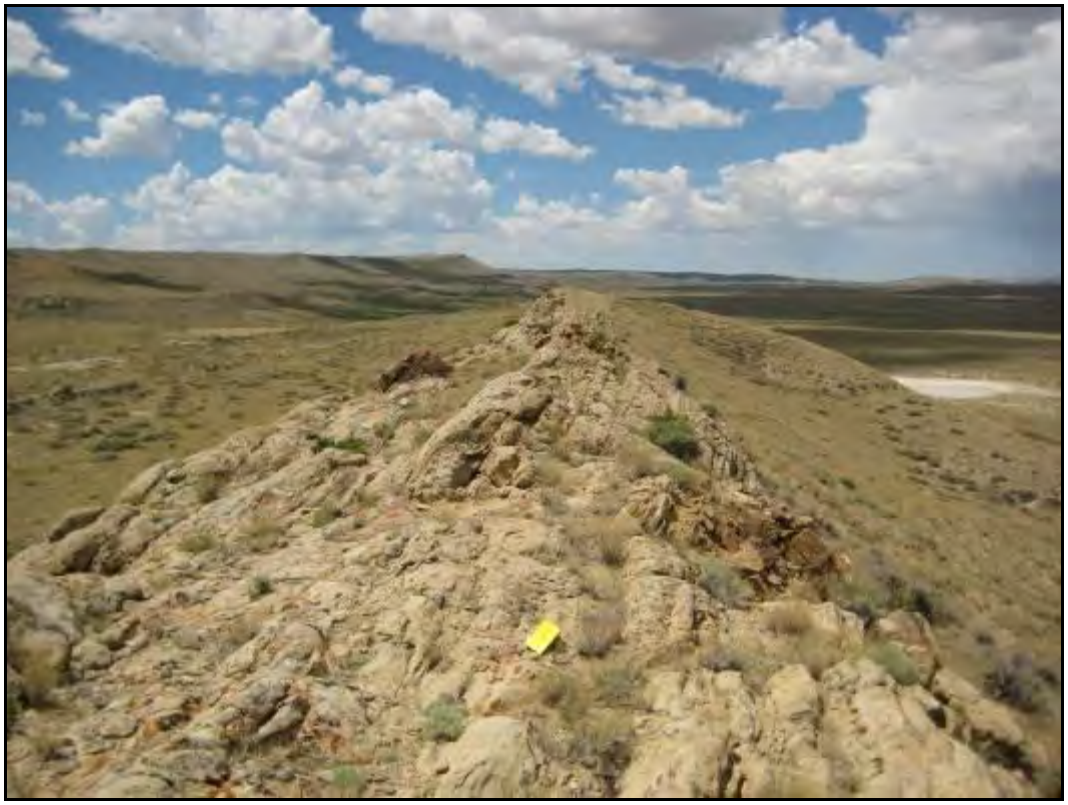

Photo 54. BLM nest site FH21853101. No nest was found at this site.

Photo 55. Nest located 329 meters east of FH21853101.

Photo 56. Nest located 115 meters east of FH21853201.

Photo 57. Remnants of a nest located 100 meters southwest of FH21853301.

Photo 58. BLM nest site FH21863601. No nest is located at or near this site.

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MEMORANDUM

BY ELECTRONIC MAIL

FROM: Garry Miller, Vice President of Land and Environmental Affairs, PCW

TO: Trish Sweanor, Fish & Wildlife Biologist, U.S. Fish & Wildlife Service

CC: Steve Guertin, Regional Director
Noreen Walsh, Deputy Regional Director
Mike Thabault, Assistant Regional Director, Ecological Services
Mark Sattelberg, Field Supervisor Cheyenne
Tyler Abbott, Deputy Field Supervisor Cheyenne
Casey Stemler, Acting Assistant Regional Director, Migratory Bird & State Programs
Kevin Kritz, Biologist, Migratory Birds & State Programs
David Cottingham, Senior Advisor to the Director

DATE: July 6, 2012

RE: Summary of cooperation to date and response to June 25, 2012 data request

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This memorandum responds to your June 25 request for various data relating to the Chokecherry and Sierra Madre Wind Energy Project (CCSM Project). It also summarizes the history of discussions and cooperation to date between the Power Company of Wyoming LLC (PCW) and the U.S. Fish and Wildlife Service (Service) concerning development of a Bird and Bat Conservation Strategy (BBCS)[1] and Eagle Conservation Strategy (ECS) for the CCSM Project. We believe this summary will be useful as our discussions move forward due to the volume of information and technical data that has been exchanged, the loss of "institutional knowledge" regarding the CCSM Project due to the change in Service personnel, and the complex interplay between the Service's policies and procedures, those of the BLMs, and the landscape scale of the CCSM Project FEIS.

PCW has been working closely with the Service for over two years to develop a comprehensive BBCS/ECS that will avoid and minimize the potential for golden eagle take.

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[1] Previously referred to as an Avian Protection Plan (APP).

In 2011, the Service determined that developing an APP is an appropriate option for the CCSM Project.[2] The Service not only approved, but enthusiastically endorsed PCWs monitoring protocols, use of avian radar, and the overall BBCS/ECS development approach.

In 2008 and 2009, BLM's environmental sub-contractor used traditional survey techniques to collect avian use data, which are sufficient for NEPA-level analysis. Beginning in 2010, PCW undertook additional data collection efforts for site-specific avian use with an extensive avian survey program. In March 2011 PCW deployed a sophisticated avian radar system in conjunction with traditional avian survey methods on the Overland Trail ranch to gather specific insights into the habitat that eagles and other raptors either may or may not use. This will inform PCW as to CCSM Project areas that may not be suitable for development/siting turbines. PCW also is gaining valuable insights – such as approximately 93% of all birds and bats fly well above rotor-swept height (blade height).

PCWs avian monitoring program: (1) exceeds USFWS Eagle and Onshore Wind Guidance, State of Wyoming survey recommendations, Federal Advisory Committee guidelines, and BLM survey recommendations and Instructional Memoranda; and (2) provides 100% coverage of probable turbine locations – this is unprecedented pre-construction coverage.

PCWs eagle use data and survey results (there are no eagle nests in the CCSM Project development area) do not support the estimated annual golden eagle fatalities cited in BLMs Final EIS, which largely relied on assigning a risk factor to the entire project site based on limited surveys in high-use areas. PCW would like to meet with the Service's modeling experts to discuss the eagle fatality model developed by SWCA Environmental Consultants (SWCA) for the CCSM Project. This model supports the USFWS initial determination that the CCSM Project is a Category 2 Project for which a BBCS/ECS is appropriate.

Initial Discussions Between PCW and the Service

Beginning mid-2010, PCW contacted the Service and initiated discussions concerning development of a CCSM Project Avian Protection Plan (APP), currently referred to as a BBCS. This was prompted by the newly released Bureau of Land Management (BLM) Instruction Memorandum (IM) 2010-156. The purpose of IM 2010-156 is to provide direction to the BLM for complying with the Bald and Golden Eagle Protection Act (BGEPA) and to identify a process whereby BLM can ensure that authorization of renewable energy projects is consistent with the provisions contained within BGEPA. Under the IM, if the Service determines developing an APP is an appropriate option, the BLM may issue a

[2] Attachment 1, Letter from the Service to BLM dated April 20, 2011.

Record of Decision (ROD) approving the project. The BLM, however, may not authorize a Notice to Proceed until the Service has evaluated the APP and determined that it is adequate.

The parties participating in these initial discussions were PCW, its biological consultant SWCA, BLM, Wyoming Game and Fish Department (WGFD), and the Service. The Service was represented by Mr. Travis Sanderson, the renewable energy coordinator stationed in Rawlins, Wyoming, and Mr. Clark McCreedy and Mr. Scott Covington of the Wyoming Ecological Services Field Office in Cheyenne, Wyoming.

The understanding among PCW, BLM and the Service was that IM 2010-156 applied to golden eagles as opposed to all migratory birds and that BLM and the Service would confer regarding risk to golden eagles for the CCSM Project. Bald eagles were not considered to be at risk by either the BLM or the Service due to extremely low usage, absence of nests, and no identified bald eagle home ranges within the CCSM Project Area. In addition, at that time there was only one known bald eagle fatality at a wind farm in the U.S. Therefore, while the Service encouraged PCW to consider risk to all migratory birds in developing the CCSM Project APP, it was clear that the BLM's decision framework and its concurrence with the Service would only consider risk to golden eagles.[3]

The data available in 2010 consisted of raptor nest data maintained by BLM, and the avian nest and use surveys conducted by WEST Inc. in 2008 and 2009 for the CCSM Project environmental impact statement studies.[4] Upon review of the WEST data, the Service concluded that the data were inadequate to evaluate risk to eagles for purposes of developing an APP and would not produce the type of meaningful results necessary to quantify potential take. Indeed, the Service expressed the view that pre-construction avian surveys for wind projects in general were inadequate and a much more rigorous survey protocol was necessary, especially for golden eagles.

Development of Comprehensive Avian and Bat Monitoring Protocols

The result of numerous meetings, discussions and review of draft protocols was that PCW, working in close collaboration with BLM, WGFD, and especially the Service, developed robust and comprehensive avian survey protocols. The survey protocols called for both traditional ground based observer surveys, such as avian point count surveys, long-watch raptor surveys, and waterbird and breeding bird surveys; helicopter nest surveys; and one of the first ever applications of avian radar technology to survey for large raptors.

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[3] There are no bat species within the CCSM Project Area which fall under the jurisdiction of the Service.

[4] WEST was acting as a subcontractor to the BLM's third party environmental contractor.

The Service specifically requested that PCW conduct yearlong raptor surveys using a Merlin Avian Radar System manufactured by Detect Inc. While the Merlin Radar System had been previously used to monitor bat activity, it had never before been employed to survey for golden eagle activity. According to Mr. Sanderson and Mr. McCreedy, they had asked a number of developers in Wyoming to utilize an avian radar system for pre-construction surveys and all had refused, largely due to the expense - each unit costs nearly $300,000. After in-depth research regarding the potential benefits and limitations of the Merlin Radar System, PCW agreed to purchase the system, as requested by the Service, and to utilize the system in PCWs avian surveys. When making the request and recommendation that PCW invest in the Merlin Radar System, the Service and BLM were well-aware of its limitations. On September 29, 2010, PCW submitted a white paper to BLM and the Service describing that species-specific and group-specific risk assessment would not be possible with the radar data.[5]

The Service Approves PCWs Avian and Bat Monitoring Protocols

In December 2010, PCW submitted its Avian and Bat Monitoring Protocols to the Service for final review.[6] PCWs letter outlined the basis it would use in developing its APP and reflected its understanding as of that date as follows:

> We understand that you will review the adequacy and appropriateness of these Protocols and provide to us your comments, suggestions and recommendations for revising and implementing the Protocols. Upon completion of the Service's review, additional evaluations of bald and golden eagle use of the Project will be made on a site-specific basis using these Protocols. We further understand that data from the 2008 and 2009 point count surveys, data generated from the implementation of these Protocols, and any additional site-specific data provided to PCW by the Service during implementation of these Protocols will be adequate to characterize site-specific eagle activities, develop an Avian Protection Plan, identify impacts from construction and operation of the Project on eagles, and identify avoidance, minimization, and mitigation efforts upon which the Service will evaluate the APP.[7]

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[5] Attachment 2, White paper dated September 29, 2012.

[6] Attachment 3, Letter dated December 21, 2010, from PCW to the Service.

[7] *Id.*

On behalf of the Service, Mr. Sanderson reviewed the December protocols and offered some refinements concerning the long-watch surveys. PCW revised the protocols and resubmitted them to the Service in March 2011.[8]

Subsequently, the Service approved PCWs Avian and Bat Monitoring Protocols. In a March 3, 2011 email, Mr. Sanderson stated "[a]s we have stated all along, we are 100% behind the monitoring protocols . . . ."[9] On May 5, 2011, Mr. Sanderson reiterated the Service's approval of the monitoring protocols and APP/ECS development approach in an email stating "[a]s discussed previously, the Service is entirely on-board with the proposed monitoring protocols . . . ."[10] He also represented that the Service would provide PCW a "letter of endorsement" for the protocols and APP/ECS approach once several small schedule issues related to the timeline that PCW proposed for development of the APP were resolved. Prior to the formal letter being issued, Mr. Sanderson left the Service, as did Mr. McCreedy. Mr. Covington has transferred to a different position within the Service.

PCW Submits its Draft ECS and Requested Data to the Service

After collecting nearly a year's worth of additional data, on January 19, 2012, PCW submitted a draft of its ECS to the Service through Mr. Sanderson.[11] Mr. Sanderson provided the ECS to you, Mr. Tyler Abbot (Wyoming Ecological Field Services) and, we believe, others. On March 7, 2012, PCW submitted the conservation measures section of the ECS to Mr. Sanderson for review by the Service.[12] Shortly thereafter, on March 12, 2012, you, Tyler Abbott and Mr. Sanderson (on the phone), representatives from PCW and SWCA met to discuss the draft of the ECS and data collection efforts. You followed up on the meeting later that day with an e-mail to Mr. Kehmeier asking questions related to ECS data and strategy.[13] Mr. Kehmeier responded to your questions on March 14, 2012.[14]

On March 21, 2012, in response to the Service's request made during the meeting of March 12, 2012, Mr. Kehmeier provided you with raw eagle data for the CCSM Project.[15] Data

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[8] Attachment 4, Submission of revised protocols March 2011 via email dated March 2, 2011 from Mr. Kehmeier to Mr. McCreedy and Mr. Sanderson.

[9] Attachment 5, Email dated March 3, 2011, from Mr. Sanderson to Mr. Kehmeier.

[10] Attachment 6, Email dated May 5, 2011, from Mr. Sanderson to Mr. Kehmeier.

[11] Attachment 7, Submission on January 19, 2012, of first draft of the ECS (hard copy without conservation measures section).

[12] Attachment 8, Submission on March 7, 2012, of conservation measures section.

[13] Attachment 9, Email dated March 12, 2012, from Ms. Sweanor to Mr. Kehmeier.

[14] Attachment 10, Email dated March 14, 2012, from Mr. Kehmeier to Ms. Sweanor and others.

[15] Attachment 11, Email dated March 21, 2012, from Mr. Kehmeier to Mr. Abbott, Ms. Sweanor and Mr. Sanderson.

provided included all eagles observed, location of eagles, and the number of minutes each bird was observed. The dataset also included the number of minutes of total survey time which allows for calculation of use per unit of survey time.

On April 12, 2012, Mr. Kehmeier received a new data request from Mr. Abbott including a request for raw eagle use data, eagle flight path maps and survey locations.[16] The maps and data requested had previously been delivered to the Service on January 19 as part of the draft ECS. However, on April 17 and 18, Mr. Kehmeier resent the maps and data to Mr. Abbott.[17]

Subsequently, on April 30, 2012 you requested via voice mail that Mr. Kehmeier send you eagle flight path maps. These flight path maps had been previously included in the draft ECS, submitted to the Service on January 19, 2012, respectively, and again with the April 17 response. On May 1, 2012 Mr. Kehmeier resent the flight path maps in response to your April 30 request.[18]

On May 7, 2012, Mr. Kehmeier responding to a phone conversation with you resent the eagle data that were initially provided to you on March 21 and again on April 17 and 18.[19] The May 7 submission also included updated information to reflect results of winter 2011/2012 avian surveys.

On May 16, 2012, I met with you, Mr. Kevin Kritz and Mr. Tim Modde (Service Region 6 employees), Mr. Kehmeier, and Mr. Clint King and Mr. Doug Faulkner of SWCA to discuss the status of the ECS. At this meeting, PCW was informed for the first time that it must submit not only an ECS to the Service, but a BBCS as well. The Service informed PCW that it is no longer using APPs for wind projects.

We discussed PCW's extensive efforts to date to collect and analyze avian survey data, to assess risk to eagles, and to prepare an ECS. We further discussed the relationship between the BLMs decision on the CCSM Project and the Service's concurrence on the BBCS/ECS. In accordance with IM 2010-156 the BLM may issue a Record of Decision (ROD) approving the CCSM Project based upon the Service's determination that developing an APP for the CCSM Project is an appropriate option. The BLM, however, may not authorize a Notice to Proceed until the Service has evaluated the APP and determined that it is adequate.

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[16] Attachment 12, Email dated April 12, 2012, from Mr. Abbott to Mr. Kehmeier.
[17] Attachment 13, Emails dated April 17 & 18, 2012, from Mr. Kehmeier to Mr. Abbott and Ms. Sweanor.
[18] Attachment 14, Email dated May 1, 2012, from Mr. Kehmeier to Ms. Sweanor.
[19] Attachment 15, Email dated May 7, 2012, from Mr. Kehmeier to Ms. Sweanor.

Service's Request for Unprocessed Avian Radar Data

We also discussed, at length, the avian radar data, and its appropriate uses and limitations. At the May 16 meeting, you requested the raw radar data. As we discussed, however, there are several factors that are problematic with respect to providing you with the unprocessed avian radar data. First, the data files are enormous comprising several terabytes of information which was gathered 24/7 for over a year. Second, the Service does not have the software required to process the raw data. Finally, Mr. Kehmeier, Mr. King and Mr. Faulkner explained that because of the size of the radar data sets and the inability to differentiate among species or size categories, viewing the raw radar data or radar data presentations in the format you requested would not be informative. We have provided the Service with the results of compiling, processing and analyzing the raw radar data and incorporated this information into the draft ECS. In doing so, SWCA followed accepted scientific procedures for presenting data to the Service.

BBCS/ECS and an Eagle Take Permit

At the May 16 meeting we also discussed the relationship between the ECS and an incidental eagle take permit (ITP) and our understanding of the differing standards associated with the Service's approval of each. We base this understanding on the draft Eagle Conservation Plan Guidance (draft Guidance) issued January 2011 and the February 8, 2011 Eagle Conservation Plan Guidance Questions and Answers.

The draft Guidance provides a means of compliance with BGEPA via three components: (1) "conducting early pre-construction assessments to identify important eagle use areas; (2) avoiding, minimizing, and/or compensating for potential adverse effects to eagles; and, (3) monitoring for impacts to eagles during construction and operation."[20] Thus, the focus or standard with respect to the Service's approval of PCW's ECS is whether PCW through its extensive collection of data using traditional and avian radar surveys has, prior to construction, identified important eagle use areas and fully evaluated options to avoid and minimize Project impacts and thoroughly assessed mitigation measures related to siting, operations and monitoring such that the likely take can be minimized or avoided.

The ECS may be considered a first step towards obtaining an ITP as the ECS can be developed to support the issuance of an ITP. The draft Guidance resulting in an ECS

[20] U.S. Fish & Wildlife Service, Draft Eagle Conservation Plan Guidance at 7 (January 2011).

"describes a means by which to collect and analyze information that could lead to a programmatic permit to authorize unintentional take of eagles at wind energy facilities."[21] In determining whether an ITP would be compatible with the preservation of golden eagles, the Service will look to whether the issuance of such permit would be "consistent with the goal of stable or increasing breeding populations."[22] That term "allow[s] take that is compatible with long-term stability or growth of eagle populations."[23] Thresholds for authorizing take are based on regional eagle populations.[24]

Although PCW intends to apply for an ITP, its initial focus is on the development and approval of the ECS and the standards associated with an ECS.

PCWs Response to the Service's Most Recent Data Request of June 25th

On June 20, 2012, you informed me and Mr. Kehmeier that you were meeting with the Service's Eagle Team the next day and asked if we could supply your office with the eagle model PCW is using to estimate eagle take from PCWs survey data. You also requested GIS information for certain bird habitat layers and offered to provide a list of the habitat features you would like. Mr. Kehmeier responded that he was unable to immediately provide you with the data you requested as he was presenting at an important national seminar on greater sage-grouse. On June 25, 2012, you clarified your June 20 data requests and provided specifics on the information sought.[25]

PCW responds to your June 25 data requests as follows:

1. Request: Data on active nest sites for 2008, 2011 and 2012.
   Response: The raptor nest data sets for 2008 and 2011 were previously provided. Transmitted with this memo we are resending the GIS data for 2008 and 2011 and providing the dataset for 2012.
2. Request: Flight path data for all raptor species.
   Response: We have previously provided flight path data for all eagles. We have not compiled flight path data for raptors other than eagles. Transmitted with this memo

[21] U.S. Fish & Wildlife Service, Draft Eagle Conservation Plan Guidance at 7 (January 2011).
[22] 74 Fed. Reg. 46836, 46837 (September 11, 2009).
[23] 74 Fed. Reg. at 46839.
[24] 74 Fed. Reg. at 46841.
[25] Attachment 16, Email dated June 20, 2012, from Ms. Sweanor to Mr. Kehmeier and Mr. Miller; email dated June 20, 2012, from Mr. Kehmeier to Ms. Sweanor; and email dated June 25, 2012, from Ms. Sweanor to Mr. Kehmeier.

we are resending the flight path GIS data for eagles. We will compile the flight path data for other raptors and include it with the BBCS/ECS submission.

3. Request: Avian survey point locations.
   Response: These data have been previously provided to you and were also included in the draft ECS. Transmitted with this memo we are resending the avian survey point locations in GIS format.
4. Request: Data on vegetation cover.
   Response: The draft ECS includes maps of vegetation cover. We have not previously received a request for the GIS data. Transmitted with this memo are the GIS files for the vegetation cover.
5. Statement: You indicated that you have BLM historical nest sites and prairie dog town data. No response from us is required; however, we do note the following. In 2010 BLM contracted with Smith Environmental and Engineering to investigate and record white-tailed prairie dog (WTPD) town locations and associated burrow density. The data were collected to help in identification of suitable black-footed ferret (BFF) habitat for the Bolten Ranch BFF Complex. We have reviewed this report and have serious concerns regarding its accuracy, the scientific methods employed, and its conclusions. We have undertaken an independent study to examine the report's findings. We will document our field investigations and provide a review of the Smith report with the submittal of the BBCS/ECS. Until our review is complete, we caution the Service in relying upon this BLM supplied data in the Service's assessment of eagle risk for the CCSM Project as our early assessment is that the Smith data are seriously flawed.
6. Request: Data on ungulate crucial winter range.
   Response: The data have not been previously requested from us. Transmitted with this memo are the GIS files showing ungulate crucial winter range.
7. Request: Greater sage-grouse lek locations.
   Response: These data have not been previously requested from us. Transmitted with this memo are the GIS files showing greater sage-grouse leks.
8. Request: Data on ungulate parturition areas.
   Response: There are no ungulate parturition areas with the CCSM Project area.
9. Request: Data regarding grouse (presumably greater sage-grouse) brood rearing habitat data.
   Response: These data have not been previously requested from us. We are uncertain of how to respond to your request as greater sage-grouse brood rearing activity (early and late) can occur throughout portions of the CCSM Project area. We request that you be more specific in your request or clarify the intended use of the data so that we might be responsive to your needs. Without a more specific request we can state that the majority of brood-rearing activity surrounding the CCSM

Project occurs in sage-grouse core areas as defined under Wyoming Executive Order 2011-5.

10. Request: Data on rodent concentrations (e.g., ground squirrels).
    Response: Over the course of our greater sage-grouse and avian studies we record incidental observations of rodents within the CCSM Project area; however, we have not conducted any surveys for rodents other than the surveys recently undertaken to examine the validity of the Smith report. We are therefore unable to provide the data you requested.
11. Request: A GIS layer for the CCSM Project area boundary modified to exclude the Grizzly Wildlife Habitat Management Area as set forth in the final environmental impact statement.
    Response: As we were not privy to the contents of the CCSM Project final environmental impact statement prior to the Notice of Availability, we were previously unaware that the Grizzly WHMA was excluded. Transmitted with this memo is the GIS data layer for the CCSM Project boundary with the Grizzly WHMA omitted.

As to your request for the eagle fatality model developed by SWCA for the CCSM Project, we request a meeting with you and the Service's modeling experts to review the SWCA model as well as the Service's model. We believe it is imperative to understand the model inputs, assumptions, and construction in order to fully comprehend and appreciate the model results. We believe this is best achieved through an in-person meeting with you and the Service's modelers.

Finally, based on the notification PCW received on May 16, 2012, that PCW would need to submit a BBCS in addition to its ECS, we are in the process of finalizing those documents. Because PCW has not received guidance from the Service as to the expected format of the BBCS, PCW intends to include a project description, discussion of survey methodologies and results, and as an appendix an ECS that addresses issues specific to eagles. While you have requested that PCWs BBCS be a concise document, you have also requested that it include all of our survey methods explained in full (even those that involve standard avian protocols) along with a detailed discussion of analysis, results, conservation and mitigation measures, post-construction monitoring plans, and adaptive management procedures. PCW is striving to achieve this challenging balance in the draft BBCS/ECS and expects to provide these to the Service for review by July 16, 2012.

ATTACHMENT 1

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

APR 2 6 2011

In Reply Refer To:
ES-61411/WY11CPA0147

Memorandum

To: Field Manager, Bureau of Land Management, Rawlins Field Office, Rawlins, Wyoming

From: Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming

Subject: Avian Protection Plan Concurrence for the Sierra Madre-Chokecherry Wind Energy Project

Thank you for your letter of December 9, 2011, regarding the proposed Power Company of Wyoming's (PCW) Sierra Madre-Chokecherry Wind Energy Project (Project). The proposed Project is located south/southwest of the city of Rawlins, Carbon County, Wyoming. The Project is a proposed 2,000-MW electrical generating facility consisting of up to 1,000 2-MW wind turbines.

You have requested that the U.S. Fish and Wildlife Service (Service) determine if an Avian Protection Plan (APP) is appropriate for this Project to minimize the potential "take" of eagles. Our response to your request is based on the two-step process identified in the Bureau of Land Management's (Bureau) Instruction Memorandum No. 2010-156 (IM-2010-156), which is:

1) The Service determines that developing an APP is an appropriate option for this Project to avoid and minimize the potential for golden eagle take; therefore, the Bureau's Authorized Officer may issue a Record of Decision approving the project; and

2) The Bureau's Authorized Officer shall not authorize a Notice to Proceed for this Project until the Service has evaluated the APP and determines that it is adequate.

Following the two-step process, we have determined that developing an APP is an appropriate option to avoid and minimize the potential take of eagles (based on the Bureau's IM-2010-156), and migratory birds and bats based on PCW's commitment to meeting the following criteria:

a) Three years of surveys evaluating eagle, migratory bird and bat use of the Project area, as per Service guidance, conducted prior to Project construction; and

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b) Turbine numbers and layout are adjusted to provide effective buffers for eagle and other raptor nest sites as well as areas with high bird and bat utilization, as evidenced by the survey data.

To avoid and minimize impacts to migratory bird species protected by the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, as well as eagles protected under the Bald and Golden Eagle Protection Act (Eagle Act), 16 U.S.C. 668, the APP will need to address all migratory bird species. The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the MBTA has no provision for allowing unauthorized take, the Service realizes that some birds may be killed even if all reasonable measures to protect them are used. The Service's Office of Law Enforcement (OLE) carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to minimize their impacts on migratory birds, and by encouraging others to enact such programs. It is not possible to absolve individuals, companies, or agencies from liability even if they implement avian mortality avoidance or similar conservation measures. However, the OLE focuses its resources on investigating individuals and companies that take migratory birds without regard for their actions or without following an agreement to avoid take.

We advise the Bureau's Authorized Officer to not authorize a "Notice to Proceed" until the completed APP is delivered to the Service for evaluation and the Service determines the APP is adequate as documented in formal correspondence. The Service's determination as to the adequacy of the APP will depend upon the quality of the survey results used to develop the APP, how survey information was used to design a project layout that minimizes impacts, and how conservation measures will be applied during construction and operation.

We suggest that a programmatic APP, containing conservative conservation measures (e.g., no turbines within 4 miles of a golden eagle nest), be developed initially to provide guidance in lieu of area-specific information. This APP should be incorporated into the Project's Environmental Impact Statement (EIS). Any subsequent Project phases that rely upon an Environmental Assessment, which tiers to the EIS, will also form the basis for an individual Plan of Development (POD) APP. We expect that site-specific PODs will have higher levels of information about bird use, and their APP can be tailored to each specific area. We caution that it may not be reasonable to expect that the entire Project area can be developed (e.g., some Project areas may not be suitable for construction and should remain undeveloped).

The Service appreciates the Bureau's efforts to conserve golden eagles, other migratory birds, and bats in Wyoming. If you have questions regarding this letter or the MBTA and the Eagle Act, please contact Travis Sanderson of my staff at the letterhead address or phone (307) 328-4333.

cc: BLM, High Desert District Manager, Rock Springs, WY (J. Ruhs)
BLM, RECO Wildlife Biologist, Rawlins, WY (C. Morton)
BLM, Project Manager, Rawlins, WY (P. Murdoch)
BLM, RECO Project Manager, Cheyenne, WY (T. Engles)
BLM, State RECO Manager, Cheyenne, WY (M. Valle)
USFWS, Regional Energy Coordinator, Lakewood, CO (T. Modde)
USFWS, Branch Chief Energy, Water, Climate, Lakewood, CO (P. Repp)
USFWS, Chief, Branch of Conservation Planning Assistance, Washington, D.C (L. Bright)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)

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ATTACHMENT 2

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Review of Avian Radar Technologies and Comparison with Traditional Survey Methodologies

Prepared for

Power Company of Wyoming, LLC
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Prepared by

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September 2010

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Introduction

The Chokecherry and Sierra Madre Wind Energy Project (Project) is being developed by the Power Company of Wyoming LLC.. The Project, located south of Rawlins, Wyoming, includes the construction and operation of 1,000 wind turbines producing between 2,000 and 3,000 megawatts of electricity. The Project will be constructed in "checkerboard" lands - a mixture of federal and private lands where approximately half of the land is private and approximately half is administered by the Bureau of Land Management (BLM), with a small portion being owned by the State of Wyoming.

In July 2008, the BLM published a Notice of Intent to prepare an Environmental Impact Statement (EIS) to analyze the environmental consequences of the Project. Generally, the Project consists of two distinct wind development areas. The northern, Chokecherry development area will contain 50-60% of the 1,000 turbines with the remainder of the turbines in the southern Sierra Madre development area.

Between June 2008 and June 2009, avian use data were collected for much of the wind development area as part of the BLM National Environmental Policy Act (NEPA) process (Johnson et al. 2008). Data were collected using standard point count methods at 19 locations in all months except January and February when much of the Project area was inaccessible due to adverse weather conditions. All sites except for three were visited 31 times during the survey period.

Data collected during the 2008 and 2009 surveys are sufficient to provide estimates of avian use of the Project area as well as to provide initial estimates of the frequency of each species at rotor-swept heights. However, since the surveys were completed, recommendations have been made to utilize avian radar technology to better understand avian use within the Project footprint. These recommendations have been made in part because of perceived biases of traditional survey methodologies related to bird identification, detection, and estimation of height and location.

This document reviews the avian radar technology, evaluates options for the types of radar that might be utilized for survey of the Project footprint, and summarizes the benefits and tradeoffs of using radar versus traditional point count methodologies.

Review of Radar Technology

Since the 1940s, echoes from locations of avian species have been detected in surveillance radar data (Lack and Varley 1945 *in* Gauthreaux and Belser 2003). Radar became a useful tool for studying and quantifying bird movements in the U.S. after the installation of the Weather Surveillance Radar system across the country in 1957 (WSR-57) (Gauthreaux 1970 *in* Gauthreaux and Belser 2003). The WSR-57 system was used for several decades to better understand timing and location of bird migrations.

During the 1980s, the Weather Surveillance Radar system was upgraded to include Doppler (WSR-88D) (Gauthreaux and Belser 2003) to better determine the velocity and detailed movement patterns of weather systems. The U.S. Air Force also began using site-specific radar systems to reduce the number and severity of bird strikes with aircraft (Merritt et al. 2008). These systems were used through the 1980s and 1990s to better understand migration patterns and to reduce risks associated with bird

strikes at airports across the U.S. In the late 1990s, commercial avian radar systems became available (Nohara et al. 2007) and are currently used to monitor avian activities for airports, military installations, energy projects (including wind), and other applications.

How Avian Radar Works

Radar is an acronym for Radio Detection and Ranging. Radar systems work by transmitting a radio beam and listening for the echoes of that beam as it is reflected off of various surfaces. By calculating the time between the transmission and reflection of the radio waves and the relative strength of the reflection, radar systems can determine the distance a target is from the transmission source and the relative size and sometimes shape of the target. Two different types of radar bands (X-band and S-band) are typically used for avian radar systems. X-band radar operates on a 2.5-4 cm wavelength and a frequency of 8-12 GHz. S-band radar operates on an 8-15 cm wavelength and a frequency of 2-4 GHz. Because of the shorter wavelength, X-band radar allows for higher resolution data and better target identification and differentiation.

Types of Avian Radar

Some avian radar systems require manual operation. Manual radar systems require that technicians use two-dimensional (2-D) T-bar marine radar and watch the radar reflections on screen as they are collected. For manual radar applications, a technician counts the number of targets recorded for each pass of the radar and maps flight paths. Manual operation works reasonably well during periods with low avian use. However, during periods of high avian use (i.e., migration), recording frequency does not allow for accurate counts of individual targets or determination of all flight paths. Additionally, because of time required to operate a manual radar unit and record individuals and flight paths, data typically are collected only on one plane (horizontal or vertical) at a time, are not operated continuously, and do not allow for determination of an individual bird's location in all three dimensions.

Advancements in radar and computer technology currently allow for remote monitoring and automatic radar operation with less time required for technicians. Current programming, processing, storage, and analysis capabilities enable more accurate differentiation among different sizes and types of targets. Current avian radar systems also enable data post-processing to remove noise, map flight paths, and enable comparison with environmental correlates to better understand localized bird migration and use patterns. Many currently available avian radar systems simultaneously operate two T-bar marine radar units (one in the X-band and one in the S-band). Use of the two different bands allows for simultaneous operation without signal interference and allows for 3-dimensional (3-D) mapping of bird use patterns where the two bands overlap.

In addition to the technologies described above, fixed-beam vertical profiling radars are becoming commercially available for the purposes of avian and bat species discrimination (an example of one such system is the Vesper system manufactured by DeTect, Inc.). The fixed beam vertical profiling radar system for birds and bats is similar to radar wind profiling systems currently used for weather forecasting and aircraft flight planning (site:http://en.wikipedia.org/wiki/Wind_profiler accessed September 21, 2010). The technology focuses a narrow beam of electromagnetic energy vertically.

When the beam is disrupted by a target, the reflections are detected and recorded by the radar system. The goal of the fixed beam vertical profiling radar system for avian and bat survey purposes is to differentiate bird, bat, and insect targets based on their wingbeat frequencies and size. While promising for future applications in areas with very high bird or bat use, the technology is still in the development stages for avian and bat survey purposes (Edward Zakrajsek, DeTect, Inc., Personal communication with Jon Kehmeier August 4, 2010). Because the technology is still in the development stages and considered experimental, the fixed beam vertical profiling system will not be further reviewed in this document.

Commercial Dual-Band Avian Radar Systems

Two different radar systems will be reviewed in this section. Both systems are manufactured by DeTect, Inc. in Panama City, Florida, an industry leader in avian radar technologies. DeTect manufactures avian and airport radar systems and is one of several commercial distributors of avian radar technology. DeTect's radar systems are currently being used on a number of large wind projects including the Gulf Wind project in southern Texas.

DeTect, Inc. manufactures and provides technical support for the dual band MERLIN© Avian Radar System (MERLIN). The following information was provided by Gary Andrews, General Manager of DeTect, Inc., in an email to Jon Kehmeier dated August 20, 2010. This information was provided in response to queries regarding operating conditions, range of sampling, and off-road capabilities of the MERLIN radar system. Two models (MERLIN XS10200e and MERLIN XS10200 pe-series systems) were evaluated. Each system consists of a continuous scanning horizontal and vertical dual bird radar sensor system with a 200 watt horizontally-operating solid-state S-band, open array radar sensor with Doppler processing and extendable tower and a 10 kW vertically-operating magnetron X-band open array radar on fixed tower with slide-out.

The standard MERLIN XS10200e (Figure 1) includes dual, high clearance, heavy duty off-road axles with torsion bar suspension that are suitable for off-road travel on unimproved roads. The system is mounted on a 23 foot long and 8 foot wide trailer weighing 4800 pounds. All electronics are mounted in an environmentally controlled operator cabin. Cost for purchasing a XS10200e is $295,000. This does not include maintenance, operation, or validation costs which could effectively double or triple the purchase price.

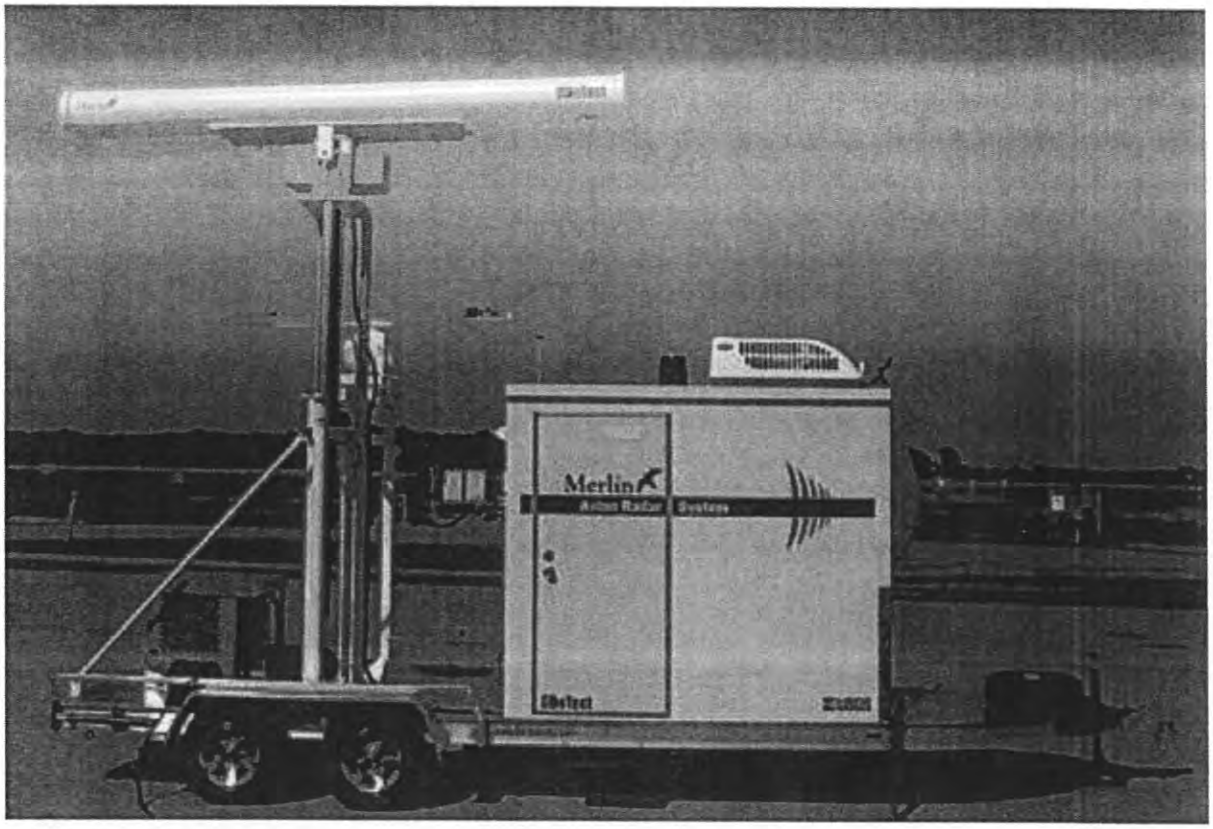


Figure 1. Image of MERLIN XS10200e system. S-band horizontal radar is uppermost T-bar and X-band vertical radar is lower T-bar. The yellow box is a diesel generator power supply and the white cabin is the environmentally controlled operator cabin. Image provided by DeTect, Inc.

The MERLIN XS10200 pe-series (Figure 2) is lighter, narrower, and shorter (16 feet long by 6.5 feet wide) with a single axle. The system is specifically designed for getting into rugged, hilly terrain but still cannot be moved frequently across very rough roads such as those in the Project area because of trailer length, weight, and the sensitivity of the electronics. The pe-series is the functional equivalent to the XS10200e unit but the electronics are mounted in a National Electrical Manufacturers Association (NEMA) outdoor enclosure rather than in an environmentally controlled operator cabin. Cost for purchasing the XS10200-pe is $245,000 and does not include maintenance, operation, or validation costs as discussed above.

Either model of the MERLIN radar system is a fully self-contained, trailer mounted system functional at delivery. All structural components of the system are industrial grade, corrosion resistant marine grade aluminum or stainless steel. The system is mounted on a trailer constructed to U.S DOT standards made of marine grade aluminum with aluminum diamond plate decking. The trailer is constructed with industrial couplers, torsion suspension and electric or hydraulic brakes with heavy-duty off-road high

clearance axle(s). Ancillary support equipment on either model includes a spare tire, lightning protection, ground anchors, tools, and safety equipment.

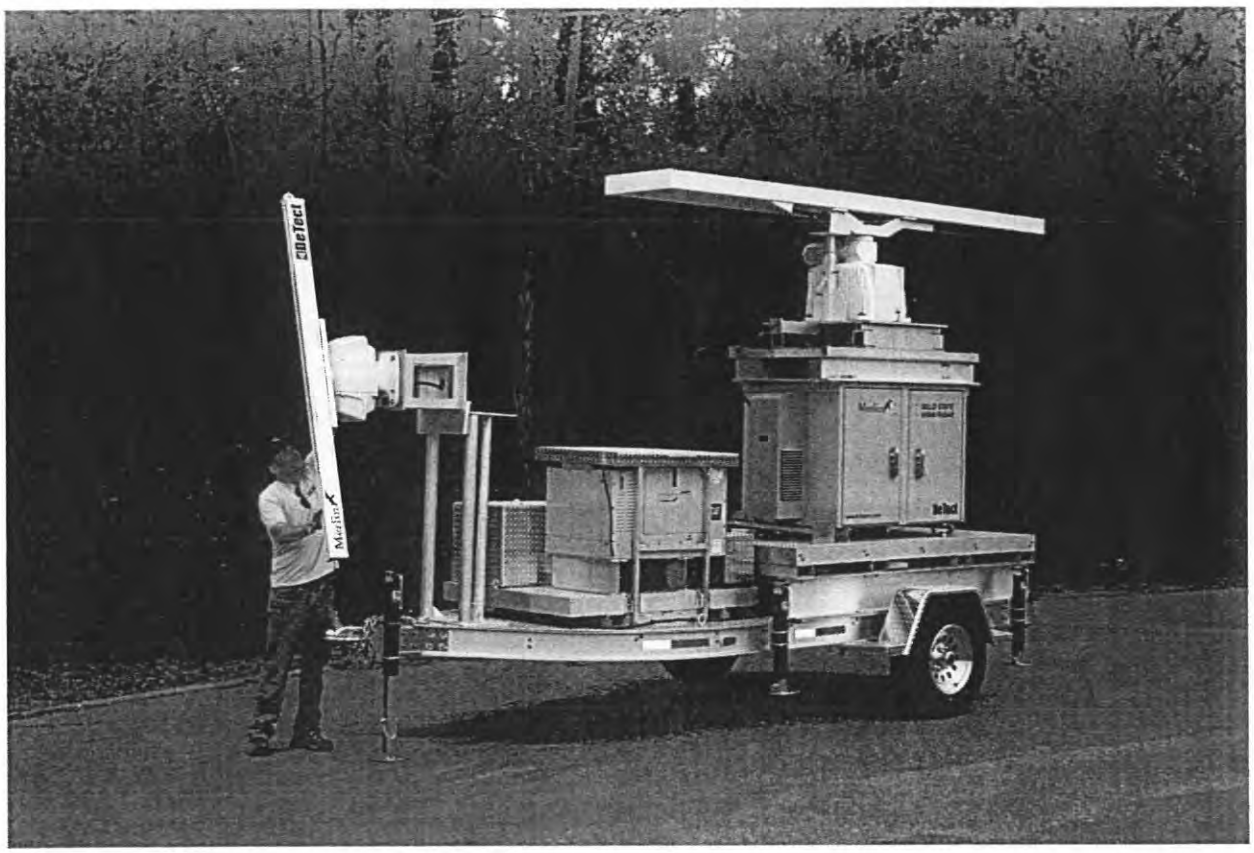


Figure 2. Image of MERLIN XS10200-pe system. S-band horizontal radar is uppermost T-bar and X-band vertical radar is T-bar being handled by the operator. Note the single axle compared to the double axles in Figure 1 and the NEMA enclosure versus the operator cabin. Image provided by DeTect, Inc.

Both models contain a redundant onboard power supply with options for commercial electrical power or diesel generator power. Because of the lack of a commercial electrical connection in the project area, a dual 6 kW diesel power generator system with extended run fuel tank operation would be required. This would include an Uninterruptible Power Supply (UPS) back-up that will function when one of the two generators stops operating. Weekly maintenance is necessary to refill fuel for the generator and maintain and check all systems. The system is designed such that one of the two generators would be functioning at all times resulting in continuous air emissions and noise. Additionally, because of the requirement for diesel generators in the Project area, there would be some possibility for small fuel and fluid spills.

The MERLIN system is designed to require low maintenance and provide reliable use in adverse environments and temperatures (-20 to +130 degrees F). The MERLIN XS10200e system has a redundant environmentally controlled, insulated operator/equipment cabin while the MERLIN XS10200pe has a NEMA enclosure to protect the electronics. The XS10200e system also has weatherproof panel construction and is wind-load tested to 80 mph. Its trailer is covered with an aluminum deck and slip resistant flooring and has an access door with step, window, and keypunch lockset. Within the cabin, the XS10200e has a technician console with fixed radar display and a slide-out keyboard and mouse tray.

When operating, the MERLIN systems have a S-band horizontal survey range of 2-4 miles and a 24-degree above ground level detection and X-band vertical survey range of 0.75-2 miles and a 24-degree survey band width. The combination of the two survey zones provides some overlap and allowance for 3-D mapping of avian and bat activity immediately above the radar system (Figure 3).

Both MERLIN models are delivered with a data processing computer system; a MERLIN radar operating and processing software package, including MERLIN Administrator, Processor, Display, Remote, MerlinChart™, TrackPlot™, and a MERLIN SQL datasystem. This software and analysis package enables analysts to remove much of the clutter and noise from the radar dataset, map the locations and flight pathways, and sort the targets by size. Figure 4 illustrates the data recorded from the horizontal radar. Figure 5 illustrates the data recorded from the vertical radar. Figure 6 illustrates the types of analyses and output files generated by DeTect's analysis software packages. Data from the radar system can be remotely managed using cellular networks, satellite uplinks, high-speed internet, or via direct download from the system.

Each system also contains a MerlinGPS /Compass™Georeference Datum System; and a weather station. Both systems come with installation support, user training, 1-year of data processing and analysis support, a 3-year parts and labor warranty, and a 3-year software upgrade commitment. Depending on manufacturing backlog, current delivery times for either MERLIN model is between 120 and 150 days. DeTect will deliver the selected system to any North American location.

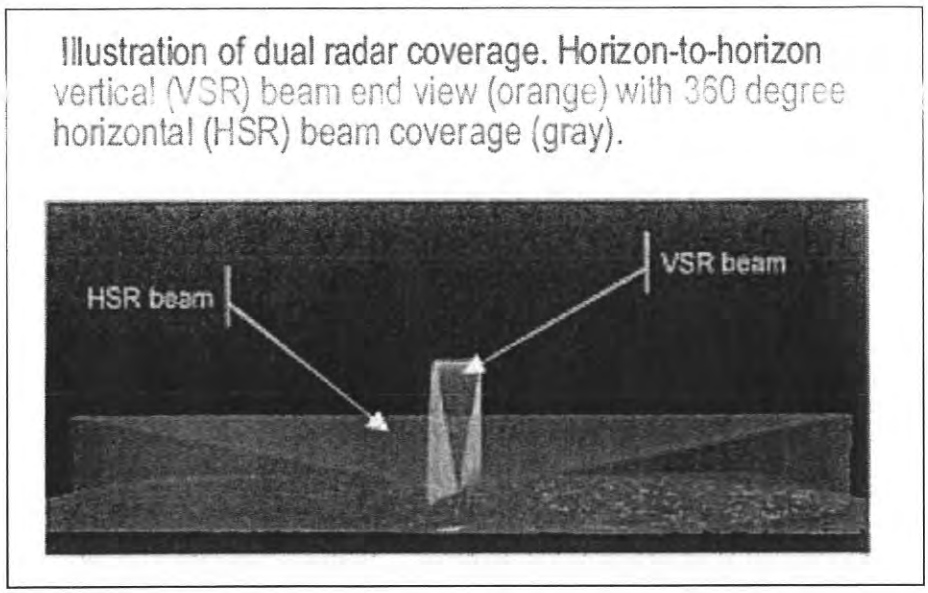


Figure 3. Illustration of surveyed area for both vertical and horizontal radar. Image from DeTect, Inc. Avian Radar System Brochure.

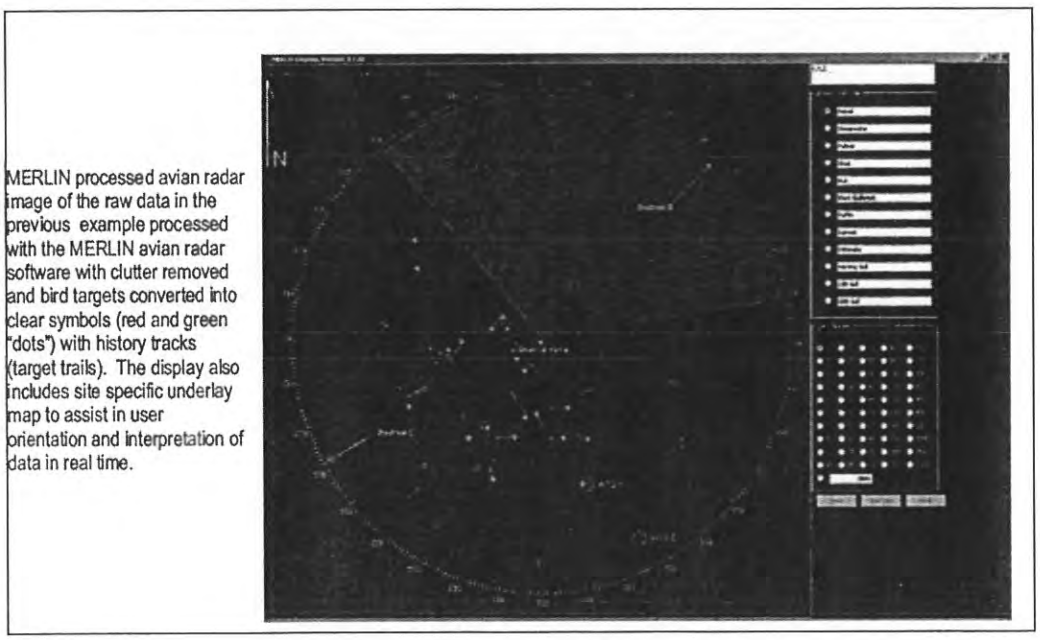
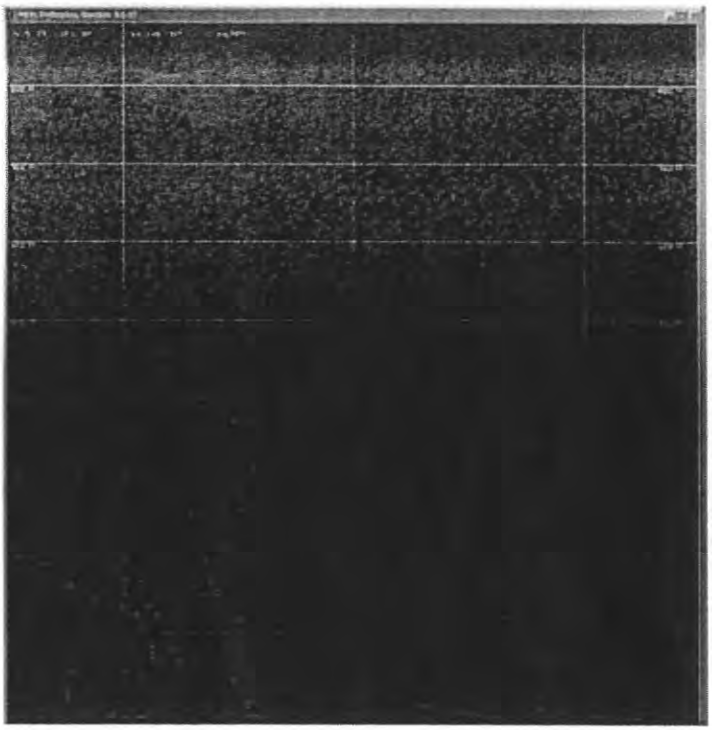
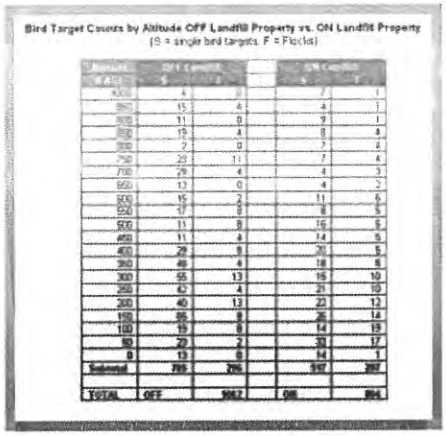


Figure 4. Illustration of survey area and data recorded from horizontal radar application. Image from DeTect, Inc. Avian Radar System Brochure.



MERLIN Avian Radar vertical radar display showing heavy bird migration during the spring of 2004 in upstate New York during survey conducted for the Cornell Lab of Ornithology. Bird targets are red dots with target history trails with z (altitude) in feet up to 4500 ft above ground level and y (distance from radar) in nautical miles (nm) out to 0.75 nm to either side of the radar (the radar position is the bottom center of the screen). The vertical radar beam in this survey was aligned in the predominant migration direction and most of the targets are passing along the length of the beam.

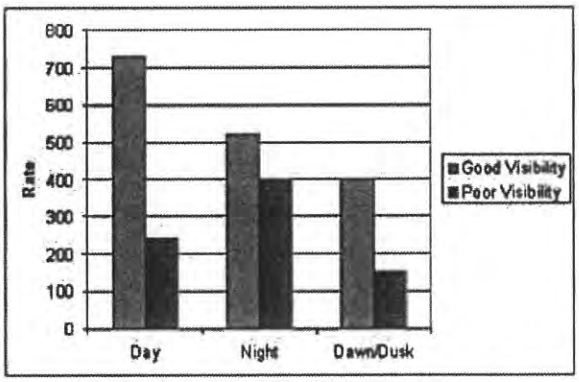
Figure 5. Illustration of survey area and data recorded from vertical radar application. Image from DeTect, Inc. Avian Radar System Brochure.



Bird Target Counts by Altitude OFF Landfill Property vs. ON Landfill Property
(S = single bird targets, F = Flocks)

Altitude (AGL)	OFF Landfill S	OFF Landfill F	ON Landfill S	ON Landfill F
1000	4	0	2	1
950	15	4	4	1
900	11	0	9	1
850	19	4	8	4
800	2	0	7	4
750	29	11	7	4
700	29	4	4	3
650	13	0	4	2
600	15	2	11	6
550	17	8	8	5
500	11	8	16	5
450	11	4	14	5
400	29	9	20	5
350	40	4	18	6
300	55	13	16	10
250	42	4	21	10
200	40	13	22	12
150	55	8	26	14
100	19	8	14	19
50	22	2	32	17
0	13	8	14	1
Subtotal	799	296	997	207
TOTAL	OFF	1062	ON	1204

Tabulated daily count of single birds and flocks for radar sample areas On landfill versus Off landfill; daily analysis used to document effectiveness and compliance of the landfill bird control and habitat management program. (data extracted from vertical radar database of MERLIN XS2530i Avian Radar System at the Waste Management Outer Loop RDF, Louisville, Kentucky).



Summary Chart of Passage Rate of Bird Targets Across 1 km Wide Front by Visibility Conditions (data extracted from vertical radar database of a MERLIN Avian Radar System at proposed wind farm site).

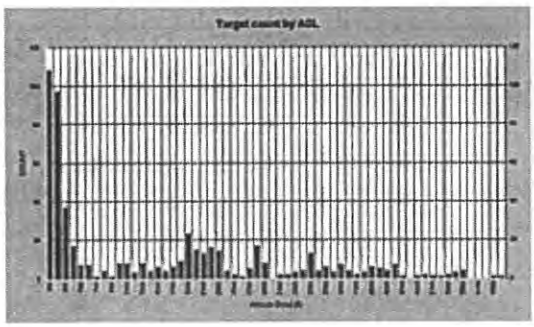
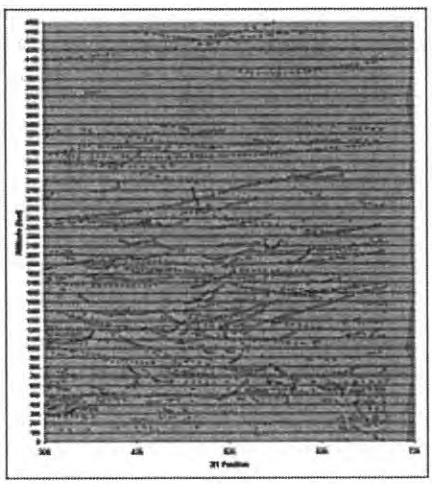


Chart of bird target count by altitude for a 24-hour period generated by MERLINChart® data report software from MERLIN Avian Radar System database (data from USAF Beale AFB, California MERLIN XS2530m system from January 2007).



One hour altitude track plot of vertical radar data for night spring migration over USAF Travis AFB, California (generated by MERLIN TrackPlot® software from MERLIN XS2530m Avian Radar System database).

Figure 6. Illustration of data output and some of the analysis options using DeTect's analysis software and technical support.

Summary of Benefits and Tradeoffs

Radar technology has gained support within the scientific community because it reduces or eliminates observer biases that are inherent to traditional visual observation survey techniques; it monitors and records avian activity 24-hours a day eliminating the need for costly and unreliable nocturnal surveys; it enables assessments of avian and bat activity during low visibility conditions when traditional survey methods are not appropriate; and it samples larger areas (up to a four mile radius from the radar) than traditional survey methodologies.

However, even with the benefits described above, radar technology does not provide all of the data necessary to assess species-specific or group-specific risk. Radar technology is limited in its ability to detect and differentiate some species or groups of birds or bats. Avian radar systems typically classify each target identified according to size (small, medium, large, or flock size). Small targets might correlate with sparrow-sized birds, medium with American kestrel sized birds, large with common raven or red-tailed hawk, and flock size with a Canada goose, golden eagle, or bald eagle. Unfortunately, confusion can even occur within each of these categories. For instance, three sparrows migrating together would appear as a medium target; two crows would appear as a large target; and several large or medium sized birds together would appropriately appear as a flock (as does a single goose, multiple geese in formation, a single or multiple eagles, etc.). Additionally, radar detections are lower when there is noise from landscape features, the ground, vegetation, or weather. Detections will be highest when birds are flying in areas with clear, unobstructed views of the sky and lowest near the ground or in areas with considerable topography.

Because of the detectability and differentiation issues associated with radar systems, substantial calibration of the system is necessary to determine how avian species might correlate with the different targets that are or are not recorded. While traditional surveys have detectability and identification biases, very rarely, if ever, would they result in confusing a Canada goose with a golden eagle. Additionally, they would be much more sensitive to avian use close to the ground where many resident and nesting avian species are expected. Point count surveys are superior to radar surveys for detectability and differentiation purposes. Additionally, field observations recorded as part of point count surveys allow for identification of the behavior of an individual bird and the ability to correlate that behavior to some environmental variable. The knowledge of why an individual is using an area is important to design and implement more effective mitigation and avoidance strategies. Radar data will not provide the important behavioral information that point count observations provide.

Avian radar systems are designed for and recommended for use in areas with high avian or bat use and/or areas with substantial risk for impacts to sensitive or protected species that can be differentiated from other species in the area. In 2008 and 2009, avian and bat data were collected for the Project in support of BLM's ongoing NEPA process (Johnson et al. 2008). The mean raptor use of the Project area was compared to 41 other wind facilities in the western United States for summer surveys and 39 for fall surveys. Results indicate that mean raptor use in the area is low to moderate compared to other wind energy projects in the western United States. This indicates that the Project area does not have high avian or bat use relative to other wind development sites around the country. Additionally, while

golden eagles, ferruginous hawks, and other species of interest do occur in the Project area, a radar system will not enable differentiation between those species and other similar-sized species of lesser concern.

Because of the uncertainty associated with differentiation and detectability of avian species with radar and the observer bias and smaller sample area with traditional survey methods, a combination of the two approaches is necessary when it is determined that radar use is appropriate. This would include survey of areas outside of the radar perimeter. Additionally, frequent validation of the radar data would be required to compare with point count data to determine which species were present, whether they were detected, and how frequently they were differentiated from other species or targets. Validation of the system would require two trained technicians. One technician would identify each species observed, record its approximate height and location, and radio the information back to the second technician. The second technician would match the species-specific location and height to the appropriate target on the radar screen to enable more detailed analysis of that target and allow for possible differentiation of that species from others recorded by the system. The combined radar and point could survey process would result in increased costs compared to traditional survey methods. Increased cost would depend on the level of effort required to calibrate the radar data and to survey points that fall outside the radar survey perimeter.

For the Chokecherry and Sierra Madre Wind Energy Development Project area there is already a year's worth of avian and bat use data for the Project (Johnson et al. 2008) that can be used to characterize general turbine collision risk, community diversity, habitat use, and species distribution. These data are sufficient for project-level collision risk assessment. An additional year of combined radar and traditional point surveys would add to this dataset and assist in identifying high-use areas and site-specific mitigation and avoidance planning through micro-siting of turbines. However, The Chokecherry and Sierra Madre project area is not known to have high avian use as demonstrated by the data collected to date for the EIS analysis and it could be difficult to differentiate sensitive or protected species (golden and bald eagles, other raptors, etc.) from other targets including ravens, geese, or other species. An additional year of count surveys may be sufficient to characterize avian use and perform risk assessments for the Project, although as discussed above, there are also limitations with these techniques.

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