APPENDIX A
AGENCY CORRESPONDENCE

September 30, 2013

Mr. Tim Snowden
Environmental Protection Specialist
Western Area Power Administration
5555 East Crossroads Boulevard
Loveland, Colorado 80539-3003

Re: **Proposed Minor Expansion of CHW Wind Project and Western Interconnect Agreement**

Dear Mr. Snowden:

As a follow-up to our recent discussion, Colorado Highlands Wind, LLC (CHW) is writing to update the Western Area Power Administration (Western) about our proposed plans for constructing a minor expansion of our existing wind resource generation project near Fleming, Colorado (the "Project"). As a result of recent legislative mandates in Colorado for rural areas to promptly increase their supplies of renewable energy, CHW has been requested by Tri-State Generation and Transmission Association to expand our existing Project to help meet the new requirements on an expedited basis. As described below, this relatively minor expansion will require an amendment to CHW's existing Interconnection Agreement with Western for the Project but, as we understand it, will not require any expansion or alteration of Western's Wildhorse Creek Switchyard or physical modifification of any other Western facilities.

Proposed Project Expansion

The proposed Project expansion will consist of installing up to 12 additional 1.7 megawatt ("MW") wind turbine generators (WTGs), bringing the total number of WTGs for the whole Project to 68, with a total nameplate capacity of 111.4 MW (Expansion). With cumulative collector system, transformer, and tie-line losses, the maximum instantaneous electrical output delivered to Western's interconnection facilities at the Wildhorse Creek Switchyard will be 110 MW or less. The Expansion facilities will be located to the east of the existing Project boundary, on roughly 2,000 acres of private and state land with similar characteristics to the existing Project site. The location, boundary, microwave beam paths and proposed

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WTG layout for the Expansion are identified on the map provided with this letter. The preliminary Expansion WTG layout shown on the enclosed map is in compliance with all previously identified environmental, avian, and biological setbacks, exclusions and/or other restrictions identified in the existing Environmental Assessment (EA), Mitigation Action Plan (MAP), and Finding of No Significant Impact (FONSI).

As with the existing Project, the electric power generated by the Project Expansion will be sold and delivered to Tri-State Generation and Transmission Association.

A comprehensive cultural resources survey of the entire Expansion area will be completed as soon as possible to identify any potential significant cultural resources, and the WTG layout will be adjusted as necessary to avoid any such areas. The cultural survey report will be provided to Western and the State Historic Preservation Office (SHPO) 60 days prior to any on-the-ground construction activities to allow for full review and concurrence by SHPO prior to any ground disturbance.

Existing Studies and Approvals

As you know, as part of the EA completed for the existing Project, with Western as the lead agency under the National Environmental Policy Act (NEPA), consultants funded by CHW conducted extensive biological, avian, habitat, cultural and other reviews of the Project site. Those environmental reviews did not identify any federally endangered or threatened species or critical habitat within the Project area. Based on the EA, Western issued a MAP in January 2009 and the FONSI for the Project in February 2009.

CHW has continued to perform additional avian and cultural studies since issuance of the FONSI to further characterize the Project site and adjacent areas. We summarized in our February 8, 2013 letter to you the extensive environmental studies, reports, and correspondence prepared for the CHW Project and previously submitted to Western, Colorado Parks and Wildlife (CPW) and the US Fish and Wildlife Service (USFWS) as of that date. CHW has also prepared a Bird and Bat Conservation Plan and Post-Construction Bird and Bat Fatality Monitoring Plan for the Project, as required by the MAP, and has provided those documents to Western, CPW, and USFWS. CHW has continued to implement the monitoring plan this summer and fall and will provide a report of those results to the agencies later this fall.

Western Consideration of Project Expansion

As you know, the original proposed Project evaluated in the EA and approved by Western consisted of 60, 1.5 MW WTGs with a 90 MW interconnection with Western's 115 kV transmission system at the new Wildhorse Creek Switchyard. Following completion of that NEPA process, CHW and Western entered into a Large Generator Interconnection Agreement dated October 30, 2009 (LGIA), authorizing that 90 MW interconnection at the Wildhorse Creek Switchyard. The existing Project as constructed consists of 56 WTGs with an effective 90 MW capacity, as contemplated and covered by the existing EA and the LGIA.

For the proposed Expansion, the current Interconnection Agreement for the existing 90 MW Project would need to be amended to expand the authorized capacity for interconnection to the Wildhorse Creek

Switchyard from 90 to 110 MW. CHW understands that no actual, physical expansion or modification of the Wildhorse Creek Switchyard or any related Western facilities would be required to allow for that increase. CHW has a System Impact Study underway with Western to confirm Western's system capacities. Recently, the capacity of the Wildhorse Creek Switchyard, CHW's 115kV generator tie-line, and CHW's 115kV step-up transformer were reviewed this past summer in accordance with North American Electric Reliability Council standards, and it was determined that the limiting capacity component is the step-up transformer with a 110 MW limitation. Based on this recent information, CHW is requesting this expansion to maximize the use of the existing CHW and Western electrical infrastructure.

Under these circumstances, we further understand that, under DOE's NEPA implementing regulations, there is some question whether the NEPA Categorical Exclusion for modification of electricity transmission agreements under 10 C.F.R. § 1021.410, Subpart D, Appendix B, B4.8, would apply here. Because the proposed LGIA amendment to increase the allowable capacity from 90 to 110 MW would not involve any new Western generation project or any physical change in Western's Wildhorse Creek Switchyard, we understand that this B4.8 Exclusion would apply to the proposed LGIA amendment. If that Exclusion does apply, we understand that this LGIA amendment can be completed without further NEPA review.

In the event the above or some other NEPA Categorical Exclusion does not apply in these circumstances, we understand that the alternative would be that a Supplemental EA (SEA) would be required to be prepared to support the LGIA amendment under 10 C.F.R. § 1021.321, Subpart D, Appendix C, C7, for contracts for interconnection of new generation resources that are less than 50 average MW. The new generation resources in the proposed Expansion will be far less than 50 average megawatts. We further understand that any such SEA would only need to update and expand the analyses performed in the original EA to the proposed Expansion site and confirm that such analyses show the same lack of significant impacts at the adjacent Expansion site. We also understand that the ongoing avian and other studies of both the existing Project site as well as the Expansion site could be incorporated directly into any SEA.

If that SEA analysis is required, given the extent of the past and ongoing studies at the existing and Expansion sites, we would work with Western to complete the SEA as quickly as possible, and would like to plan to have both the SEA and any public review period completed, if possible, by the end of this calendar year. In that connection, we understand that no public hearing would be required to complete the SEA and that the final document could have, but is not required to have, a public notice and comment waiting period.

We would appreciate your and Western's confirmation at your earliest possible convenience that (1) it will be possible to amend the existing LGIA to increase the allowable capacity for this Project from 90 MW to 110 MW, and (2) that such a contract amendment is covered by the above or other Categorical Exclusion and will not trigger any further NEPA review or, in the alternative, (3) NEPA review will be required and will be satisfied by a Supplemental EA that can incorporate and rely on the ongoing avian, cultural resource and other studies and, if possible, can be completed by the end of 2013.

If it would be helpful to expedite this process, we would be glad to meet with you at your earliest convenience to further discuss this proposed Expansion work, answer any questions that you may have, and obtain Western's confirmation that this is the proper course to address NEPA and authorize this Expansion work to proceed.

Thank you for your continuing assistance and please feel free to contact me or Bruce Pohlman if you have any questions, would like any additional information, or want to arrange a meeting.

Regards,
Colorado Highlands Wind LLC

Jim Michael, P. E.
Managing Member

Enclosure

cc: Roy Belden, GE EFS
David Heinze, ENVIRON
Bruce Pohlman, CHW

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Colorado Highlands Wind, LLC

October 4, 2013

Mr. Tom Kroening
Colorado Parks and Wildlife
122 East Edison
P.O. 128
Brush, CO 80723

Ms. Sandy Vana-Miller
US Fish and Wildlife Service
P.O. Box 25486 DFC (65412)
Denver, CO 80225-0486

Re: **CHW Project - Expansion**

Colorado Highlands Wind, LLC (CHW) is writing to update you on the status of our wind resource generation project northeast of Fleming, Colorado (the Project). As you know, CHW recently completed construction of 14 additional wind turbine generators (WTGs) in September 2013 to increase the capacity of the Project to 90 MW using a total of 56 wind turbine generators (WTGs). The renewable energy generated by the project is purchased by Tri-State Generation and Transmission Association, Inc. (Tri-State).

As a result of recent legislative mandates in Colorado for rural areas to promptly increase their supplies of renewable energy, CHW has been requested by Tri-State to expand our existing Project to help meet the new requirements on an expedited basis. A recent capacity study of the Project's major electrical components indicated that an additional 20 MW of generation could be added at the site without significant electrical upgrades. Studies are underway to confirm the ability of the Western Area Power Administration (Western) 115kV transmission system to accept the additional energy deliveries at the Wildhorse Creek Switchyard constructed as part of the Project.

CHW is in discussions with Tri-State for an amendment to the power purchase agreement (PPA) for installation of up to 12 additional WTGs to increase the output of the overall project to approximately 110 MWs (the Expansion) and assist Tri-State in complying with the recent legislative mandates. Mitigation measures to be implemented for the Expansion will be similar to those applied to prior construction activities, as detailed in the Finding of No Significant Impact (FONSI), the Environmental Assessment (EA), and Mitigation Action Plan (MAP) prepared by Western as the lead agency under the National Environmental Policy Act (NEPA), for the existing Project. CHW anticipates the construction contractor mobilizing to the site in early May, and having the Expansion constructed and operational by the fourth quarter of 2014.

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Telephone (303) 730-2328 Fax (303) 730-2518

Existing Studies and Approvals

As you know, as part of the EA completed for the existing Project, consultants funded by CHW conducted extensive biological, avian, habitat, cultural and other reviews of the Project site. Those environmental reviews did not identify any federally endangered or threatened species or critical habitat within the Project area. Based on the EA, Western issued a MAP in January 2009 and the FONSI for the Project in February 2009.

CHW has continued to perform additional avian and cultural studies since issuance of the FONSI to further characterize the Project site and adjacent areas. We summarized in our April 12, 2013 letter to you the extensive environmental studies, reports, and correspondence prepared for the Project and previously submitted to Western, Colorado Parks and Wildlife (CPW) and the US Fish and Wildlife Service (USFWS) as of that date. CHW has also prepared a Bird and Bat Conservation Plan and Post-Construction Bird and Bat Fatality Monitoring Plan for the Project, as required by the MAP, and has provided those documents to Western, CPW, and USFWS. CHW has continued to implement the Post-Construction Bird and Bat Fatality Monitoring Plan this summer and fall and will provide a report of those results to the agencies later this year. CHW is also preparing an Eagle Risk Assessment for the Project.

Status Update and Schedule for Expansion

The proposed Project expansion will consist of installing up to 12 additional 1.7 megawatt ("MW") wind turbine generators (WTGs), bringing the total number of WTGs to 68, with a total nameplate capacity of 111.4 MW. With cumulative collector system, transformer, and tie-line losses, the maximum instantaneous electrical output delivered to Western's interconnection facilities at the Wildhorse Creek Switchyard will be 110 MW or less. The Expansion facilities will be located to the east of the existing Project boundary, on roughly 2,000 acres of private and state land with similar characteristics to the existing Project site. The site location, boundary, preliminary WTG layout, required setbacks, microwave beam paths and the associated setbacks, and environmental restricted areas and setbacks are identified on several maps provided with this letter.

The private land portion of the proposed Expansion area was previously studied by CHW's biological consultant, Walsh Environmental Scientists and Engineers (Walsh), in 2011 and 2012. Work included habitat determination, prairie chicken lek surveys, avian point counts, raptor nest searches, and other wildlife surveys, and the results were previously provided to you.

CHW is currently in discussion with the State Board of Land Commissioners regarding a wind energy production lease for state land located between the existing Project and private land previously studied by CHW. Walsh has indicated that since the state land under consideration is surrounded on three sides by the private land already studied, the previous avian and wildlife surveys provide sufficient coverage of the

state land to enable accurate characterization of the area. The enclosed figure summarizes the observation locations and results of the previous studies in the state land area. As you can see from the enclosed figures, CHW has elected not to pursue beneficial state land to the west with better wind generation potential due to the identified wildlife resources. A habitat evaluation of the state land under consideration was completed this fall and is also enclosed for reference.

The preliminary Expansion WTG layout shown on the enclosed map is in compliance with all previously identified environmental, avian, and biological setbacks, exclusions and/or other restrictions identified in the existing EA, MAP, and FONSI for the Project, and the layout will be implemented in accordance with the MAP issued by Western.

In addition, as required in the MAP, CHW will conduct raptor nest surveys, prairie chicken lek surveys, and other pre-construction wildlife surveys beginning in March 2014 to confirm setback requirements prior to construction.

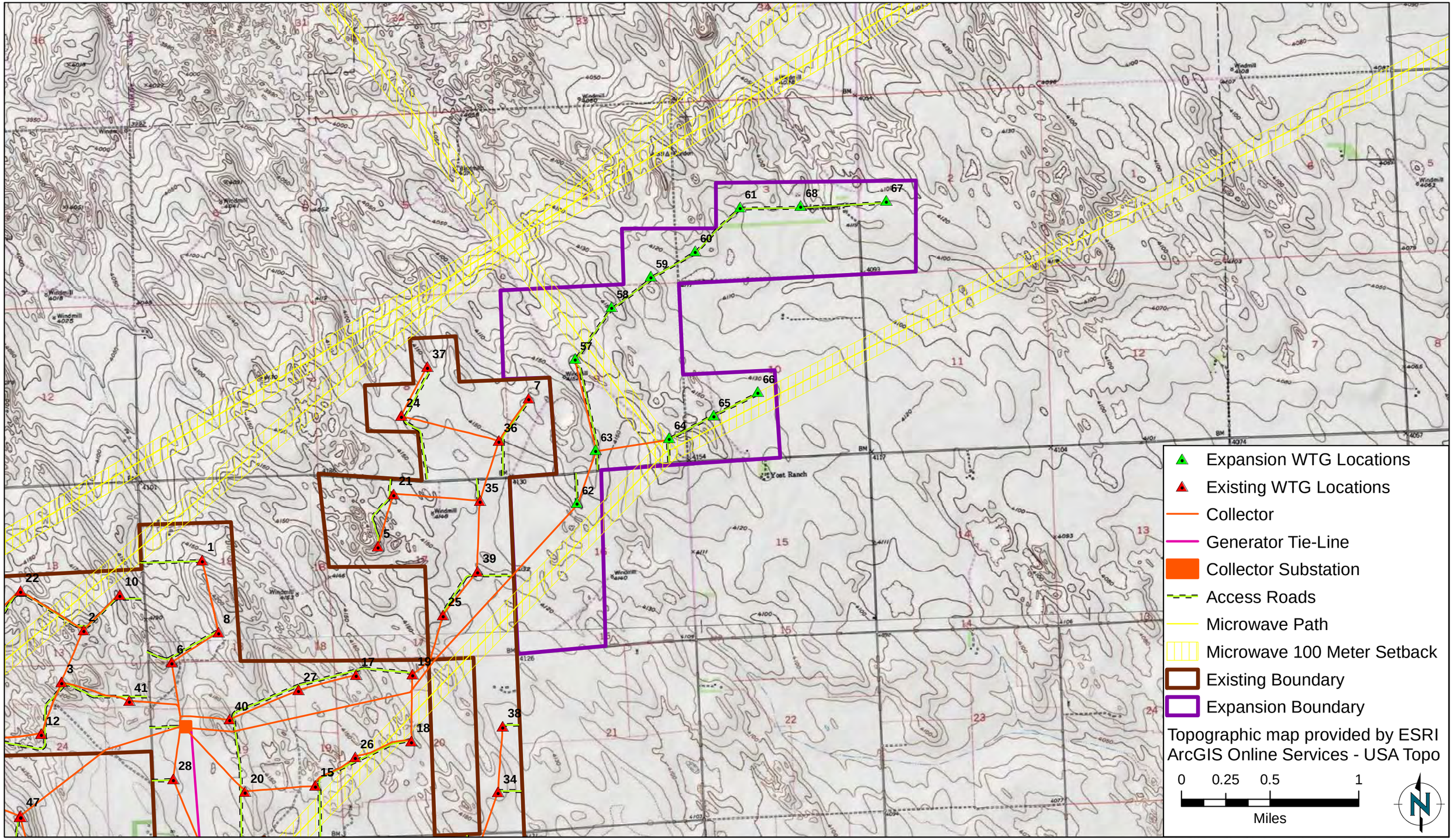
Thank you for your continuing assistance and please feel free to contact me or Bruce Pohlman if you have any comments or questions.

Regards,
Colorado Highlands Wind LLC

Jim Michael, P. E.
Managing Member

Enclosures

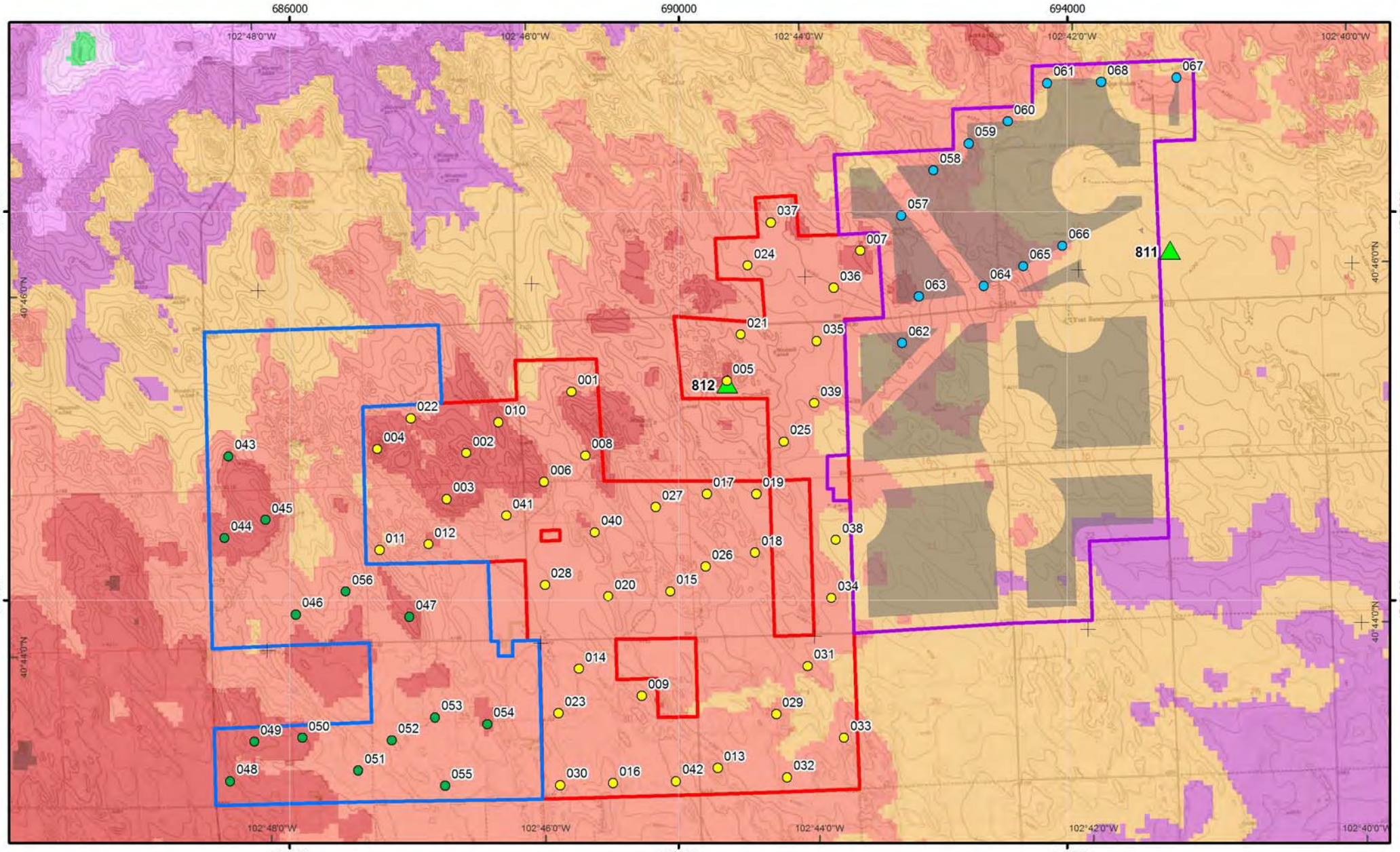
cc: Roy Belden, GE EFS
Wendy Figueroa, CPW
David Heinze, ENVIRON
Bruce Pohlman, CHW
Tim Snowden, Western



ENVIRON

COLORADO HIGHLANDS WIND PROJECT - EXPANSION
FLEMING, COLORADO

EXHIBIT
B-3



COLORADO HIGHLANDS, CO

Mean Annual Wind Speed at 80 Meters

Legend

- GE 1.7-100 Proposed Turbine
- GE 1.7-100 As-Built Turbine
- GE 1.6-100 As-Built Turbine
- Meteorological Tower
- Buildable Area
- Phase 3 Project Area - with State Land
- Operational Turbines Project Boundary
- Expansion Area Project Boundary

Mean Annual Speed at 80 m

m/s	mph
< 7.25	< 16.2
7.25 - 7.50	16.2 - 16.8
7.50 - 7.75	16.8 - 17.3
7.75 - 8.00	17.3 - 17.9
8.00 - 8.25	17.9 - 18.5
8.25 - 8.50	18.5 - 19.0
8.50 - 8.75	18.5 - 19.6
> 8.75	> 19.6

Product

Layout Optimization

Originator

Date: 09/11/2013
Drawn/Checked/Originator: CB/SVK
Client: Colorado Highlands Wind, LLC

Disclaimer

This map was created by AWS Truepower™ using the Sitewind® system and historical weather data.

Reference

0 0.5 1 1.5 2 Kilometers
0 0.3 0.6 0.9 1.2 Miles
N

Wind Data Resolution: 50 m
Coordinate System: UTM 13N
Datum: WGS84

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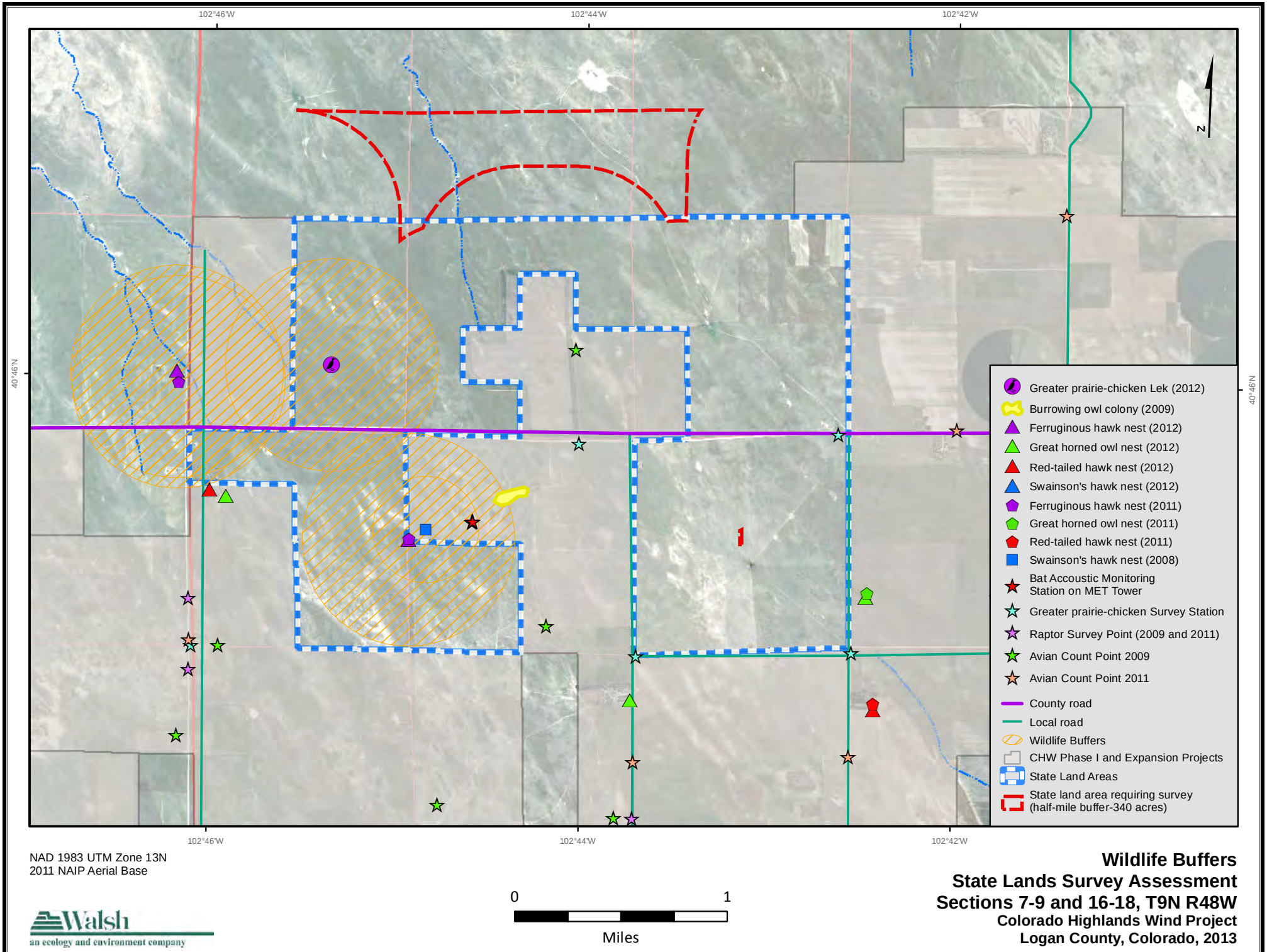
Curitiba, Brazil | Denver, Colorado
info@awstruepower.com | awstruepower.com



NAD 1983 UTM Zone 13N
2011 NAIP Aerial Base

0 1
Miles

Walsh
an ecology and environment company

Wildlife Buffers
State Lands Survey Assessment
Sections 7-9 and 16-18, T9N R48W
Colorado Highlands Wind Project
Logan County, Colorado, 2013

I:\Projects\WA001614_ColoradoHighlands_AvianWA001.696_2013\ExpansionStateLands.mxd 6/8/2013

Walsh
Environmental Scientists and Engineers, LLC
an **ecology and environment** company

M E M O R A N D U M

To: Bruce Pohlman, Colorado Highlands Wind LLC.

From: Jessie Dulberger, Wildlife Biologist

Date: September 23, 2013

Subject: Habitat Assessment, Colorado Highlands Wind Project, Phase III

The Colorado Highlands Phase III Project (Project) is located northeast of the town of Fleming, approximately 3.5 miles north of Highway 6 in Logan County, Colorado. The Project is located east of the northeast corner of Colorado Highlands Wind Farm Phase I, off of County Road 46 and County Road 89. It is situated within the Crook and Fleming U.S. Geological Survey (USGS) 7.5 Minute Quadrangle Maps in the following Townships, Ranges, and Sections:

Crook Quadrangle: All or part of Sections 9 and 16; T9N R48W

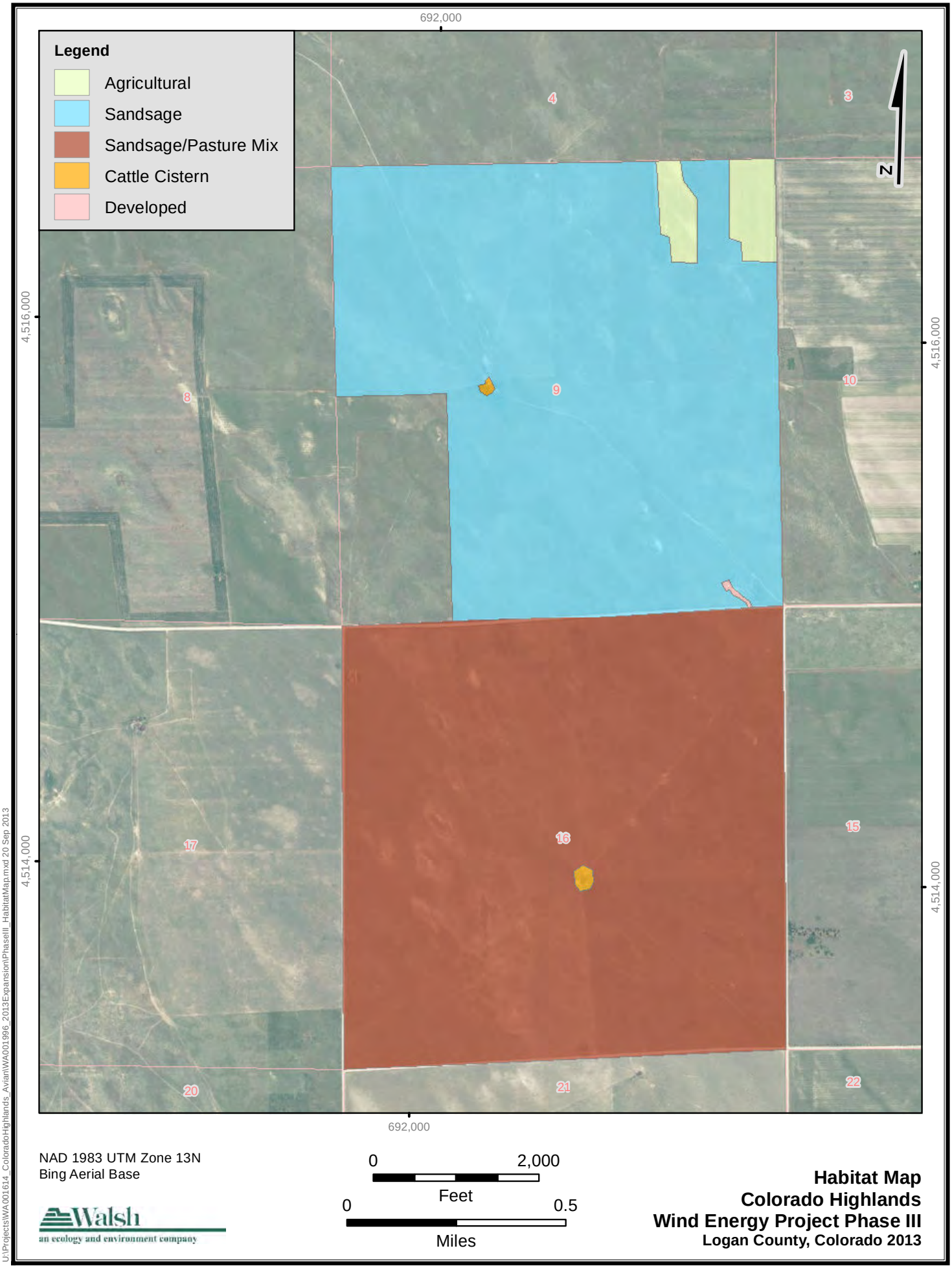
The Project boundary encompasses 1,237 acres. Phase III will use 12 General Electric 1.7-MW wind turbine generators and produce 20.4 megawatts upon completion. In addition to the turbines, the Project will include buried electrical collector lines, a collector substation, overhead 115 kilovolt (kV) transmission line, and access roads.

Walsh conducted one day of onsite field mapping of the dominant habitat types on the Project site, using Geographic Information System (GIS) and an aerial map. All habitat types were delineated on the aerial map and later digitized (Figure 1).

Section 9 and 16 are state lands. The primary land use for both sections is grazing for cattle. The Project habitat summary is: 53 percent sandsage/pasture mix, 45 percent sandsage, 2 percent agricultural lands, and less than 1 percent developed.

Section 9 is predominately sandsage habitat with two small areas of agricultural lands in the northeast corner. There is also a small section in the southeast corner that was developed with a microwave tower. Section 16 is predominantly sandsage-pasture mixture. A cattle cistern is centrally located within each section.

The habitat types stated above are typical for this region.



NAD 1983 UTM Zone 13N
Bing Aerial Base

Walsh
an ecology and environment company

0 2,000
Feet

0 0.5
Miles

Habitat Map
Colorado Highlands
Wind Energy Project Phase III
Logan County, Colorado 2013

U:\Projects\WA001614_ColoradoHighlands_Avian\WA001996_2013Expansion\PhaseIII_HabitatMap.mxd 20 Sep 2013

bruce-pohlman@alliancepower.com

From: Figueroa - DNR, Wendy <wendy.figueroa@state.co.us>
Sent: Monday, October 28, 2013 2:56 PM
To: bruce-pohlman@alliancepower.com
Subject: Re: FW: CHW Expansion update letter

Bruce,

Regarding your email from October 4, 2013 about the Colorado Highlands Wind Energy Project (Fleming Wind).
The proposed studies/activities regarding sensitive species and biological surveys are consistent with the recommendations presented by Colorado Parks and Wildlife at the June 25, 2008 meeting at the Brush Office; the letter sent by the CDOW prior to that meeting; and ongoing communications since then.
Thank you for the continuing dialog concerning this project and I look forward to working with you to address the concerns identified by Colorado Parks and Wildlife.

It may be worth another meeting here at the Brush Office to discuss the development timeline and GPC surveys for this spring.

Thank you,

Wendy Figueroa

Conservation Biologist
Colorado Parks and Wildlife
122 E Edison
Brush, CO 80723

On Wed, Oct 9, 2013 at 3:10 PM, bruce-pohlman@alliancepower.com <bruce-pohlman@alliancepower.com> wrote:

Wendy,

I wanted to follow up on my e-mail from last week with information regarding an expansion to the Colorado Highlands Wind project. We are working quickly to assist Tri-State in securing additional low-cost wind energy by trying to capture federal production tax credits for the proposed expansion project, which requires major investment before the end of this year. To enable the required investment to be made, we are working to complete several permitting issues, including a conditional use permit from Logan County. In addition to working with Western under NEPA, the County has indicated that we need to submit something from CPW as evidence that we have consulted with CPW on the proposed expansion. To that end, I am requesting that you provide an e-mail response, similar to the attached from back in 2008, regarding the expansion project.

Unfortunately, time is not our friend and I need something before next Tuesday (10/15). I understand this is not the typical procedure for review, but circumstances have forced a very accelerated timeline on us. I am available to discuss the expansion and this request any time the rest of this week, or if it would be beneficial, I can meet with you in Brush on Friday or Monday.

Thank you for your continued assistance on this project. Please contact me at your convenience.

Regards,

Bruce

From: bruce-pohlman@alliancepower.com
Sent: Friday, October 04, 2013 4:39 PM
To: sandy_vana-miller@fws.gov; tom.kroening@state.co.us
Cc: wendy.Figueroa@state.co.us; jim-michael@alliancepower.com; tsnowden@wapa.gov; dheinze@environcorp.com; roy.belden@ge.com

Subject: CHW Expansion update letter

All,

Attached please find an update on the Colorado Highlands Wind project outside of Fleming, Colorado.

Please contact me if you have any questions.

Regards,

Bruce Pohlman

--
Wendy Figueroa
Conservation Biologist
Colorado Parks and Wildlife
122 E Edison
Brush, CO 80723

Department of Energy
Western Area Power Administration
Rocky Mountain Customer Service Region
P.O. Box 3700
Loveland, CO 80539-3003

NOV 05 2013

RECEIVED NOV - 7 2013

Mr. Jim Michael, P.E.
Managing Member
Colorado Highlands Wind, LLC
2001 E. Easter Avenue, Suite 100
Centennial, CO 80122

Dear Mr. Michael,

This letter is in response to your letter dated September 30, 2013, "Proposed Minor Expansion of Colorado Highlands Wind Project and Western Interconnect Agreement". Your letter describes the proposed Colorado Highlands Wind (CHW) project expansion from the existing 90 megawatt (MW) facility to a nameplate capacity of 111.4 MW. This expansion would include construction of 12 additional 1.7 MW wind turbine generators located on 2000 acres of State and private owned land adjoining the eastern border of the existing project.

A suggestion was made in the letter by CHW that Western Area Power Administration (Western) might be able to satisfy its requirements under the National Environmental Policy Act (NEPA) with a Categorical Exclusion (CX) found in 10 CFR 1021 § 1021.410, Subpart D, Appendix B, B 4.8 "Electricity Transmission Agreements." However, this CX specifically states "...provided that no new generation projects would be involved..." Since the project contains new generation facilities this particular CX does not apply.

CHW and Western completed an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the original project in 2009. CHW has submitted a change in the proposed action that is substantial and may have bearing on environmental resources. This proposed action will require Western to complete a System Impact Study and amend its existing Large Generator Interconnection Agreement with CHW. Since amending the agreement constitutes a Federal action, Western must comply with its obligations under NEPA. The Department of Energy NEPA Implementing Regulations do not necessarily require preparation of a Supplement Analysis to determine the need for further NEPA review of an action analyzed in an EA. Given the size of the expansion and the possible effects to some environmental resources, Western has determined that a Supplemental EA be completed for the project expansion. The supplemental EA should incorporate and explain the differences between the new proposal and the original project and the potential direct and indirect effects, and cumulative effects of the project expansion. Particular attention should be paid to those resources that required mitigation in the original EA and Mitigation Action Plan. Western understands that CHW has been conducting some environmental surveys post-construction of the original proposal and these may aid in assessing the potential impacts to resources by the expansion proposal.

If you have any questions regarding this letter please contact Tim Snowden, Westerns Rocky Mountain Region Office, (970) 461-7440 or tsnowden@wapa.gov.

Sincerely,

Gene Iley, Jr.

Gene Iley
Environmental Manager

cc:
Mr. Bruce Pohlman-CHW
Colorado Highlands Wind, LLC
2001 E. Easter Avenue, Suite 100
Centennial, CO 80122

HISTORY Colorado

December 13, 2013

Tim Snowden
Department of Energy
Western Area Power Administration
555 Crossroads Boulevard
Loveland, Colorado 80539

Re: Alliance Power: A Class III Cultural Resources Inventory of the Colorado Highlands Wind Farm Expansion, Phase 2, in Logan County, Colorado (CHS #65110)

Dear Mr. Snowden:

We received documentation from Melissa Elkins, Project Manager, Metcalf Archaeological Consultants, dated December 6, 2013 and received by our office on December 9, 2013 for the above referenced project described as falling under the jurisdiction of Western Area Power Administration. Pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations 36 CFR Part 800, we are providing comments regarding National Register of Historic Places eligibility and project effect.

After review of the provided documentation, we concur that site 5LO877 is eligible for listing to the National Register. Further we concur that sites 5LO873 and 5LO878.1 as well as isolated finds 5LO871, 5LO872, 5LO874, 5LO875, and 5LO876 are not eligible for listing to the National Register of Historic Places. Assuming the management recommendations stipulating avoidance of site 5LO877 are achieved, we concur that the proposed undertaking will result in no historic properties affected per 36 CFR 800.4(d)(1). If this resource cannot be avoided during project construction or subsequent operations and maintenance activities, we request that additional consultation with our office occur to explore possible minimization or mitigation alternatives.

Please remember that the consultation process does involve other consulting parties such as local governments and Tribes, which as stipulated in 36 CFR 800.3 are required to be notified of the undertaking. Additional information provided by the local government, Tribes or other consulting parties may cause our office to re-evaluate our comments and recommendations.

Should unidentified archaeological resources be discovered during the course of the project, work must be interrupted until the resources have been evaluated in terms of the National Register eligibility criteria (36 CFR 60.4) in consultation with our office.

Thank you for the opportunity to comment. If we may be of further assistance, please contact Mark Tobias, Section 106 Compliance Manager, at (303) 866-4674 or mark.tobias@state.co.us.

Sincerely,

for Edward C. Nichols
State Historic Preservation Officer
ECN/MAT

cc. Melissa Elkins, Metcalf Archaeological Consultants

WAPA F 1400.59#
(7-91)

United States Government **Department of Energy**

Western Area Power Administration

memorandum

DATE: MAR 2 5 2014

REPLY TO ATTN OF: J0400

SUBJECT: Determination to Prepare a Supplemental Environmental Assessment for the Modification of the Western Area Power Administration Interconnect Agreement for Colorado Highlands Wind Project, Logan County, CO

TO: File

Western Area Power Administration, Rocky Mountain Region (Western), has received a request from Colorado Highlands Wind to modify its Interconnection Agreement for the Colorado Highlands Wind Project (Project). The modification includes expanding the existing Colorado Highlands Wind Farm by adding eleven wind turbine generators (WTGs) on approximately 1,200 acres of state and private land adjoining the eastern border of the existing Project. The electricity produced by the additional WTGs would be about 20 MW and would be transferred to Western's Sterling-Frenchman Creek 115-kV Transmission Line at Western's Wildhorse Creek Switchyard.

The Project and the Project modification are located northeast of the town of Fleming in Logan County, Colorado. As with the Project, the maximum blade tip height for the wind turbines for the modification is approximately 427 feet (130 meters). Other components of the modification would include underground electrical systems and access roads.

Western's decision is limited to determining if the MW from the additional WTGs proposed by the applicant can be interconnected with the Federal transmission system. Western's approval of the interconnection request is one of several approvals needed for the modification of the Project to proceed.

Western completed an environmental assessment and Finding of No Significant Impact in 2009 for the Project. Western's current proposal to modify the Interconnection Agreement for the Project fits within a class of actions that normally require preparation of an environmental assessment, specifically section C7 of Appendix C to Subpart D of 10 C.F.R. Part 1021, of the Department of Energy National Environmental Policy Act Implementing Procedures.

In accordance with my responsibilities under section 5.a.(8) of the Department of Energy Order 451.1B, National Environmental Policy Act Compliance Program, I have determined that the modification to the Colorado Highlands Wind Project will require the preparation of a supplemental environmental assessment.

Bradley S. Warren
Regional Manager

cc:
S. Kimbrough, A7400, Lakewood, CO
L. Reilly, A7400, Lakewood CO
J0400
J0420
J7305

South **P**latte **W**ater **R**elated **A**ctivities **P**rogram, Inc.
220 Water Avenue, Berthoud, Colorado, 80513

May 14, 2014

Mr. Bruce Pohlman
Colorado Highlands Wind LLC
2001 E. Easter Ave.
Suite 100
Centennial, CO 80122

Dear Mr. Pohlman:

Re: SPWRAP Assessment for One-Time Water Use on Colorado Highlands Wind Project Expansion

The South Platte Water Related Activities Program, Inc. (SPWRAP) understands that the Colorado Highlands Wind LLC has a planned project to expand the existing wind farm outside of Fleming, CO and has a need to cover water depletions for approximately 5 acre-feet of one-time water use for construction activities, including concrete mixing, soil compaction, and dust control.

SPWRAP has indicated that it will cover this one-time use of water under its existing membership structure for "one-time" uses of water, thereby allowing the expansion project to rely on the Platte River Recovery Implementation Program for depletions caused to the South Platte basin.

This letter confirms that SPWRAP has received a check for the sum of $150.00 from Colorado Highlands Wind LLC to cover the SPWRAP assessment for a one-time use of approximately 5 acre-feet of water from the South Platte basin.

Because SPWRAP does not issue membership certificates for one-time uses of water, this letter constitutes SPWRAP's confirmation that Colorado Highlands Wind LLC has paid their assessment to SPWRAP for the one-time use of water in the South Platte basin associated with the expansion project.

Sincerely,

Kevin Urie
Executive Director
SPWRAP

APPENDIX B
SCOPING AND PUBLIC NOTIFICATION

APR 2 2 2014

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ute Mountain Ute Tribe
Chairman Gary Hayes
Ute Mountain Ute Tribe
P.O. Box 248
Towaoc, CO 81334-0248

Dear Chairman Hayes:

The Western Area Power Administration (Western) is a federal power marketing administration in the U.S. Department of Energy. Western proposes to modify the existing Interconnection Agreement with Highlands Wind, LLC (CHW) to include the proposed expanded wind farm and additional electrical generation.

The proposed Colorado Highlands Wind Energy Project Expansion (Project) is located in Logan County, Colorado, and would be interconnected to Western's electrical transmission system at Westerns existing Wildhorse Creek Switchyard. The Project includes CHW expanding their existing Colorado Highlands Wind Farm by constructing up to 12 additional wind turbine generators (WTGs) on approximately 2,000 acres of state and private land adjoining the eastern border of the existing Project. Westerns federal action is limited to the modification of the existing Interconnection Contract with CHW, and does not entail any construction or modification of federally owned or operated equipment or facilities.

Western is the lead agency for complying with the National Environmental Policy Act and National Historic Preservation Act (NHPA). Western will prepare a Supplemental Environmental Assessment to the Colorado Highlands Wind Project (DOE/EA-1611). The new Supplemental Environmental Assessment (SEA) will evaluate the environmental effects of the expansion of the existing wind farm as described in CHW's proposed project. Under its responsibilities in Section 106 of the NHPA, Western has determined that the Project is a Federal undertaking that has the potential to cause effects on historic properties. Pursuant to 36 CFR 800.4(a)(4), Western is initiating consultation with Tribes for input concerning the Project. Western is also consulting with the State Historic Preservation Officer (SHPO).

We request comments from you and other consulted Tribes and parties concerning the Project. Comments may include identification of Traditional Cultural Properties and other issues. At your request, cultural resource survey reports will be sent to your office if you wish to review them. The reports have been sent to the SHPO for review and comment. We also request information that you have on known archaeological resources in the Project area. In order to help keep the Project on schedule, we respectfully request that you respond to this letter within

30 days. The Area of Potential Effect (APE) for the Project has not yet been determined. Additional Project design information from CHW will be used to define the APE. All of the APE will have cultural surveys prior to any construction activities.

The Project would be constructed within the following townships, ranges, and sections (Table 1):

TABLE 1

CHW Expansion Area (6th P.M.)		
Township	**Range**	**Section**
9N	48W	2, 3, 4, 9, 10, 15, 16, 21, 22

The Project is located North of the Town of Dailey. The expansion Project area includes approximately 2,000 acres of state and private land adjoining the eastern border of the existing Project. The electricity produced would be transferred to Western's Sterling-Frenchman Creek 115-kilovolt (kV) transmission line at the existing Wildhorse Creek Switchyard. Upon completion, the Colorado Highlands Wind Project would consist of a total of up to 68 WTGs which would increase the output of the overall project from 90 MW to approximately 110 MW. The maximum blade tip height for the wind turbines is approximately 427 feet (130 meters). Other Project components would include underground electrical systems and access roads that will be described in the SEA. The design and location determination of these facilities is currently being performed by CHW.

If you have any questions or concerns, please do not hesitate to contact Mr. Rod O'Sullivan at Corporate Services Office, 12155 W. Alameda Parkway, Lakewood, CO 80228-2802 or (720) 962-7260.

Sincerely,

Stephen C. Tromly

Stephen Tromly
Native American Liaison

Enclosure

cc:
Mr. Terry Knight, Sr.
NAGPRA Representative/THPO
Ute Mountain Ute Tribe
P.O. Box 468
Towaoc, CO 81334

bcc:
A7400 (RF, O'Sullivan, Tromly)
G. Iley, J0400, Loveland, CO
T. Snowden, J0420, Loveland, CO

A7400:RO'Sullivan:x7260:lou:4/21:14:Ute Mountain Tribal Letter Fleming Wind

Tribal Consultation for Colorado Highlands Wind Farm Expansion Project (RMR)

EASTERN SHOSHONE TRIBE:

Mr. Ivan Posey, Chairman (Send original here, certified mail)
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514
(307) 332-3532 or 4932

cc:

Arlen Shoyo (For Cultural Coordination)
Shoshone Business Council Authorized Tribal Spiritual Leaders include Richard "Dickie" Ferris or Floyd Osborne. These individuals must be contacted only by coordinating with Arlen Shoyo
P.O. Box 538
Fort Washakie, WY 82514.
(307) 332-3532 or 4932

Mr. Reed Tidzump
Eastern Shoshone THPO
P.O. Box 538
Fort Washakie, Wy 82514

Ms. Reba Tehran (Courtesy Copy for Cultural Issues)
Shoshone Cultural Office
P.O. Box 1008
Fort Washakie, WY 82514

NORTHERN ARAPAHO TRIBE:

Mr. Richard Braman, Chairman
Arapaho Business Council
P.O. Box 396
Fort Washakie, WY 82514
(307) 332-6120 or (307) 856-3461
FAX (307) 332-7543
E-mail: arapahotribe@hotmail.com

cc: Ms. JoAnn White **(For cultural issues consultation)**
Tribal Historic Preservation Officer
Northern Arapaho Tribe
P.O. Box 1056
Fort Washakie, WY 82514
cell: (307) 851-9617

UTE TRIBE:

Ms. Maxine Natchees, Chairwoman (send original here, certified mail)
Ute Tribal Council
P.O. Box 190
Tribal Office Building
Fort Duchesne, UT 84026

cc:

Ms. Betsy Chapoose, Director
Cultural Rights and Protection
Ute Indian Tribe
P.O. Box 190
Fort Duchesne, UT 84026
(435) 722-4992 or (435) 722-0592

OGLALA LAKOTA NATION:

Ms. Cecelia Firethunder, President (Send original here, certified mail)
Oglala Sioux Tribal Council
P.O. Box H
Pine Ridge, SD 57770
(605) 867-5821
Fax (605) 867-5659

Southern Ute Indian Tribe
Chairman Jimmy Newton Jr.
Southern Ute Indian Tribe
356 Ouray Drive, P.O. Box 737
Ignacio, CO 81137
Phone: 970-563-0100 Fax: 970-563-0396
Email: jnewton@southern-ute.nsn.us

Sunshine Flores is the Executive Assistant to the Chairman.
Email: sflores@ southern-ute.nsn.us

Alden B. Naranjo,
NAGPRA Coordinator
P.O. Box 737
Ignacio, CO 81137
Phone: 970- 563-0100 Ext. 2257 Fax (970) 563-0316
Email: anaranjo@ southern-ute.nsn.us
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Ute Mountain Ute Tribe
Chairman Gary Hayes
Ute Mountain Ute Tribe
P.O. Box 248
Towaoc, CO 81334-0248
Phone: 970-565-3751 Fax: 970-565-7412
Email: ghayes@utemountain.org

Mr. Terry Knight, Sr.
NAGPRA Representative/THPO
Ute Mountain Ute Tribe
P.O. Box 468
Towaoc, CO 81334
Phone: 970-564-5727 Fax: 970-565-5401

APR 2 3 2014

Mr. Edward Nichols
Colorado State Historical Preservation Officer
1200 Broadway
Denver, CO 80203

Dear Sirs:

The Western Area Power Administration (Western) is a federal power marketing administration in the U.S. Department of Energy. Western proposes to modify the existing Interconnection Agreement with Highlands Wind, LLC (CHW) to include the proposed expanded wind farm and additional electrical generation.

The proposed Colorado Highlands Wind Energy Project Expansion (Project) is located in Logan County, Colorado, and would be interconnected to Western's electrical transmission system at Westerns existing Wildhorse Creek Switchyard. The Project includes CHW expanding their existing Colorado Highlands Wind Farm by constructing up to 12 additional wind turbine generators (WTGs) on approximately 2,000 acres of state and private land adjoining the eastern border of the existing Wind Farm. Westerns federal action is limited to the modification of the existing Interconnection Contract with CHW, and does not entail any construction or modification of federally owned or operated equipment or facilities.

Western is the lead agency for complying with the National Environmental Policy Act and National Historic Preservation Act (NHPA). Western will prepare a Supplemental Environmental Assessment to the Colorado Highlands Wind Project (DOE/EA-1611). The new Supplemental Environmental Assessment (SEA) will evaluate the environmental effects of the expansion of the existing wind farm as described in CHW's proposed project. Under its responsibilities in Section 106 of the NHPA, Western has determined that the Project is a Federal undertaking that has the potential to cause effects on historic properties.

The Project is located northeast of the Town of Fleming Colorado. The expansion Project area includes approximately 2,000 acres of state and private land adjoining the eastern border of the existing Project. The electricity produced would be transferred to Western's Sterling-Frenchman Creek 115-kilovolt transmission line at the existing Wildhorse Creek Switchyard. Upon completion, the Colorado Highlands Wind Project would consist of a total of up to 68 WTGs which would increase the output of the overall project from 90 MW to approximately 110 MW. The maximum blade tip height for the wind turbines is approximately 427 feet (130 meters). Other Project components would include underground electrical systems and access roads that will be described in the SEA. The design and location determination of these facilities is currently being performed by CHW.

Your comments and concerns about this Project may be sent to Mr. Rod O'Sullivan, Corporate Services Office, P.O. Box 281213, Lakewood, CO 80228-8213. If you have any questions, please do not hesitate to contact Mr. Rod O'Sullivan at (720) 962-7260.

Sincerely,

/s/

Matthew Blevins
Environmental Team Lead

bcc:
A7400 (RF, O'Sullivan, Tromly
G. Iley, J0400, Loveland, CO
T. Snowden, J0420, Loveland, CO

A7400:RO'Sullivan:x7260:lou:4/22/14:State Agency CO State Historical Preservation Officer Letter

- Federal Agencies

US Fish and Wildlife Service, Region 8
134 Union Blvd, Suite 400
Lakewood, CO 80228

CC:

Susan Linner, Colorado Field Supervisor
US Fish and Wildlife Service
P.O. Box 25486
Denver Federal Center
(MS 65412)
Denver, Colorado 80225

U.S. Army Corps of Engineers
1616 Capitol Ave., Ste. 9000
Omaha, NE 68102

cc: US Army Corps of Engineers
9307 South Wadsworth Blvd.
Littleton, CO 80128
(303) 979-4120

USDA, Natural Resources Conservation Service
Denver Federal Center
Building 56, Room 2604
PO Box 25426

U.S. Department of Transportation
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Avenue, S.W., Suite 315
Renton, WA 98057-3356

Federal Highway Administration
Colorado Division
12300 West Dakota Avenue, Suite 180
Lakewood, Colorado 80228

State Agencies

Colorado Parks and Wildlife
1313 Sherman Street, 6th Floor
Denver, CO 80203

cc: Colorado Parks and Wildlife
122 E. Edison
Brush, CO 80723

Colorado Department of Transportation
Headquarters Office
4201 E Arkansas Ave
Denver CO 80222

Mr. Edward Nichols
Colorado State Historical Preservation Officer
1200 Broadway
Denver, CO 80203

Federal and State Elected Officials

John W Hickenlooper, Governor
136 State Capitol
Denver, CO 80203-1792

Local Units of Government

Town of Fleming, CO

Logan County Commissioners
315 Main Street
Sterling, CO 80751

cc: Logan County Planning
315 Main Street, Suite 2
Sterling, CO 80751

Others

Colorado State Lands Board
1127 Sherman Street, Suite 300
Denver, CO 80203-2206

Colorado Energy Office
1580 Logan Street, Suite 100,
Denver, CO 80203

The Wildlife Society
5410 Grosvenor Lane, Suite 200
Bethesda, MD 20814

APPENDIX C

FEDERALLY LISTED SPECIAL STATUS WILDLIFE SPECIES FOR LOGAN COUNTY, COLORADO

STATE LISTED THREATENED, ENDANGERED, AND SPECIES OF SPECIAL CONCERN WITH KNOWN OR POTENTIAL OCCURRENCE WITHIN THE COLORADO HIGHLANDS PROJECT AREA

Table 1. Federally Listed Special Status Wildlife Species for Logan County, Colorado

Common Name	Scientific Name	Status[1]	Likelihood of Occurrence on Project Site	Habitat
Fish				
Pallid sturgeon	*Scaphirhynchus albus*	FE	None	River habitat downstream of Logan County.
Nongame				
Least tern (interior population)	*Sterna antillarum*	FE	None	River habitat downstream of Logan County.
Piping plover	*Charadrius melodus*	FT	Very Unlikely	Mudflats and shorelines of reservoirs and lakes.
Whooping crane	*Grus americana*	Experimental Population, Non-Essential	Unlikely	River habitat downstream of Logan County.

[1]Status: FE = Federally Endangered; FT = Federally Threatened, in accordance with the United States Fish and Wildlife Service.

Table 2. State Listed Threatened, Endangered, and Species of Special Concern with Known or Potential Occurrence Within the Colorado Highlands Project Area.

Common Name	Scientific Name	Status[1]	Likelihood of Occurrence on Project Site	Habitat
Game Birds				
Plains Sharp-Tailed Grouse	*Tympanuchus phasianellus jamesii*	SE	Possible	Native and introduced tall grasslands, CRP lands, grassland/sandsage.
Raptors				
American peregrine falcon	*Falco peregrinus anatum*	SC	Observed migrant	Cottonwood riparian, shelterbelt trees.
Bald Eagle	*Haliaeetus leucocephalus*	ST	Possible migrant	Cottonwood riparian, shelterbelt trees.
Burrowing owl	*Athene cunicularia*	ST	Observed	Grassland, abandoned black-tailed prairie dog and rodent burrows.
Ferruginous hawk	*Buteo regalis*	SC	Observed	Grassland, prairie dog towns, rock outcrops, shelterbelt trees.
Shorebirds				
Greater sandhill crane	*Grus canadensis tabida*	SC	Possible migrant	Agricultural areas, moist meadows.
Whooping crane	*Grus americana*	FE, SE	Unlikely migrant	Mudflats and shorelines of reservoirs and lakes, agricultural areas.
Piping plover	*Charadrius melodus*	FT, ST	Unlikely migrant	Mudflats and shorelines of reservoirs and lakes.
Western snowy plover	*Charadrius alexandrinus*	SC	Unlikely migrant	Mudflats and shorelines of reservoirs and lakes.
Mountain plover	*Charadrius montanus*	SC	Possible	Shortgrass prairies and steppe; prefers areas with little vegetative cover, such as prairie dog colonies.
Long-billed curlew	*Numenius americanus*	SC	Possible migrant	Grassland, plains, foothills, wet meadows
Neotropical Migrants				
Western yellow-billed cuckoo	*Coccyzus americanus*	SC	Possible migrant	Lowland riparian, shelterbelt trees.
Mammals				
Black-tailed prairie dog	*Cynomys ludovicianus*	SC	Observed	Short and midgrass prairies.
Swift fox	*Vulpes velox*	SC	Possible	Short and midgrass prairies.
Reptiles				
Yellow mud turtle	*Kinosternon flavescens*	SC	Possible	Permanent and semi-permanent ponds near grasslands and sandsage.

[1]Status: FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened; SC = Species of Special Concern in Colorado.

APPENDIX D
COLORADO NATURAL HERITAGE QUERY

Colorado State University

Knowledge to Go Places

May 29, 2008

Colorado Natural Heritage Program
Colorado State University
8002 Campus Delivery
Fort Collins, Colorado 80523-8002
(970) 491-1309
FAX: (970) 491-3349
www.cnhp.colostate.edu

Danielle Cassidy
Ecologist
Walsh Environmental Scientists and Engineers LLC
4888 Pearl East Cir Ste 108
Boulder CO 80301-2475

Dear Danielle:

The Colorado Natural Heritage Program (CNHP) is in receipt of your request for information regarding a proposed wind farm project in Logan County, CO. In response, I have searched our Biodiversity Tracking and Conservation System (BIOTICS) for natural heritage elements (occurrences of significant natural communities and rare, threatened or endangered plants and animals) documented from the vicinity of the area specified in your request, specifically within a two mile radius of the township, range and sections listed in your request.

The enclosed report describes natural heritage resources known from this area and gives location (by Township, Range, and Section), precision information, and the date of last observation of the element at that location. This report includes elements known to occur within the specified project site, as well as elements known from similar landscapes near the site. Please note that "precision" reflects the resolution of original data. For example, an herbarium record from "4 miles east of Colorado Springs" provides much less spatial information than a topographic map showing the exact location of the occurrence. "Precision" codes of Seconds, Minutes, and General are defined in the footer of the enclosed report.

The report also outlines the status of known elements. We have included status according to Natural Heritage Program methodology and legal status under state and federal statutes. Natural Heritage ranks are standardized across the Heritage Program network, and are assigned for global and state levels of rarity. They range from "1" for critically imperiled or extremely rare elements, to "5" for those that are demonstrably secure.

You may notice that some occurrences do not have sections listed. Those species have been designated as "sensitive" due to their rarity and threats by human activity. Peregrine falcons, for example, are susceptible to human breeders removing falcon eggs from their nests. For these species, CNHP does not normally provide location information beyond township and range. Please contact us should you require more detailed information for sensitive occurrences.

There are two CNHP designated Potential Conservation Areas (PCAs) located within your project area (see enclosed PCA site reports and shapefile). In order to successfully protect populations or occurrences, it is necessary to delineate conservation areas. These conservation areas focus on capturing the ecological processes that are necessary to support the continued existence of a particular element of natural heritage significance. Conservation areas may include a single occurrence of a rare element or a suite of rare elements or significant features.

Natural Heritage Program
COLORADO

The goal of the process is to identify a land area that can provide the habitat and ecological processes upon which a particular element or suite of elements depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses. The proposed boundary does not automatically exclude all activity. It is hypothesized that some activities will cause degradation to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the preliminary conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

The Colorado Division of Wildlife has legal authority over wildlife in the state. CDOW would therefore be responsible for the evaluation of and final decisions regarding any potential effects a proposed project may have on wildlife. If you would like more specific information regarding these or other vertebrate species in the vicinity of the area of interest, please contact the Colorado Division of Wildlife.

The information contained herein represents the results of a search of Colorado Natural Heritage Program's (CNHP) Biodiversity Tracking and Conservation System (BIOTICS), and can be used as notice to anticipate possible impacts or identify areas of interest. Care should be taken in interpreting these data. Sensitive elements are currently known from within the proposed project area, and additional, but undocumented, elements may also exist (see enclosed Adobe PDF elements report). Additionally, we searched our observations database for non-fully tracked species that produced a few additional records (see enclosed MS Excel observations data report). Please note that the absence of data for a particular area, species, or habitat does not necessarily mean that these natural heritage resources do not occur on or adjacent to the project site, rather that our files do not currently contain information to document their presence. CNHP information should not replace field studies necessary for more localized planning efforts, especially if impacts to wildlife habitat are possible.

Although every attempt is made to provide the most current and precise information possible, please be aware that some of our sources provide a higher level of accuracy than others, and some interpretation may be required. CNHP's data system is constantly updated and revised. Please contact CNHP for an update or assistance with interpretation of this natural heritage information.

Sincerely,

Michael Menefee
Environmental Review Coordinator

Enc.

Natural Heritage Program
COLORADO

Locations and Status of Rare and/or Imperiled Species and Natural Communities known from or likely to occur within a Two-mile Radius of the Proposed Project Area for Wind Farm Project in Logan County, CO

Report generated: 29 May 2008

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
3,224	Birds	*Tympanuchus cupido pinnatus*	Greater Prairie Chicken	S	2005-05-20	009N048W			G4T4	S3	C	-	USFS	
						009N048W								
						009N048W								
						009N049W								
						009N049W								
						010N047W								
						010N047W								
						010N047W								
						010N047W								
						010N047W								
						010N047W								
						010N048W								
						010N048W								
						010N048W								
						010N048W								
						010N048W								
						010N048W								
						010N049W								
						010N049W								
						010N049W								
10,189	Natural Communities	*Artemisia filifolia / Andropogon hallii Shrubland*	Northern Sandhill Prairie	S	1997-08-01	010N048W	08		G3?	S2	B	-		
						010N048W	09							
						010N048W	10							
						010N048W	15							
						010N048W	16							
						010N048W	17							
						010N048W	18							
						010N048W	19							
						010N048W	20							
						010N048W	21							
						010N048W	22							
						010N048W	28							
						010N048W	29							

precision codes: S = "seconds", location known within 100m; M = "minutes", location known within 1 mile; G = "general", location known within 5 miles

Locations and Status of Rare and/or Imperiled Species and Natural Communities known from or likely to occur within a Two-mile Radius of the Proposed Project Area for Wind Farm Project in Logan County, CO

Report generated: 29 May 2008

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
						010N048W	30							
						010N048W	31							
						010N048W	32							
						010N048W	33							
						010N049W	13							
						010N049W	23							
						010N049W	24							
						010N049W	25							
						010N049W	36							
4,104	Natural Communities	*Populus deltoides - (Salix nigra) / Spartina pectinata - Carex spp. Woodland*	Plains Cottonwood Riparian Woodland	S	1995-08-24	010N048W	03		G1	S1	B	-		
						010N048W	04							
						010N048W	07							
						010N048W	08							
						010N048W	09							
						010N048W	10							
						010N048W	18							
						010N049W	12							
						010N049W	13							
						010N049W	14							
						010N049W	15							
						010N049W	16							
						010N049W	17							
						010N049W	19							
						010N049W	20							
						010N049W	30							
						010N050W	25							
						010N050W	26							
						010N050W	27							
						010N050W	33							
						010N050W	34							
5,864	Natural Communities	*Populus deltoides / Carex pellita Woodland*	Plains Cottonwood Riparian Woodland	S	1995-08-27	010N048W	03		G2	S1	B	-		
						010N048W	04							
						010N048W	07							

precision codes: S = "seconds", location known within 100m; M = "minutes", location known within 1 mile; G = "general", location known within 5 miles

Locations and Status of Rare and/or Imperiled Species and Natural Communities known from or likely to occur within a Two-mile Radius of the Proposed Project Area for Wind Farm Project in Logan County, CO

Report generated: 29 May 2008

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
						010N048W	08							
						010N048W	09							
						010N048W	10							
						010N048W	18							
						010N049W	12							
						010N049W	13							
						010N049W	14							
						010N049W	15							
						010N049W	16							
						010N049W	17							
						010N049W	19							
						010N049W	20							
						010N049W	30							
						010N050W	25							
						010N050W	26							
						010N050W	27							
						010N050W	33							
						010N050W	34							
3,546	Natural Communities	*Populus deltoides / Symphoricarpos occidentalis Woodland*	Plains Cottonwood Riparian Woodland	S	1995-08-27	010N048W	03		G2G3	S2	B	-		
						010N048W	04							
						010N048W	07							
						010N048W	08							
						010N048W	09							
						010N048W	10							
						010N048W	18							
						010N049W	12							
						010N049W	13							
						010N049W	14							
						010N049W	15							
						010N049W	16							
						010N049W	17							
						010N049W	19							
						010N049W	20							
						010N049W	30							

precision codes: S = "seconds", location known within 100m; M = "minutes", location known within 1 mile; G = "general", location known within 5 miles

Locations and Status of Rare and/or Imperiled Species and Natural Communities known from or likely to occur within a Two-mile Radius of the Proposed Project Area for Wind Farm Project in Logan County, CO

Report generated: 29 May 2008

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
						010N050W	25							
						010N050W	26							
						010N050W	27							
						010N050W	33							
						010N050W	34							
3,866	Natural Communities	*Salix exigua / Barren Shrubland*	Coyote Willow/Bare Ground	S	1995-08-24	010N048W	03		G5	S5	B	-		
						010N048W	04							
						010N048W	07							
						010N048W	08							
						010N048W	09							
						010N048W	10							
						010N048W	18							
						010N049W	12							
						010N049W	13							
						010N049W	14							
						010N049W	15							
						010N049W	16							
						010N049W	17							
						010N049W	19							
						010N049W	20							
						010N049W	30							
						010N050W	25							
						010N050W	26							
						010N050W	27							
						010N050W	33							
						010N050W	34							
12,172	Reptiles	*Eumeces multivirgatus multivirgatus*	Northern Many-lined Skink	S	1982-05-18	010N049W	26		G5T5	S4	H	-		
2,606	Vascular Plants	*Lesquerella arenosa var. argillosa*	secund bladderpod	G	1983-07-09	011N048W	02		G5T3	S1	H	-		

precision codes: S = "seconds", location known within 100m; M = "minutes", location known within 1 mile; G = "general", location known within 5 miles

APPENDIX E
CULTURAL/HISTORIC RESOURCES REPORT

Alliance Power: A Class III Cultural Resources Inventory of the Colorado Highlands Wind Farm Expansion, Phase 2, in Logan County, Colorado

By

Stephanie Slaughter
Staff Archaeologist

Principle Investigator
Melissa Elkins

Prepared by
Metcalf Archaeological Consultants, Inc.
651 Corporate Circle, Suite 202
Golden, Colorado 80401

Prepared for
Alliance Power
2001 Easter Ave., Suite 100
Centennial, Colorado 80122

State of Colorado
Permit #2013-70 (expires February 28, 2014)

December 2013

ABSTRACT

Metcalf Archaeological Consultants, Inc. (MAC) conducted a Class III cultural resources inventory for Phase 2 of the Colorado Highlands Wind Farm Expansion in Logan County, Colorado, for Alliance Power. The project is a large block located on private and state lands in portions of Sections 2, 3, 4, 9, 10, and 16 in T9N R48W. The total project area is 1332.0 acres; of that, 1296.6 acres were inventoried.

As a result of this inventory, eight cultural resources were newly recorded including three sites and five isolated finds. All three sites are historic and include a silo foundation (5LO873), a short road (5LO878.1), and a homestead (5LO877). The silo foundation and road are recommended to be not eligible for inclusion on the National Register of Historic Places and no further work is recommended for them. The homestead (5LO877) is recommended to be eligible, under Criterion D, for inclusion on the National Register and MAC recommends total avoidance of the site. At this time, no facilities are staked near this site, however, the wind farm expansion is still in the planning stages. The isolated finds are recommended as not eligible and no further work is recommended. Provided the eligible site is avoided, MAC recommends a finding of *no historic properties affected* for this project.

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INTRODUCTION

Metcalf Archaeological Consultants, Inc. (MAC) conducted a Class III cultural resources inventory of Phase 2 of the Colorado Highlands Wind Farm Expansion for Alliance Power under the federal authority of the Western Area Power Association (WAPA), a power marketing agency within the U.S. Department of Energy. The project is located approximately 10.0 miles north-northwest of the town of Haxtun in Logan County, Colorado, in portions of Sections 2, 3, 4, 9, 10, and 16 in T9N R48W (Figure 1). The project area covers approximately 1332 acres. Of the 1332 acres within the project area, approximately 35.4 acres on private land were not inventoried because it included the built environment around the occupied Barden Ranch and the now-abandoned open gravel pit just to the west of the ranch complex. As a result, a total of 1296.6 acres were inventoried for this project, of which 550.6 acres are on private land and 746.0 acres are on state land.

In 2008, WAPA completed an environmental assessment (EA) of the Colorado Highlands Wind Project in response to a request by Colorado Highlands Wind, LLC, to connect the power generated by the wind farm to WAPA's electrical transmission system. This EA addressed the project's need for federal permitting. The current project was conducted according to Section 106 of the National Historic Preservation Act (NHPA) and other applicable federal legislation and regulations since it expands the footprint of the existing federal undertaking, but WAPA is not providing formal consultation for this phase of the project. The goal of this inventory is to identify, record, and evaluate cultural resources within the area of potential effect (APE) of the proposed wind farm expansion area. Any cultural resources identified are evaluated for eligibility to the National Register of Historic Places (NRHP). Recommendations for further treatment are made and the nature of proposed impacts is described if significant resources are present. No proposed turbines or access roads were identified at the time of inventory, therefore, the APE is defined as the survey area for this project.

Fieldwork was conducted from October 10 to 15, 2013, under the direction of MAC archaeologist Stephanie Slaughter and assisted by Nicole Sauvageau Rockwell, Rebecca Simon, and John White. Melissa Elkins provided administrative support and direction, and Preston Debele and Michele Nelson provided GIS support.

EFFECTIVE ENVIRONMENT

The project area is located in northeastern Colorado near the dividing line between the Colorado Piedmont and High Plains physiographic provinces (Fenneman 1946). The Colorado Piedmont is an erosional inlier that has been stripped of the Miocene sedimentary rocks capping the High Plains to the east (Madole 1995). As a result, it is lower in elevation than that of the High Plains. The area is characterized as gently rolling hills and ridges with few areas where either remnants of the High Plains escarpment or the underlying bedrock are exposed (Chronic

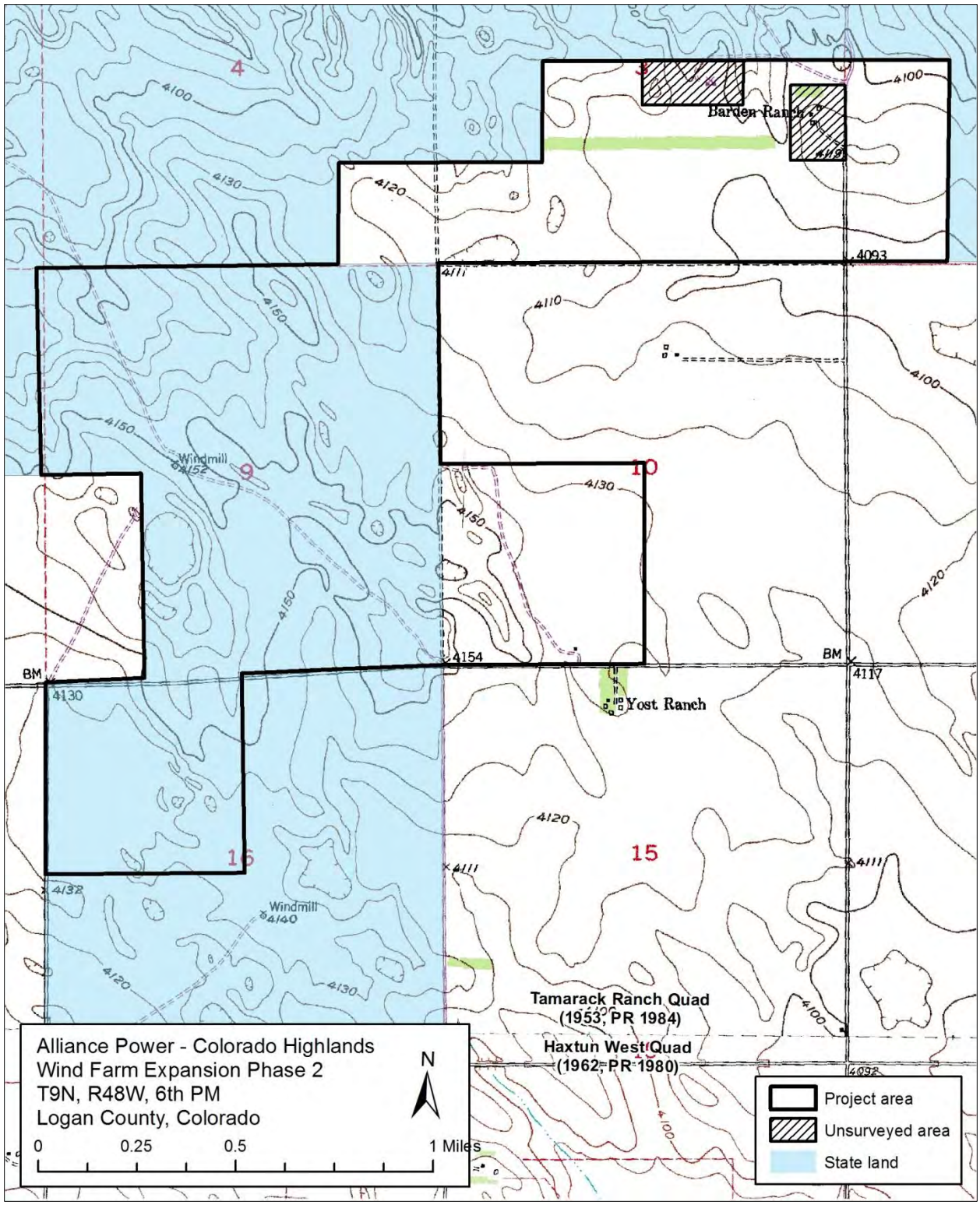

Figure 1. Project area location

and Williams 2002). More specifically, the project area lies near the southern edge of the South Platte dune field approximately 5.4 miles south of the South Platte River.

Surface sediments in the project area are aeolian sands and silts mostly deposited during the late Pleistocene and early Holocene (Madole 1995). The southern portion of the project area is mantled with a sand sheet and is characterized by a gently undulating landscape, while the western portion of the project area is covered in deep, complex sand dune formations. Madole (1995) indicates there are three generalized time periods of sand deposition and soil formation recognized in the South Platte dune field. The oldest deposition is also the most widespread, manifested at the surface as a sand sheet at the southern-most edges of the dune field as well as in linear tracts within and between dunes of younger sand. This sand was deposited roughly between 22,000 and 9,000 years ago at the end of the Pleistocene and early Holocene. Soil formation is strongest in this unit, with some blocky structure developed. Evidence of Paleoindian occupation can also be found in this older sand unit. The middle unit is not as widespread and manifests on the surface as both compound and simple parabolic dunes. This unit also has soil development but far more weakly than the lower unit. Deposition is presumed to have occurred in multiple events and loosely dated from 4,000 to 3,000 years ago during the Middle Holocene (Madole 1995:170). The youngest and overlying unit was deposited after 1,000 years ago and manifests as high, compound parabolic dunes with very weak soil development. This youngest unit covers most of the South Platte sand area and Late Prehistoric archaeological remains have been recovered from this unit (Madole 1995).

The underlying geology of the area is the Ogallala Formation, a loose to well-cemented sand and gravel deposited during the mid-Tertiary uplift period (Chronic and Williams 2002; Tweto 1979). This formation is visible in some areas of the project area where the bedrock is shallow and forms the core of sand deposits, as in the extreme northwest area of the project area. In addition, bedded layers of alluvially deposited sands and gravels are exposed in the gravel quarry in the northern portion of the project area, which underlie the aeolian sand deposits.

The climate of northeastern Colorado is affected by three main factors including air movement, mountain masses, and the interior continental location (Western Regional Climate Center 2013). Of particular importance is the north/south orientation of the Rocky Mountains, which partially blocks the movement of moist polar air masses. A rain shadow effect results in drier conditions east of the Front Range. Much of the moisture received in the project area is from summer thunderstorms and springtime warm wet air masses from southern Colorado. Most of the annual precipitation received in this area falls during the growing season, between April and September. Summer daily temperatures average above 90° F with low relative humidity. Winter month temperatures range from 0° to 10° F below freezing. Strong winds and extremely low precipitation amounts produce dust storms and at times severe drought conditions in northeastern Colorado.

Vegetation in the area is a mix of native grasses and cultivated fields. The eastern portion of the project area are cultivated with a mix of millet fields and wheat fields. Some of the fields have been allowed to become fallow and revert to grassland. Vegetation in these fields, as well as areas that were never cultivated, are dominated by bunch grasses such as bluestem and rice-grass. Sagebrush, prickly pear cactus, yucca, and various forbs are also

present. Ground visibility in the natural and naturalized areas is relatively low, typically less than 10%, increasing to nearly 100% in the cultivated fields.

The project area has a diverse array of bird species including the Lark Bunting, Western Meadowlark, and a variety of birds of prey. Other fauna also include rattlesnake, pronghorn antelope, mule deer, red fox, coyote, and prairie dog. In the past bison and elk would have been numerous in the short-grass steppe.

Modern impacts to the area are largely agricultural in nature. Most of the eastern portion of the project area has been plowed, some of which is currently cultivated with winter wheat. The plow has mixed and churned the top 20-30 cm of sediments, destroying any subsurface integrity. The margins of many of the cultivated fields have deep deposits of recently transported sand as the wind has moved much of the topsoil, indicating the probability of taphonomically active layers deeper than the plow zone, possibly up to 50 cmbs. Active wind turbines are located to the southwest.

CULTURE HISTORY AND PREVIOUS WORK

Culture History

The project area is located within the Platte River Basin prehistoric context, which encompasses the entirety of northeastern Colorado (Gilmore et al. 1999). The following summarizes the prehistoric overview covered in Gilmore et al. (1999). The prehistoric period is subdivided into four stages, including the Paleoindian, Archaic, Late Prehistoric, and Protohistoric. The historic period will be discussed separately.

Paleoindian Stage. The Paleoindian Stage is the oldest temporal and cultural unit and is defined by a subsistence system that focused on large, now-extinct megafauna. In the Platte River Basin, this stage dates from 12,040 to 5740 B.C. based on recent radiocarbon analyses and is subdivided into the Clovis (12,040-9750 B.C.), Folsom (11,340-8720 B.C.), and Plano (10,580-5740 B.C.) periods based on changes in projectile point attributes. A pre-Clovis period has been posited for the region but unequivocal evidence of its existence is presently lacking.

Relatively few Paleoindian sites have been found in eastern Colorado. This may indicate that population densities were very low during this stage and therefore relatively few localities were used. It is at least as likely, however, that natural geomorphic processes have either destroyed or buried many Paleoindian sites. Known Paleoindian sites are most often kill and game processing sites, but a few campsites, quarry sites, and lithic scatters have also been found. Sites that combine all of these characteristics have also been found (Chenault 1999:51-52).

Several Clovis period sites containing the hallmark, large, lanceolate, fluted spear points have been found in northeastern Colorado. These points are often found in association with mammoth remains. It is inferred that the Clovis subsistence system focused on procurement of that species, but the systematic killing of such large animals with simple stone tool technology is debated. A greater number and variety of Folsom period sites have been discovered in

northeastern Colorado. Folsom sites are also identified by characteristic spear points, which are fluted like Clovis points but smaller in size. The frequent association of these point types with an extinct form of bison (*Bison antiquus*) has led to inferences that Folsom subsistence focused on its procurement. The final period of the Paleoindian stage is the Plano period and is characterized by a diversity of large, unfluted projectile point types and a greater diversity of subsistence resources, including smaller game animals and plants (Chenault 1999:69-82).

Archaic Stage. This stage is subdivided into Early, Middle, and Late periods based on changes in lithic technology, primarily projectile point morphology. Overall, this stage is characterized by shifts in the subsistence base from large game to small game and plant resources. The stage is also characterized by a more diversified toolkit that included a greater variety of smaller projectile points, both stemmed and notched. Site types associated with the Archaic stage in the Platte River Basin include open and sheltered lithic scatters, open and sheltered campsites, open and sheltered architectural sites, quarries, kill sites, game processing sites, ceremonial sites, burial sites, and rock art sites (Tate 1999:94-99).

The Early Archaic period (5500-3000 B.C.) is generally associated with the Altithermal climatic episode, a time of warmer and drier environmental conditions. Projectile points include primarily large, side- and corner-notched dart points (Tate 1999:94). Very few sites of this time period have been recorded on the eastern plains of Colorado, but several have been recorded in the hogback/foothills immediately to the west and at high altitude along the Continental Divide (Tate 1999:102). This site distribution pattern, coupled with evidence for Altithermal dessication, has led many scholars to hypothesize that the plains were largely abandoned in favor of cooler, moister environments in the foothills and high mountains to the west (Tate 1999:92).

The Middle Archaic (3000-1000 B.C.) is associated with the end of the Altithermal and a subsequent period of climatic amelioration on the plains (Medithermal). It is defined technologically by the appearance of milling stones, suggesting a greater exploitation of plant resources, and by the abrupt appearance of distinctive lanceolate and stemmed, indented-base projectile points (Duncan, Hanna, McKean). Large, side-notched dart points (Mallory, Hawkin) are also associated with the period (Tate 1999:95). Although the majority of known Middle Archaic sites in the Platte River Basin are in hogback/foothill settings, the eastern Colorado plains show a dramatic increase in the number of sites dating to this period as compared to the Early Archaic (Tate 1999:18-21).

The Late Archaic period (1000 B.C.-A.D. 150) is associated with a period of continued climatic amelioration on the plains. This period is marked by a continuation of subsistence based solely on hunting and gathering. Late Archaic projectile points primarily include large, corner-notched and side-notched dart points. A predominance of rock-filled hearths, a decrease in permanent storage features, and increased frequencies of ground stone also characterize this period (Tate 1999:95). Site density, and by inference population, also continued to increase during the Late Archaic, especially on the plains. Several Late Archaic sites have been recorded in Weld County, including the Uhl Site, Happy Hollow Rockshelter, and Rattlesnake Shelter (Tate 1999:134-140).

Late Prehistoric Stage. This stage is subdivided into the Early and Middle Ceramic periods. It is defined by the appearance of ceramic artifacts and the presumed introduction of the bow and arrow, inferred from the presence of small, corner- and side-notched projectile points (Gilmore 1999:175-177). Like the preceding Archaic Stage, the subsistence economy continued to focus on hunting and gathering, but limited evidence of horticulture has been found at a few Late Prehistoric sites in the plains and hogback/foothill areas of the Platte River Basin (Gilmore 1999:236).

The Early Ceramic (A.D. 150-1150) has more associated radiocarbon dates than any other period in all three of its subareas (plains, hogback/foothill, mountain). This may indicate an increase in the population regionally, but may also be due to other factors such as an increase in the size and complexity of the sites and/or better site preservation (Gilmore 1999:179). The modal frequencies of the radiocarbon dates suggest a movement of peoples from the mountains, to the hogback/foothills, and finally onto the plains. This pattern appears to coincide with increased effective moisture and an amelioration of the climate on the plains (Gilmore 1999:181). Early Ceramic material culture and burial practices show some similarities to the Plains Woodland tradition of Kansas and Nebraska, suggesting cultural affiliation and/or some degree of contact between the peoples inhabiting these two regions.

The Middle Ceramic period (A.D. 1150-1540) sites show little change from those of the Early Ceramic, suggesting cultural continuity between the two periods. A significant decrease in the number of sites associated with this period, however, may indicate a substantial decrease in the regional population, triggered by a decrease in seasonal effective moisture on the plains (Gilmore 1999:245).

Protohistoric Stage. The Protohistoric stage or Late Ceramic period dates from about A.D. 1540 to A.D. 1860. This stage is defined by the appearance of ethnographically identifiable groups, the shift to horse nomadism, and a focus on bison for subsistence. It is also marked by the first intrusions of Europeans and European trade goods in the area. During this stage, significant population shifts and cultural changes occurred on the southern and central plains. Apparent ancestral Pawnee peoples migrated north into the Lower Loup River of Nebraska and the Athabaskan speaking Plains Apache (archaeologically the Dismal River aspect) immigrated into the High Plains of Kansas, Nebraska, and Colorado. The subsistence economy of the Dismal River peoples focused on bison hunting, but included hunting of smaller game animals and gathering of mollusks, berries, and nuts (Brown 1987:1). In the eastern portion of their range where rainfall was more plentiful, there was a secondary reliance on maize agriculture. Dismal River sites are distinguished by their distinctive pottery (Lovitt), ceramic pipes, double bitted drills, large roasting or baking pits, absence of storage pits, presence of trash-filled borrow pits, and house structures with a five-post base pattern (Logan 1996:168).

In the Platte River Basin where Dismal River peoples appear to have remained essentially nomadic, their sites consist of scatters of artifacts with or without associated stone circles. These sites have been identified only on the basis of some associated diagnostic ceramics (Clark 1999:312; Wedel 1986:138). Dismal River sites are found in a variety of topographic settings. Larger village sites occupy terraces along perennial streams while smaller camp sites are found around lakes and ponds, in blowouts and rockshelters, and on the tops of buttes (Wedel

1986:140). Only one Dismal River site (Cedar Point Village) with evidence of pithouses has been identified in eastern Colorado.

Near the end of the Protohistoric stage, various Apache groups (Paloma, Cuartelejo) continued to occupy eastern Colorado north of the Arkansas River until they were driven south and west into New Mexico by the Comanches, aided by the Utes, in the early 1700s. One group joined the Kiowas but maintained their Apache linguistic identity, becoming the Kiowa-Apache (Clark 1999:312-313; Wedel 1986:140-142).

Subsequently (post-A.D. 1700), the Comanches abandoned eastern Colorado and moved south into southwestern Kansas, New Mexico, and Texas, leaving the Platte River Basin open to brief settlement by other Native American groups, first the Arapaho and then the Cheyenne. All of these tribes followed a nomadic, horse-mounted lifeway that centered around bison procurement. The site types most commonly associated with this period are open lithic scatters and campsites. Other site types include sheltered camps, sheltered lithic scatters, open architectural sites, rock art, battlefields, trails, and peeled trees. The similarity of the lifeways of these tribes makes their associated sites appear quite similar archaeologically and difficult to attribute to a specific group (Clark 1999:313-314).

Very few Protohistoric sites have been found in the Platte River Basin. In adjacent Weld County, the widest variety of sites dating to this period are located, including open architectural (the Hatch Site, the Camp Site) and sheltered camps (McEndaffer Rockshelter) (Clark 1999:315-318).

Historic Period. The Historic Period covers the period from approximately A.D. 1840-1950 and is generally discussed as historic themes that cover the major trends and patterns linking the history of the area to the larger region, state, and nation. Two themes, early exploration and the fur trade, are not represented by known cultural resources, although other themes are well represented, such as transportation, early agricultural and ranching development, and agriculture.

By the time of the 1859 gold rush to Colorado, several emigrant trails had been in use for nearly 40 years, including a branch of the Oregon/Overland Trail known as the Trappers' or South Platte Trail. At the same time, the U.S. Army also built several military forts to maintain the trails and protect and aid travelers along the emigrant trails (Zornow 1957). The West's dependence on wagon roads and trails typifies the period from about 1800-1870 when most early travelers made their trips by wagon or stagecoach.

In 1862, Congress passed the first Pacific Railroad Act, which authorized the Union Pacific Railroad (UP) and the Central Pacific Railroad (CP) to build the first transcontinental railroad route, as well as providing each company with substantial public land grants through generally unsettled land (Athearn 1971). In the following decades, numerous other railroad companies were established and built roads through Colorado. Of particular importance to the settlement of the eastern Plains and along the Front Range was the Denver Pacific (DP) railroad, which built a line to Cheyenne to connect to UP's transcontinental route and the rest of the country (Athearn 1971; Clark and Corbett 2007:110).

The Homestead Act was also passed in 1862, allowing for the purchase of 160 acres of land for $10 in fees. The settler had to prove five years of continuous residence and cultivation to gain the patent to the land (Cartensen 1963; Dick 1970; Gates 1968). This legislation aided the settlement of the West by opening up the land for various economic uses, mostly farming and ranching. Enterprising farmers and ranchers realized the opportunity presented by the need of the towns, mountain mining areas, merchants and commercial traders to be supplied with agricultural produce (Goff and McCaffree 1967:9-37, 69-120; Peake 1937). During the latter part of the 19th century, the need for access to a steady supply of water in order for these agricultural ventures to be successful became an important issue. Various irrigation canals and ditches, as well as wells, were built and drilled over the ensuing decades (Zornow 1957).

Dryland farming expanded with the onset of WWI, when the wartime needs encouraged increased output from American farms. As a result of this increased demand, more and more marginal lands were put into production, increasing both the need for and interest in understanding dryland farming issues. Factors such as different methodologies in crop rotation and tilling, as well as the development of drought resistant crops and labor saving machinery fueled the growth in the industry in the early part of the 20th century (Mehls and Mehls 1989; Steinel 1926). Cattle ranching also experienced a boom as the lands not converted to farming reverted to natural prairie and regained their carrying capacity (Mehls 1984:138-142).

The expanded agricultural markets greatly contracted after the end of WWI and the recovery of European agriculture. With the slide in prices for produce, many farmers switched to cattle and sheep ranching, whose prices were much less volatile. By the mid 1920s, the markets had stabilized. In 1929, however, the Stock Market crashed, triggering the Great Depression. This event, combined with the severe drought of the 1930s, nearly collapsed the economy of the region, leading many to leave the area. Economic recovery began with the onset of WWII, with a renewed demand in agricultural products in order to support the war effort. In addition, a greater focus was placed on the development of more stable cash crops, which have helped the region remain a healthy industry for the last 45 to 50 years (Athearn 1976: 296-300; Dorsett 1977:220-225; Mehls 1984:173-182).

Previous Work

A files search was conducted through the Colorado Office of Archaeology and Historic Preservation's (OAHP) online *Compass* database on October 8, 2013, by Melissa Elkins. GLO plats were also inspected for evidence of historic features. A one-mile radius around the project area was examined.

The files search indicates that only one project has been previously conducted within one mile of the current project area (Table 1). The project is the original survey and report for the wind farm, conducted in 2008 by Centennial Archaeology (Anderson et al. 2008).

Table 1. Summary of previous projects within one mile files search radius

OAHP Accession #	Legals (T/R/Sec)	Project Type	Project Description	Client	Company	Year
LO.E.R8	9/49/13, 24 9/48/19, 30, 31	Linear/block	Wind Farm inventory	Department of Energy	Centennial	2008

T/R/Sec = Township/Range/Section; OAHP = Office of Archaeology and Historic Preservation; Centennial = Centennial Archaeology, Inc.

As a result of this project, six cultural resources were identified and recorded. These include four sites and two isolated finds (Table 2). All four of the sites are historic and include two homesteads, one artifact scatter, and one powerline segment. The homesteads date to the first half of the 20th century, and the artifact scatter is dated to the latter part of the 19th century to the early part of the 20th century. All four sites are officially not eligible for inclusion on the NRHP. The isolated finds include one Late Archaic tool and one historic windmill.

Table 2. Summary of previously recorded cultural resources within one mile files search radius

Site No.	Type	Description	NRHP
5LO642.1	Historic	Powerline segment	NE-OAHP
5LO649	Prehistoric	Isolated find	NE
5LO654	Historic	Homestead	NE-OAHP
5LO655	Historic	Artifact scatter	NE-OAHP
5LO658	Historic	Homestead	NE-OAHP
5LO659	Historic	Isolated find	NE

NRHP = National Register of Historic Places; OAHP = Office of Archaeology and Historic Preservation; E-OAHP = Officially eligible; NE-OAHP = Officially not eligible; NE = Not eligible

STATEMENT OF OBJECTIVES

Following state and federal policies and regulations implementing the National Historic Preservation Act (Public Law 89-665) as amended, the project area was inventoried to identify any cultural resources within the APE for the proposed activities. Any discovered cultural resources were to be evaluated for eligibility to the NRHP under the Criteria for Eligibility (36 CFR §60.4). Register eligibility is evaluated in terms of the integrity of the resource; its association with significant persons, events, or patterns in history or prehistory; its engineering, artistic, or architectural values; or its information potential relative to important research questions in history or prehistory.

Prehistoric resources are most often evaluated under Criterion D, for their potential to yield information important to studies of prehistory. Significant information potential in a prehistoric site requires that the site contain intact cultural deposits or discrete activity areas that can be securely associated with a temporal period or named cultural group. The potential for intact deposits or cultural/temporal associations may be inferred from surface evidence of cultural features or undisturbed Holocene deposits, and the presence of temporally or culturally diagnostic artifacts. Historic resources may be evaluated under any of the Criteria. However, in the absence of structural features or documented association with significant historic events or

important contributions of persons significant in history, historical resources are evaluated under essentially the same criteria as prehistoric resources.

Based on the results of the previous surveys, few sites were expected. Types of sites expected were generally historic homesteads and debris scatters and dumps. Prehistoric and historic isolated finds were also expected.

FIELD METHODS

The project area was inventoried with pedestrian transects at intervals no greater than 20 m apart. Special attention was given to areas that allowed observation of subsurface sediments, such as road cuts, drainage cutbanks, animal burrows, and animal trails. Field conditions at the time of survey were generally good for discovery, with sunny skies for the majority of the fieldwork.

Sites are defined as five artifacts or more within a 30 m radius and represent a discrete location that is believed to be the locus of patterned human activity. Historic sites are defined as having more than 50 historic artifacts dating pre-1962, or a feature, structure, or trail; or any combination of these elements. Fewer than 50 historic artifacts not associated with a feature, building, or structure, or in an established trash dump were recorded as an isolate. Windmills plotted on the topographic map and not directly associated with a larger complex, such as a homestead, are also considered isolates.

When cultural material was encountered, the immediate area was intensively examined to determine the nature and extent of the resource. Once defined, resources were recorded on appropriate OAHP forms, a site map was produced utilizing a hand-held Trimble GEO XT unit, all tools and features were described and photographed, and overview photographs of the site were taken. Although mapping datums were used, no physical datum stakes were left on the sites because they are all located on private property. All field GPS data was collected using Trimble GEO XT units in NAD 83 UTM coordinate system.

Artifacts were analyzed in the field. MAC analyzes artifacts by type and materials. Diagnostic historic artifacts were photographed or drawn in the field for further analysis in the office. No artifacts were collected.

RESULTS

As a result of this inventory, three sites and five isolated finds were discovered and recorded (Table 3). All of the cultural resources are historic. The sites include one silo foundation (5LO873), one homestead (5LO877), and one degrading road (5LO878.1). Two of the sites (5LO873, 5LO878.1) are recommended to be not eligible for inclusion on the NRHP. The homestead (5LO877) is recommended to be eligible for inclusion on the NRHP.

Table 3. Summary of inventory results

SITS No.	Temporary No.	Age/Cultural Affiliation	Description	NRHP	Recommendations
5LO871	SS02	Historic	Isolated find	NE	No further work
5LO872	SS01	Historic	Isolated find	NE	No further work
5LO873	MM 13-1000	Historic	Silo foundation	NE	No further work
5LO874	SS04	Historic	Isolated find	NE	No further work
5LO875	SS05	Historic	Isolated find	NE	No further work
5LO876	SS03	Historic	Isolated find	NE	No further work
5LO877	MM 13-1002	Historic	Homestead	E	Avoidance
5LO878.1	MM 13-1001	Historic	Degrading road	NE	No further work

SITS = Smithsonian Institute Trinomial System; NRHP = National Register of Historic Places; E = Eligible; NE = Not eligible

Sites

5LO873 (MM13-1000)

This site is a newly recorded historic foundation and artifact scatter located on private land in a level agricultural field amidst rolling sandhills south of the South Platte River. Approximately 30 cm of aeolian sand, likely deposited during episodes of plowing in the adjacent field, has accumulated in and around the foundation. The remainder of the site lies on an estimated 40 cm deep deposit of fine-grained loamy sand that has been repeatedly churned by agricultural activities. Vegetation within approximately two meters of the foundation consists of an understory dominated by bunch grasses; however, Russian thistle and black-eyed susans are also present. The remaining portion of the site is vegetated by cultivated millet. Ground surface visibility within the site is approximately 25%. The above ground components of the silo are no longer present and the remaining foundation has been heavily eroded by wind and cultivation of the surrounding agricultural field.

The site consists of a circular concrete foundation (Feature 1) and a limited artifact scatter. The foundation is roughly 28 ft in diameter by 6 in wide, and 2 ft high. A trowel probe in the center of the foundation indicates it is solid and buried beneath approximately 1 ft of accumulated sediments. There are two inscriptions on the top of the foundation, made with a finger when the concrete was wet and include what are likely initials (“UW”) and possibly a brand symbol (bar under backward “B”). The concrete is crumbling in places, with lengths of barbed wire protruding from the lower third of the foundation. The location of the foundation in a field unassociated with any domestic features and its circular shape indicate it was likely a foundation for a silo. A large depression about 94 m southeast of the foundation was noted but not included in the site. Although the depression appears to have been mechanically excavated, there was no evidence to indicate there may have been a structure associated with the silo. Its function and age is unknown.

Artifacts found in association with the foundation were minimal and scattered about 15 m around the feature. They include several pieces of concrete, one white earthenware fragment, one piece of colorless glass, and one watch battery.

Patent details provided in the BLM-GLO Records indicates that the site is on land awarded to Elmer F. Weck on June 2, 1913 by the Sterling Land Office under authority of the Homestead Act of 1862 (Accession #338778, Doc #05647).

NRHP Eligibility and Management Recommendations. The above ground components of the silo erected on the site are no longer present and the remaining concrete foundation has been heavily eroded by wind and cultivation of the surrounding agricultural field. As a result, the site lacks integrity of design, workmanship, materials, association, and feeling, but retains integrity of setting and location. The features and artifacts observed at this site are most likely related to use of the location for cultivating crops but are not associated with important historical events (Criterion A), significant persons in history (Criterion B), and do not embody distinctive methods of construction or design (Criterion C). Although a small portion of the site is buried beneath a thin deposit of aeolian sand, it is unlikely that further work will yield important information regarding historic use of the region. As a result, MAC recommends the site not eligible for inclusion in the NRHP and no further work is recommended.

5LO878.1 (MM 13-1001)

This newly recorded site consists of an overgrown, east/west-trending road located on private land with cultivated fields to the north and south. The road starts at the east end at a ranch labeled "Barden Ranch" on the USGS topographic map, which is a currently occupied domestic and agricultural complex, and ends at the west end at a north/south-trending fenceline. Lines of pine, juniper, cottonwood, and ash trees have been planted on either side of the road, with primarily grasses covering the site area. Ground surface visibility is less than 5%. Surface sediment is a dark brown loam with a high organic content and a layer of humus covering much of the road. The site has been impacted by neglect and natural degradation. There is a significant amount of deadfall on the road with dead trees interspersed in the living trees.

This site consists of a degrading, grass-covered, east/west-trending road that starts at the Barden Ranch on the east end and terminates at a north/south-trending fenceline at the west end. The road is approximately 3,001 ft by 20-30 ft wide. No imported material was noted, so the road does not appear to have been crowned, although it was clearly bladed with ditches excavated on either side. The ditches are lined with pine, juniper, cottonwood, and ash trees that were planted to serve as a windbreak. The southern treeline is dominated by pine and juniper, and a barbed wire fence parallels the treeline along the north side of the road. This road may have provided access from Barden Ranch to adjacent fields, particularly considering it does not extend beyond the segment visible on the ground. Both the historic ranch and road are depicted on the 1953 topographic quadrangle, with the road shown as a line of vegetation to the southwest of the ranch, indicating the site is historic in age.

Patent details provided in the BLM-GLO Records indicate that the site is on land awarded to Elmer F. Weck on June 2, 1913, by the Sterling Land Office under authority of the Homestead Act of 1862 (Accession #338778, Doc #05647).

NRHP Eligibility and Management Recommendations. The road is overgrown and has been impacted by erosion and neglect. As a result, the site has lost some integrity of design, materials, workmanship, and feeling. The site's integrity of association, setting, and location remain intact. The road is limited in length and may have provided access to the Barden Ranch. It is not associated with significant historical events (Criterion A) or important persons in history (Criterion B) and does not embody distinctive construction techniques or design (Criterion C). Additional work at the site is not expected to yield important information regarding historic use of the land (Criterion D). As a result, MAC recommends site 5LO878.1 to be not eligible for inclusion in the NRHP and no further work is recommended.

5LO877 (MM 13-1002)

This newly recorded historic homestead is located on private land at the south edge of the sand hills south of the Platte River. The landscape to the north and west is characterized as complex, stabilized dunes with topographic variability. To the east and south are relatively flat, rolling hills of agricultural fields and fields reverted to pasture. Surface sediment is aeolian brown sand loam with subrounded to rounded gravels. Vegetation includes a variety of native grasses (rice grass, blue stem, needle-and-thread, and fescues), Russian thistle, sand sagebrush, prickly pear cactus, and forbs. Various trees including cottonwood, acacia, elm, and apple, define the boundaries of the homestead. Ground visibility is less than 5%. The site is in generally poor condition. Although there are four standing structures present, they are all deteriorating from exposure to the elements. Additionally, several of the cultivated trees have died, likely due to lack of water, and the house structure has been dismantled and largely removed.

The site is a homestead consisting of six features, several discarded wagons and farm implements, and a light scatter of mostly domestic artifacts. The features include the remains of the house, a privy, a well/cistern, barn/garage, possible storage shed, and a circular slab located southwest of the main house. Four of the features include extant structures.

Feature 1 is a house foundation with a depression filled with miscellaneous construction debris. The depression is large enough to have served as either a basement or cellar, although the depth is unknown because of the debris. The foundation consists of four poured concrete walls set in the basement depression and measures 23 ft 6 in north/south by 28 ft 2 in east/west. The walls are 5 in wide and partially dismantled along all of the sides except the south, which is intact. There is a line of bricks embedded in the ground along the south side, approximately 3 ft 11 in from the wall and that may have represented a brick-lined path. Two small pads on either end of the south wall may have been stoops for the entranceways. The debris pile within the depression interior includes dimensional lumber, wire fencing, the head of a shovel, and other detritus dumped in the depression at a later date. A pipe runs north-south away from the foundation on the north side, presumably connecting to the cistern and part of the plumbing for

the house. Outside of the foundation, artifacts consist of scattered debris including window pane glass, a sherd of porcelain, and fragments of asbestos siding.

Feature 2 is an intact two-seat outhouse located 36 ft northwest of the main house (F1). Currently, the outhouse leans to the north and is supported by a wide pipe and 2x4 wooden post. The construction is post-and-girt that consists of vertical 2x4's and horizontal 4x8 planks, fastened together with wire nails. It sits on a concrete foundation approximately 4 in high. The entrance is on the south side of the building and is a simple, flush door with cast iron hinges and a sliding bolt lock on the right side of the door. The roof is side-gabled with wood shingles in a plain pattern. The structure measures 6 ft 4 in east/west by 4 ft 3in north/south by 6 ft 5 in high.

Small holes in the east and west walls were likely used for ventilation and possibly light. Repairs to the structure include a patchwork of flattened tin cans and miscellaneous metal debris attached to the bottom of the north wall. The area around the feature is heavily overgrown and generally devoid of artifacts with the exception of a few pieces of miscellaneous construction debris.

Feature 3 is a well and cistern with an unusual configuration and located 49 ft north of F1. The cistern is a large galvanized metal cylindrical tank set atop a concrete building that opens to the south. The tank has calcium deposits along the seams and measures approximately 8 ft tall by 6 ft diameter. A pipe extends below the tank into the concrete building, which was apparently the housing for the water pump. The remains of a water pump are present within the housing, including a piece of machinery with the inscription "JENSEN BROS MFG CO INC/ COFFEYVILLE KANSAS US". In addition to the pipe connecting the now-dismantled pump to the cistern is another pipe extending outward from the east side of the cistern. Finally, there is a concrete slab on the north side of the well and cistern with two 50-gallon barrels with spigots encircled by a sturdy, wire fence. The enclosed area measures 17 ft long north/south by 6 ft 8 in wide east/west, and the slab is 6 ft by 12 ft. The function of the slab within the enclosed area is unknown, but possibly the foundation of a small windmill. Its proximity to the water feature suggests it was associated with the water supply system. The pipe leading away from the tank suggests it provided running water to the house, increasing the water pressure through use of gravity.

Feature 4 is a circular concrete slab embedded in the ground 23 ft southwest of the main house. The piece measures 3ft 6 in diameter and is flush with the ground. The slab is heavily overgrown with grasses and Russian thistle; it was not possible to determine if it was a circular liner for a well or planter, or a solid block that may have been moved here from elsewhere. The function is unclear.

Feature 5 is a barn/garage located 85 ft northwest of the main house. It measures 25 ft 4 in wide (east/west) by 16 ft 6 in long (north/south) and is 13 ft 7 in high to the peak of the gable. The structure is post-and-girt construction with horizontal planks for wall coverings and sits on a concrete foundation. The building has a central room and five side rooms, two on the east side and three on the west side, likely used to store equipment or animal feed. The interior of the main room has a dirt floor and sliding doors on both the north and south sides. The western half of the southern door is missing and the eastern half is fully open. The door on the north side is

corrugated metal and secured shut. The main room is fenced to exclude livestock, which gather within the sheltered area provided by the building. The side rooms are above the ground surface by approximately 12 in and have wooden floors. Two nine-ft-high fences extend from the corners of the building, one directly east and one trending southwest. A fence encloses the area to the south with open gates on both the east and west sides. There is a modern well and water tank in the western portion of the enclosure. The area measures approximately 75 ft northeast/southwest by 43 ft northwest/southeast and is heavily overgrown with Russian thistle. Frayed electrical wiring and insulators located on the outside of the building indicate it was likely a garage with electrical lighting.

Feature 6 is another outbuilding located 135 ft north of the main house. This structure is likely a storage shed with no windows for ventilation. There is, however, one window casement above the door. The structure is a front gabled, post-and-girt construction that sits on concrete slabs for the foundation. The walls are horizontal planks with patches of miscellaneous wood and flattened cans and there are some wood shingles still present on the roof. The building measures 12 ft 4 in by 14 ft 5 in and is 12 ft high at the center of the gable. The door is a flush wooden door that is likely a replacement for the original and does not fit the doorway. It is nailed shut. The interior retains a faint blue paint on the walls that were visible from the opening above the doorway. It appears that there is only one open room with two mattress springs, a wooden crate, wood scraps, cans, and two glass jugs.

All of the extant buildings are constructed with a post-and-girt method. The shed and barn/garage have boards creating two walls: an interior and an exterior. The walls are all horizontal boards. The roofs of the structures are all simple pitched; the barn/garage and shed are front gables and the outhouse is a side gable. Some wood shingles remain on the shed. Holes in the boards of both larger outbuildings are covered in metal, which generally are cans that have been cut open and flattened.

Along the northeast side of the site is a line of old wagons and farm implements. The wagons are wooden with metal connectors and include the chassis of one, the axles of at least three, and wooden wheels encased in metal on three. One wagon (Farm Implement 12) has an axle with two embossed metal plates, one of which reads “A.T./BARR/PAT./SEPT./1883” with an additional piece that has “ALLIS-CHALMERS/8[…]M/NORWOOD, OHIO”. The Allis-Chalmers Company formed in 1901 (Leffingwell 1993). Farm implements are metal and include plows, discers, seed spreaders, and winnowers. One implement (Farm Implement 2) is a John Deere No. 2, a combine first manufactured in 1927 (John Deere 2013). Another implement (Farm Implement 3) is a sulky plow manufactured by the Parlin and Orendorff (P&O) Plow Company, with “P&O CO.” and “Sulky” embossed on the machine. On the east side of the site are a discer and a seeder, both of which lie within groves of trees and brush.

The north and west sides of the site are partially defined by lines of trees that were planted to serve as windbreaks. A small grove of acacias marks the northern boundary; this tree was likely planted because it requires low water and grows quickly. The western boundary is marked by several dead and dying cottonwood trees. On the east side are two groves of trees that may also have served as windbreaks or possibly provided shade and food. The northern of

the two groves is dominated by cottonwoods. The southern grove is a mix of apple, elm, and ash trees, as well as thick brush.

Artifacts are minimal and generally focused around the structures. Artifacts include pane glass, construction materials, machine rods and other parts, asbestos tile, and at least two pieces of decorative amethyst glass. All construction was done with wire nails. Dates for the homestead based on these artifacts are 1910 to the 1930s.

The site represents a small homestead that might have started out prosperously, based on the presence of a house basement, which would have increased the amount of materials needed for construction. Apparently, however, the homestead fell on hard times; the asbestos tile was a cheap siding option for houses, and the patchy repairs of the buildings indicate creative use of common household items, which is more typical during economically hard times. A search of historic land patent records revealed that the southwest quarter of Section 10, T9N, R48W was patented to Wilson L. Barden on February 18, 1909 (Accession #47296; Doc #0443).

NRHP Evaluation and Management Recommendation. Although few artifacts were observed, four structures remain standing, and the site retains integrity of location, design, materials, and workmanship. Integrity of setting has been impacted by a cell tower and large wind turbines to the west; however, the area is still agricultural with few modern intrusions, most of which would have been present during the period of significance, such as the county road and nearby homesteads. Thus, integrity of association and feeling remain intact.

One of the extant buildings is a privy set over a pit. There are likely buried cultural materials within the privy, as well as the house depression. The site can provide information about small family farms in the early part of the 20th century. The layout of the house and spatial relationship of the buildings can illuminate the intersection between adaptation to a harsh environment and adherence to cultural norms not native to the semi-arid environment of northeastern Colorado. Additionally, the artifact assemblage can provide information about the area's place in the larger economy and society. The site can provide information important to understanding the area's history (Criterion D) and MAC recommends the site to be eligible for inclusion on the NRHP. Total avoidance of the site is recommended.

Isolated Finds

Five historic isolated finds (IF) were recorded and include three fragments of ceramics, one complete bottle, and one small debris scatter (Table 4). The ceramics include two pieces of stoneware and one piece of white earthenware. Each was found in a field that had been cultivated, each is located in general proximity to a homestead, and none exhibit diagnostic attributes to aid in dating the artifacts.

Two of the IFs are located on state land that had not been cultivated. One (5LO874) is a colorless Listerine bottle with a circle-diamond-I maker's mark, indicating the Owens-Illinois Bottling Company manufactured the bottle. The date code indicates the bottle was manufactured in 1936. 5LO875 is a small scatter of less than 10 artifacts in an area that measures 49 ft by 56 ft. The scatter lies in a small, wind-blown depression near the crest of a larger dune. Artifacts

Table 4. Summary of isolated finds

Smith No.	Temp No.	Age/Cultural Affiliation	Description
5LO871	SS02	Historic	Stoneware fragment
5LO872	SS01	Historic	White earthenware fragment
5LO874	SS04	Historic/1936	Colorless Listerine bottle
5LO875	SS05	Historic/post-1911	Debris scatter
5LO876	SS03	Historic	Stoneware fragment

include a graniteware kettle, a galvanized metal tub, one sanitary can, a few pieces of scrap metal, a crown cap amber bottle with no maker's marks, and a light green soda bottle with "Sterling Bottling Works/Sterling, Colo." embossed on the side. A Google search for the Sterling Bottle Works was generally uninformative, although one reference to the industry was found in a Business Directory Archive dated to 1911 (Colorado State Business Directory 1911). The debris scatter was likely deposited in a single episode at some point after 1911.

EVALUATIONS AND RECOMMENDATIONS

The majority of resources found as a result of this inventory are recommended to be not eligible for inclusion on the NRHP. They include all of the isolated finds and two of the sites (5LO873, 5LO878.1). No further work is recommended for these resources. One site (5LO877) is recommended as eligible for inclusion on the NRHP. This site is a historic homestead with extant structures and good potential for buried deposits. Additional investigation of the site, including excavation, has the potential to provide data that could further our understanding of small, family farms in the early part of the 20th century in this part of Colorado (Criterion D). MAC recommends total avoidance of this site.

EVALUATION OF RESEARCH

All of the resources discovered during this inventory are historic in nature. This is likely a result of the heavy use of the landscape for agriculture within the last 150 years. The areas of the project that have not been subjected to disturbance by the plow have been impacted by grazing cattle. These disturbances indicate the top 10-30 cm of the project area have been reworked and redeposited by various taphonomic processes. The lack of prehistoric resources could be the result of such disturbances, or lack of ground visibility in the thick grasses, or it is possible this particular area was not utilized by prehistoric people. What prehistoric resources have been found in the area tend to be widely dispersed, which could be a result of the paucity of available surface water. Alternatively, evidence of prehistoric occupation could be more deeply buried in the aeolian sands. The higher number of historic resources is likely because they have been present on the landscape for a shorter period of time, and thus less subjected to burial by shifting sands.

SUMMARY AND CONCLUSIONS

MAC conducted a Class III cultural resources inventory of Phase 2 of the Colorado Highlands Wind Farm Expansion for Alliance Power, located approximately 10.0 miles north-northwest of Haxtun in Logan County, Colorado. The project area covers approximately 1332 acres, of which 35.4 acres on private land were not inventoried because they included the built environment around the occupied Barden Ranch and the now-abandoned open gravel pit just to the west of the ranch complex. As a result, a total of 1296.6 acres were inventoried for this project, of which 550.6 acres are on private land and 746.0 acres are on state land.

As a result of this inventory, eight cultural resources were recorded, including three historic sites and five historic isolated finds. The majority of these resources are recommended to be not eligible for inclusion on the NRHP. They include all of the isolated finds and two of the sites (5LO873, 5LO878.1). No further work is recommended for these resources. One site (5LO877), a historic homestead, is recommended as eligible for inclusion on the NRHP. MAC recommends total avoidance of this site. Provided the eligible site is avoided, MAC recommends a finding of *no historic properties affected* for this project.

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Appendix A
Cultural Resource Location Map
(Agency Copies Only, Not for Public Distribution)

Appendix B
Site sketch maps
(Agency Copies Only, Not for Public Distribution)

Appendix C
Cultural Resource Forms
(Agency Copies Only, Not for Public Distribution)

APPENDIX F

SPRING 2011HABITAT ASSESSMENT AND AVIAN SPRING SURVEYS

SPRING AND SUMMER 2012 AVIAN SURVEYS

2013 CHW PHASE III HABITAT ASSESSMENT

AND

POST-CONSTRUCTION BIRD AND BAT FATALITY STUDY - PHASE I

Habitat Assessment and Avian Spring Surveys for Colorado Highlands Wind Farm

Logan County, Colorado

Spring 2011

January 11, 2012

Prepared for:

Colorado Highlands Wind, LLC

Prepared by:

Walsh

an ecology and environment company

Table of Contents

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List of Abbreviations and Acronyms

APLIC	Avian Power Line Interaction Committee
CDOW	Colorado Division of Wildlife
CPW	Colorado Parks and Wildlife
CRP	Conservation Reserve Program
GPS	Global Positioning System
MBTA	Migratory Bird Treaty Act
Project	Colorado Highlands Wind Farm
RSA	Rotor Swept Area
USFWS	United States Fish and Wildlife Service
Walsh	Walsh Environmental Scientists and Engineers, LLC

Executive Summary

A habitat assessment, greater prairie-chicken lek surveys, raptor nest surveys, and avian point count surveys were conducted at the proposed and expanded Colorado Highlands Wind Project in Logan County, Colorado during spring 2011. The original Project area was surveyed in 2008 and 2009, and encompassed 4,500 acres. With additional land added to the original Project area the proposed wind farm site currently encompasses approximately 12,540 acres. It comprises primarily agricultural land, grassland, and Conservation Reserve Program (CRP) seeded grassland. Lek surveys were completed in mid-April following protocol provided by Colorado Parks and Wildlife (CPW). All previously located raptor nests were visited, and new nest locations were marked. Twelve point count stations were established to adequately assess avian use across the entire Project site. Each of the 12 points was visited six times throughout the spring and early summer for a total of 72 point count surveys.

Two greater prairie-chicken leks were observed. One lek was detected near its original location in prior surveys of the original Project area. A second, historical lek, identified by CPW staff, was detected outside the west edge of the expanded survey area.

Fifteen raptor nests were found and the locations were marked with a GPS (Global Positioning System). All 15 nests were surveyed for activity level and, if occupied, for species identification. There were three active ferruginous hawk nests, one active red-tailed hawk nests, three active great horned owl nests, and one active Swainson's hawk nest. The remaining seven were inactive.

Forty-four species of birds were identified during point count surveys. Species composition within the point counts included 31 species of songbirds (70 percent), 7 species of raptors (16 percent), two species of water birds (5 percent), two species of game birds (5 percent), and two species of owl (5 percent).

A total of 2,033 individuals were detected. Mean relative abundance of all species at all points was 28.24 birds per point count. The most abundant species was western meadowlark with a relative abundance of 7.58 birds per point count. The next five most abundant birds were the lark bunting, horned lark, mourning dove, ring-necked pheasant, and grasshopper sparrow.

A total of 0.29 percent of all birds (6 individuals) and four species were observed in the rotor-swept area (RSA). The potential collision index, which takes into account the percent of birds flying within the RSA and relative abundance, was 0.06 for all birds, with northern harrier and mourning dove having the highest risk of collision.

No Endangered, Threatened, or Candidate species were detected during the survey period. One State Threatened species, the burrowing owl, was seen in the Project area. It was observed in the known prairie dog colony, and was previously documented near the same prairie dog colony in 2009.

Recommendations for habitat and avian protection and mitigation are included.

Introduction and Project Description

Walsh Environmental Scientists and Engineers, LLC (Walsh) was retained by Colorado Highlands Wind, LLC, to conduct a habitat assessment and various avian spring surveys at an expansion of the proposed Colorado Highlands Wind Farm (Project). This effort involved conducting a habitat assessment, greater prairie-chicken lek surveys, raptor nest surveys, and avian point counts to document migrating and breeding bird occurrence during spring of 2011. This report presents the results of these surveys.

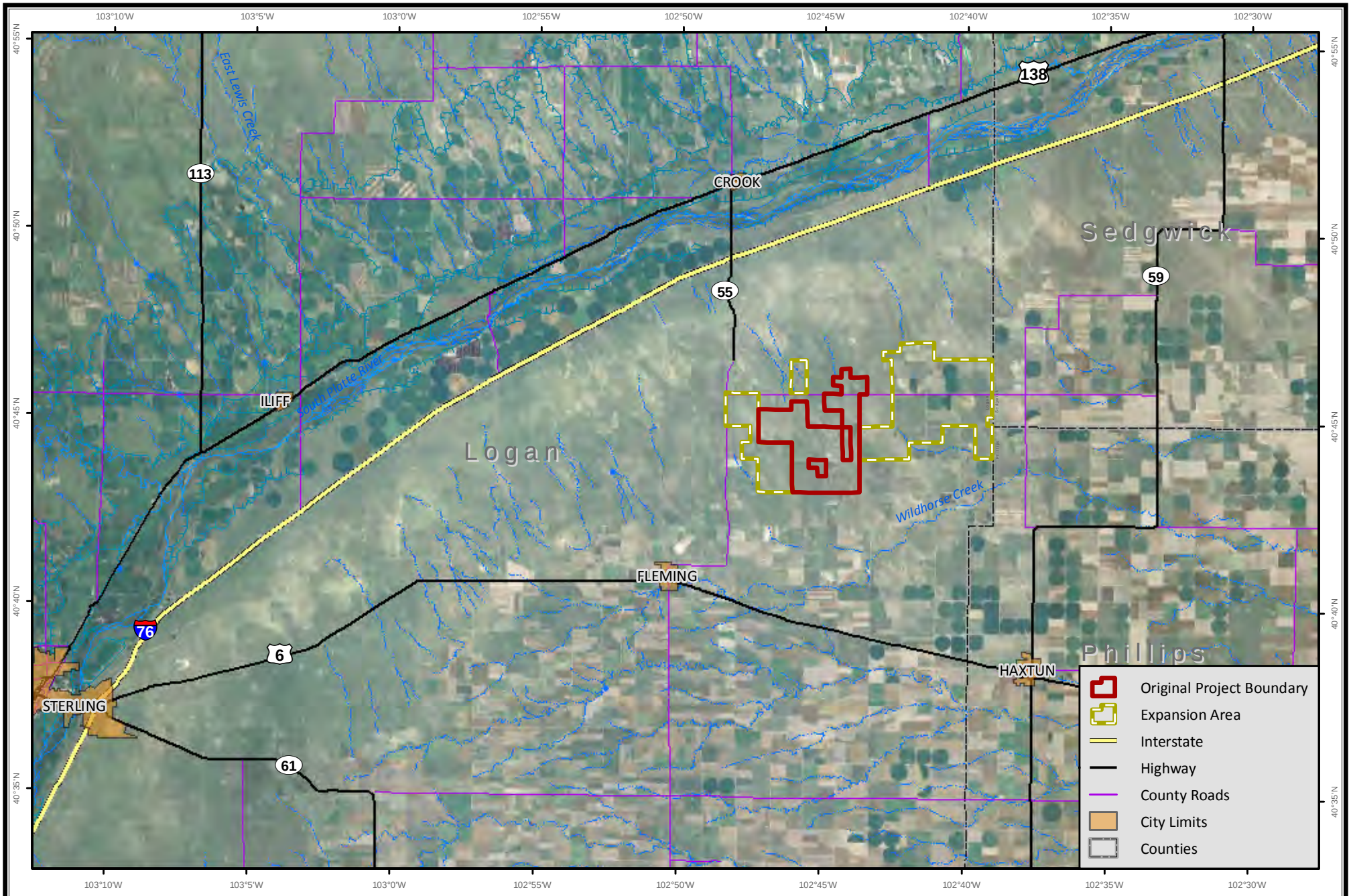
The Project is located northeast of the town of Fleming approximately 3.5 miles north of Highway 6 in Logan County, Colorado (Figure 1). It is situated within the Crook, Fleming, Haxtun West, and Tamarack Ranch USGS 7.5 Minute Quadrangle Maps in the following Townships, Ranges, and Sections:

- Tamarack Ranch Quad: T9N, R48W, Sections 2, 3, 4, 8, 9, 10, 11, 12, 14, 15;
- Haxtun West Quad: T9N, R48W, Sections 20, 21, 22, 23, 24, 29;
- Crook Quad: T9N, R48W, Sections 7, 13, T9N, R49W, Sections 13, 14;
- Fleming Quad: T9N, R48W, Sections 19, 30, T9N, R49W, Sections 23, 24, 25.

The proposed Project with the current expansion encompass approximately 12,540 acres. It is composed primarily of agricultural land, grassland, and Conservation Reserve Program (CRP) seeded grassland.

This report of findings represents the ninth of nine reports documenting results of three years of wildlife surveys conducted by Walsh for the Project. Previously prepared reports are:

1) *Habitat and Wildlife Assessment for Colorado Highlands Wind Farm Project, September 9, 2008;*
2) *Habitat Mapping for Colorado Highlands Wind Farm Project, September 10, 2008;*
3) *Addendum to Habitat and Wildlife Assessment and Habitat Mapping Reports for Colorado Highlands Wind Farm Project, November 11, 2008;*
4) *Fall 2008 Baseline Acoustic Monitoring of Bat Populations Colorado Highlands Wind Project, January 14, 2009;*
5) *Winter Raptor Survey Report for Colorado Highlands Wind Farm, May 26, 2009;*
6) *Avian Spring Surveys for Colorado Highlands Wind Farm, October 16, 2009;*
7) *Avian Fall Surveys for Colorado Highlands Wind Farm, April 8, 2010;* and
8) *Winter Raptor Surveys for Colorado Highlands Wind Farm, Winter 2009-2010, May 19, 2010.*



NAD83 UTM Zone 13N
2011 NAIP Aerial Base

Walsh
an ecology and environment company

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Miles

Figure 1.
Vicinity Map
Colorado Highlands Wind Farm
Logan County, Colorado, 2011

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Methods

Habitat Assessment

A one day onsite habitat assessment was conducted by a two-person field crew. All habitat types in the expansion area were mapped using a Global Positioning System (GPS) and noted on aerial field maps in the expanded areas of the Project.

Greater Prairie-Chicken Lek Surveys

During a site reconnaissance visit in spring 2008, Colorado Parks and Wildlife (CPW, formerly Colorado Division of Wildlife {CDOW}) personnel informed Walsh biologists of the location of a known greater prairie-chicken lek within the original Project area. During spring of 2009, the known lek was revisited and lek surveys were completed according to the guidelines provided by CPW to determine if there were additional leks. In 2011, with the expansion of the Project area, the original survey route was expanded to cover the additional leased land. This expanded survey route consisted of 16 points and was driven through the Project area and transmission line from one half-hour before sunrise to two hours after sunrise. Walsh biologists stopped every mile to listen for five minutes for booming and other vocalizations and to look for prairie-chicken lekking activities. If booming was heard, a researcher walked to the location of the lek and took a GPS reading. These surveys were conducted on April 11, 12, and 13, 2011. The lek survey route focused on prairie-chicken breeding habitats on site including sand sage prairie, short grass prairie, and CRP lands, as well as a thorough assessment of the footprint of the Project area.

Raptor Nest Surveys

Raptor nest surveys were conducted in April and May when nesting activity was highest. During the five days of surveys, researchers visited all known raptor nests (including nests documented during 2008 and 2009 surveys) by vehicle and foot and searched the expanded Project area for nests. Biologists determined whether each nest was active, inactive, or undetermined. Additional nests found during this survey were marked with a GPS unit and the activity status of these nests was determined.

Avian Spring Point Count Surveys

Avian point count surveys were conducted using the standard methodology that was used for the wildlife surveys completed in 2009. Survey points were located in representative habitat types across the expanded Project area. Nine new points (plots), distributed evenly within the expanded Project area and three points from the original survey were surveyed to provide continuity between the original Project area and the expanded area. This allowed for some degree of awareness of potential year-to-year differences. Thus a total of 12 points were visited each count. Six point counts were conducted from mid-April to mid-July (four point count surveys in April and May, two point count surveys in June and July) to capture both migratory and breeding bird use of the Project area. Sampling protocol addressed variability in time (number of times a particular plot was sampled) and space (number of plots on site).

Avian surveys were conducted during the morning up to four hours after sunrise to capture the time of maximum bird activity. Data sheets listed exact time, species, and number of individuals observed. Also

listed were distance from observer, height above ground, behavior of the bird, direction of flight, and habitat. Information on cloud cover, wind speed, and temperature were recorded. Each point count survey was conducted for 10 minutes, during which two biologists would identify and count all birds detected within the plot, defined by an 800-meter radius. A total of 72 point count surveys (6 surveys x 12 points) were completed to generate a valid sample size for data analysis. Point counts are the most widely accepted method of land-bird survey techniques in bird population studies (USDI 2006). Data analysis included species present on the site in spring, relative abundance, and a potential risk index for each species.

All data were recorded in in field notebooks and subsequently entered into Excel spreadsheets. Quality assurance/quality control consisted of proofing the spreadsheet against original data in the field notebook.

Relative abundance (A) is a standard ecological measure of a species' relative representation. Relative abundance was calculated as the number of observations divided by the field effort. The relative abundance for horned larks would be the total number of individual horned larks observed within all 12 point count station areas divided by 72 (the number of surveys conducted): 314 observations/72 surveys = 4.36.

Potential risk of a species flying in the rotor-swept area of the proposed wind turbines was calculated. A potential risk index (R) was calculated for each bird species observed during the point count surveys by multiplying relative abundance of each species with the proportion of observations of each species observed flying (Pf) and the proportion of observations of each species observed flying in the rotor-swept area (Prsa):

$$R = A * Pf * Prsa$$

The ability of this index to predict actual conditions has not been demonstrated. Few studies have compared this index with post-construction fatality estimates, and it is not known if a correlation exists (NWCC 2001).

This calculation includes a single species' abundance, the probability that the species is flying, and the probability that the species is flying within the rotor-swept area, as determined by data collected during point count surveys. The possible turbines to be deployed within the Project area have a rotor-swept height of 30 to 130 meters.

Results

Habitat Assessment

The Project area is in the Lower South Platte River watershed of the central shortgrass prairie ecoregion of the United States (Hazlett 1998) and the southern portion of the Great Plains-Palouse Dry Steppe Province (Bailey 1995). The Project area's rolling terrain is formed by a series of roughly east-west trending ridges separated by swaths of upland grasses and agricultural fields. A shift in plant species composition from grassland to sandsage prairie is associated with shifts in topography from the flat fields to the sides and tops of ridges. Moisture regime is limited due to the rain shadow effect created by the Rocky Mountains (Hazlett 1998).

Over the past 100 or more years since settlement, the landscape has shifted from intact shortgrass prairie to pasture and agricultural lands with remnants of shortgrass prairie in level, low-lying areas and remnants of sandsage prairie on ridges. Since 1986, much of eastern Colorado's lands have been enrolled in the Natural Resource Conservation Service's CRP program, which offers payments to farmers that remove land from annual crop production in order to lessen erosion and water-quality problems on a long-term basis.

The property's only wetlands are playas (natural dry lakebeds that contain water temporarily), and man-made stock ponds for cattle and horses. Moisture also accumulates seasonally in scattered, shallow, lowland areas.

Four major habitat types characterize the proposed project area (Figure 2). Habitat types are described in more detail below. Plant nomenclature follows Weber and Wittman (2001).

Agricultural

Agricultural habitat is characterized by open fields with flat or gently rolling topography. In the project area this habitat is typically a cropland of vegetables such as corn or a cultivated field of grains such as wheat.

CRP Land

Within the project area, large expanses of CRP-planted reclamation species such as smooth brome, switchgrass, Indian ricegrass, sand bluestem, and western wheatgrass dominate. Sand dropseed is the dominant naturally-occurring grass species (Travis McCay, personal communication, May 2008). Sand dropseed dominated habitat occurs on open flat areas with sandy, well-draining soils. In many disturbed areas such as roadsides and along fencelines, sand dropseed occurs with smooth brome and less frequently with cheatgrass.

Grassland

Grasslands are flat or gently rolling plains dominated by grass species with some forb and shrub species. The project area's dominant grassland habitats are sand dropseed, sandsage prairie, and pasture land. Remnant shortgrass prairie, dominated by blue grama, sand dropseed, and buffalograss, occurs in patches throughout and at the base of sandsage prairie ridges. Blowout grass habitat exists adjacent to the project area.

102°48'W 102°46'W 102°44'W 102°42'W 102°40'W

40°46'N 40°44'N

CR 46 CR 4. CR 81

T9N R49W T9N R48W

Logan Sedgwick Phillips

Playa
Agricultural *1,980 Acres*
CRP Lands *3,584 Acres*
Grassland *6,697 Acres*
Shelterbelt *116 Acres*
Original Project Boundary
Expansion Area
State Highway
County Roads
Local Roads

Wildhorse Creek

NAD83 UTM Zone 13N
2011 NAIP Aerial Base

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Figure 2.
Habitat Map
Colorado Highlands Wind Farm
Logan County, Colorado, 2011

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Sand sagebrush prairie is found primarily on ridges and occasionally in the low lying areas. In flatter areas, sandsage prairie begins to co-occur with grasses including sand dropseed, switchgrass, and little bluestem. Pastures of grazed grasslands are characterized by open areas and short vegetation. Forbs are scarce but include purple prairie clover, chamomile, purple mustard, and alfalfa. The dominant sub-shrub is sand sagebrush.

Historically, sandsage prairie on Colorado's eastern plains was dominated by sand sagebrush. Associated grass, forb, and shrub species included Indian ricegrass, sand dropseed, sand bluestem, prairie sandreed, blowout grass, little bluestem, lemon scurfpea, and rabbitbrush (EPA undated). Some yucca and skunkbrush shrubs were also observed.

With the exception of cheatgrass, very few noxious weeds or introduced species occur on site. In areas of higher disturbance such as roadway edges and adjacent field edges, species diversity tends to be lower with weedy species such as smooth brome dominating. Areas with discontinued human activities, such as abandoned farmsteads, tend to have a greater diversity of weeds including cheatgrass, Russian thistle, and purple mustard.

Shelterbelt

Shelterbelts or windbreaks are characterized by trees and shrubs planted to protect downwind habitat. In the project area, shelterbelts are planted in closely spaced rows between fields or grasslands, or they are planted in groves around homesteads for wind protection or privacy. Dominant tree species include plains cottonwood, Siberian elm, juniper, ponderosa pine, and skunkbrush.

Greater Prairie-Chicken Lek Surveys

Two greater prairie chicken leks were observed within the Project area. On April 12 and 21, a greater prairie-chicken lek was seen and heard south of County Road 42 (Figures 3 and 4) approximately 0.25 miles west of the western Project boundary. A maximum of 13 individuals were observed at this lek. Another lek was seen and heard northeast of the intersection of County Roads 42 and 87, approximately 0.13 miles north of a lek found in 2008 and 2009. A maximum of ten individuals were observed at this lek.

Raptor Nest Surveys

Fifteen raptor nests were found and the locations marked with a GPS during the 2011 surveys (Figure 4, Table 1). There were three active ferruginous hawk nests, one active red-tailed hawk nests, three active great horned owl nests, and one active Swainson's hawk nest. The remaining seven nests were inactive.

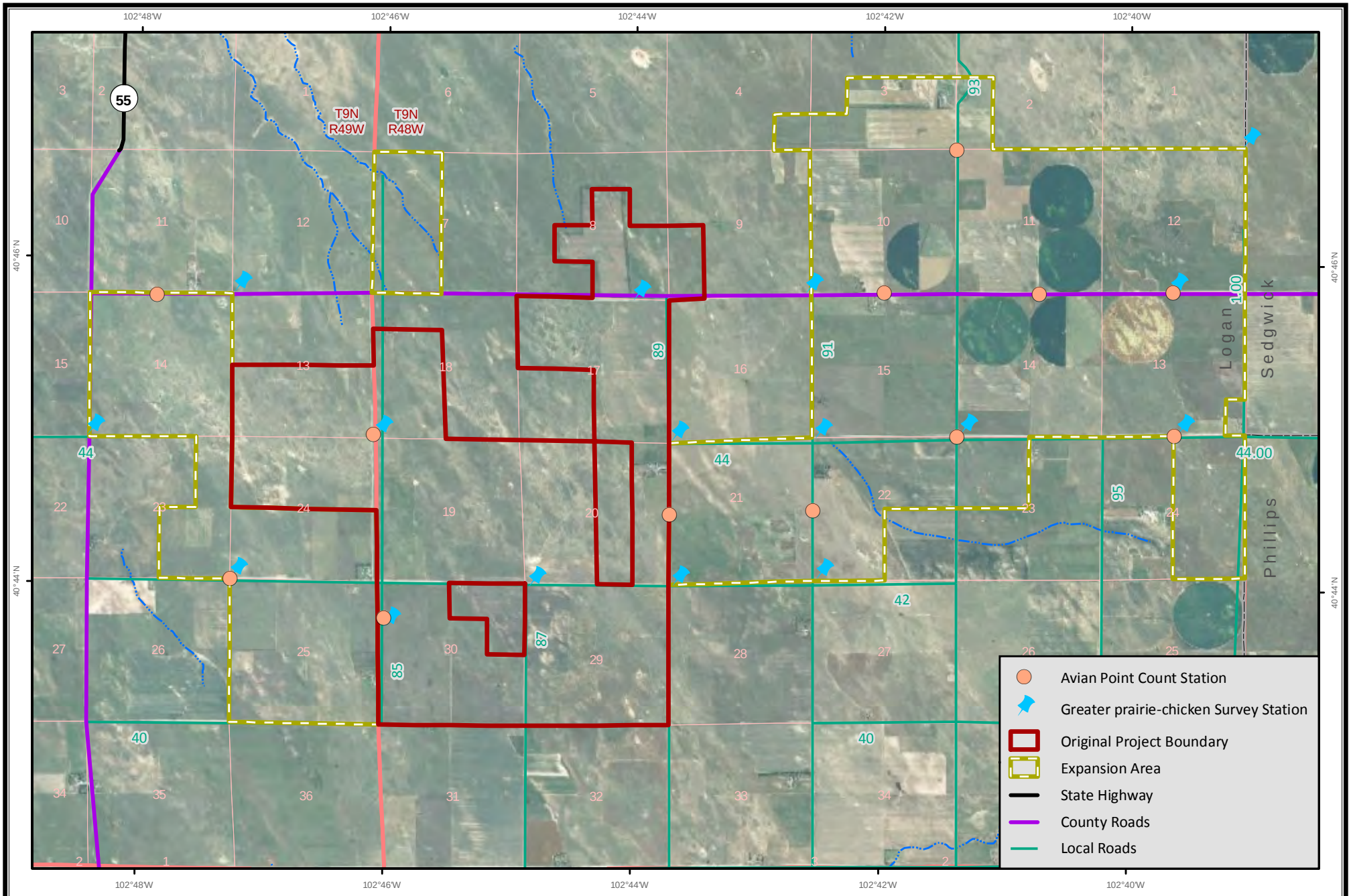

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Figure 3. Avian Point Count & Greater Prairie-Chicken Survey Stations
Colorado Highlands Wind Farm
Logan County, Colorado, 2011

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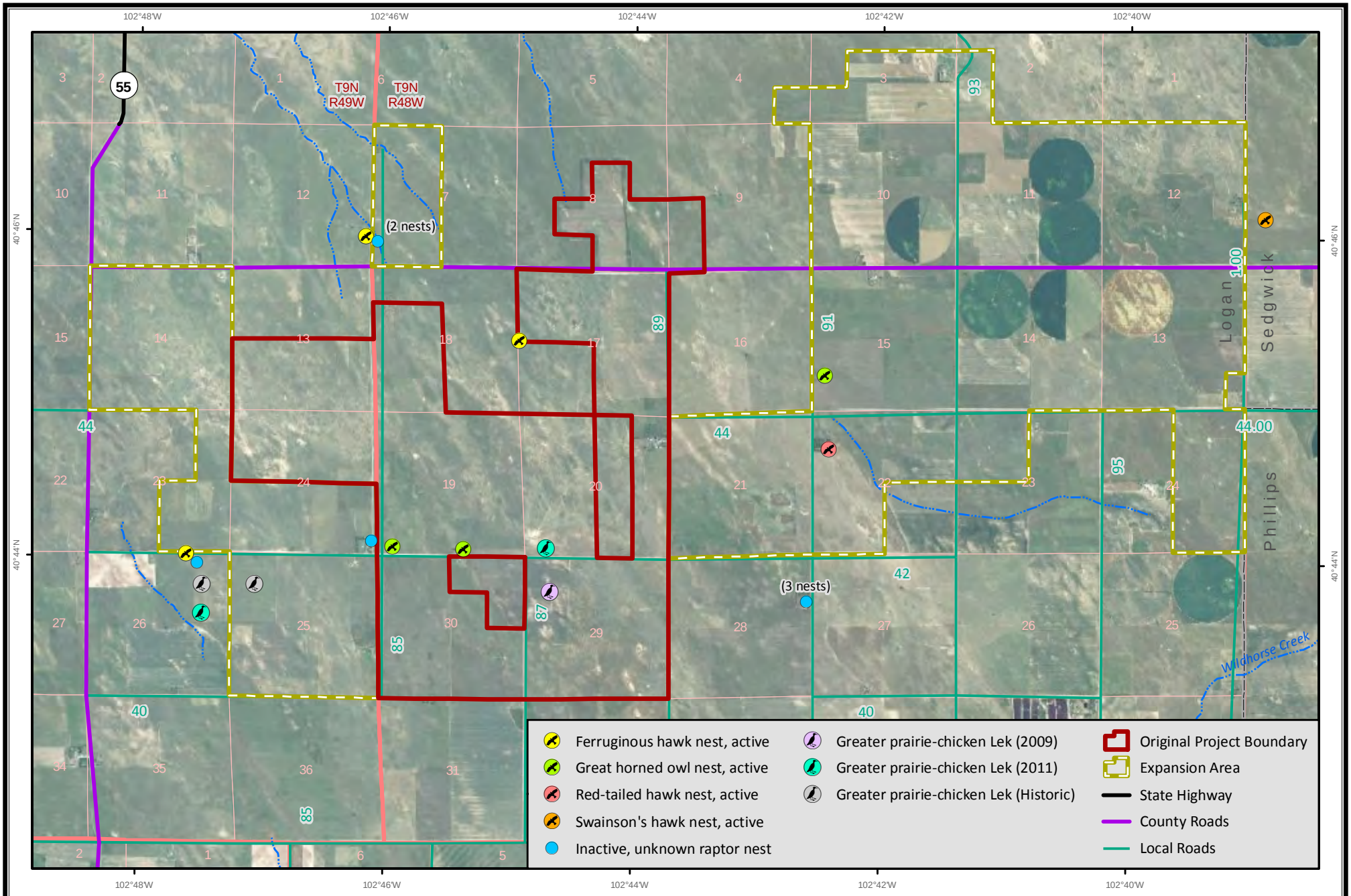

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Figure 4. Raptor Nest & Greater Prairie-Chicken Lek Locations Colorado Highlands Wind Farm

Logan County, Colorado, 2011

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Table 1. Raptor Nest Locations, Colorado Highlands Wind Energy Project, Logan County, Colorado, 2009 and 2011

Coordinates*	Total Number of Nests	Year Located	Description	Activity Level
N40 46.023 W102 46.156	3	2009	Great horned owl nest	Active
			Two unidentified nests	Inactive
	3	2011	Ferruginous hawk nest	Active
			Two unidentified nests	Inactive
N40 45.569 W102 46.104	3	2009	Red-tailed hawk nest	Inactive
			Two dilapidated, unidentified nests	Inactive
N40 45.556 W102 44.307	Unknown	2009	Burrowing owl nests, 5 individual birds seen	Active
N40 44.021 W102 47.612	2	2011	Ferruginous hawk nest	Active
			Unidentified nest	Inactive
N40 44.118 W102 46.120	1	2009	Unidentified nest	Inactive
	1	2011		
N40 45.346 W102 44.937	1	2011	Ferruginous hawk nest	Active
N40 44.695 W102 42.431	1	2011	Red-tailed hawk nest	Active
N40 44.345 W102 46.171	1	2011	Great horned owl nest	Active
N40 45.137 W102 42.566	1	2011	Great horned owl nest	Active
N40 44.236 W102 45.408	1	2011	Great horned owl nest	Active
N40 46.127 W102 38.917	1	2011	Swainson's hawk nest	Active
N40 43.757 W102 42.602	3	2011	Unidentified nests	Inactive

*Coordinates given denote location of the active nest within a group of clumped nests; if no nest is active, then coordinate denotes general location of a group of inactive nests. Note that Figure 4 shows 2011 nests only.

Avian Spring Point Count Surveys

A total of 44 avian species (2,033 individual birds) were identified on the Project site during the avian spring point count surveys (Table 2). Four unknown sparrow species and three unknown Buteo (red-tailed, Swainson's, or ferruginous hawk) species were also observed and included in these counts.

Species composition included 70 percent songbirds (31 species), 16 percent raptors (7 species), 5 percent owls (2 species), 5 percent game birds (2 species), and 5 percent water birds (2 species). The number of individuals observed was: 1,883 songbirds (92.6 percent), 120 game birds (6 percent), 25 raptors (1 percent), 3 owls (0.1 percent), and 2 water birds (0.1 percent). Mean relative abundance was 28.24 birds per point count survey. The most common bird species observed was the western meadowlark, with lark bunting, horned lark, mourning dove, ring-necked pheasant, and grasshopper

sparrow being the next five most abundant species (Table 2). Other abundant species included the house sparrow, Brewer's blackbird, and Cassin's sparrow.

Table 2. Avian Point Count Surveys, Number Observed and Relative Abundance, Colorado Highlands Wind Energy Project, Logan County, Colorado 2011

Species	Number Observed	Relative Abundance (A)*
Western meadowlark	546	7.58
Lark bunting	397	5.51
Horned lark	314	4.36
Mourning dove	178	2.47
Ring-necked pheasant	113	1.57
Grasshopper sparrow	92	1.28
House sparrow	76	1.06
Brewer's blackbird	70	0.97
Cassin's sparrow	57	0.79
Brown-headed cowbird	24	0.33
Lark sparrow	22	0.31
Barn swallow	20	0.28
Red-winged blackbird	15	0.21
Chipping sparrow	14	0.19
Northern harrier	13	0.18
Killdeer	10	0.14
American robin	7	0.10
Dickcissel	7	0.10
Greater prairie-chicken	7	0.10
Common nighthawk	5	0.07
Cliff swallow	4	0.06
Common grackle	4	0.06
Unknown sparrow	4	0.06
Western kingbird	4	0.06

Table 2. Avian Point Count Surveys, Number Observed and Relative Abundance, Colorado Highlands Wind Energy Project, Logan County, Colorado 2011

Species	Number Observed	Relative Abundance (A)*
Red-tailed hawk	3	0.04
Unknown Buteo	3	0.04
Swainson's hawk	3	0.04
American kestrel	2	0.03
European starling	2	0.03
Great-horned owl	2	0.03
Northern mockingbird	2	0.03
Mallard	2	0.03
Brown thrasher	1	0.01
Bullock's oriole	1	0.01
Eastern kingbird	1	0.01
Great blue heron	1	0.01
Lazuli bunting	1	0.01
Loggerheaded shrike	1	0.01
Lincoln's sparrow	1	0.01
Northern cardinal	1	0.01
Prairie falcon	1	0.01
Sage thrasher	1	0.01
Vesper sparrow	1	0.01
Total number observed and mean relative abundance	2033	28.24

* Relative abundance (A) = number observed/total number of surveys

Potential Risk Index

Of the 44 bird species observed, 4 species (9 percent) were observed within the RSA (between 30 and 130 meters above the ground) (Table 3). Of the 2,033 individuals seen, 6 individuals (0.29 percent) were observed in the RSA. The potential collision index for all birds, which takes into account the percent of birds flying within the RSA and relative abundance, was 0.06, with northern harrier and mourning dove having the highest risk of collision.

Table 3. Proportion of Birds Flying, Proportion in the Rotor-Swept Area, and Potential Risk Index at Colorado Highlands Wind Farm, Logan County, Colorado, Spring 2011

Common Name	Relative Abundance (A)	Proportion Observed Flying (P_f)	Proportion Observed Flying in RSA (P_{rsa})	Potential Risk Index (R) $R = A*P_f*P_{rsa}$
Northern harrier	0.18	0.92	0.15	0.03
Mourning dove	2.47	0.60	0.01	0.02
Lark sparrow	0.31	0.77	0.05	0.01
Swainson's hawk	0.04	0.67	0.33	0.01

Discussion

Habitat Assessment

The Project area and the general vicinity have been under continual use as rangeland for livestock and horses and as cropland for many decades. The landscape is dominated by grasslands in the western half of the Project while the eastern half is a mosaic of agricultural, CRP, and grasslands. Due to various habitat conversions taking place since the time of settlement including agriculture and grazing, the Project area supports lower biodiversity than it did prior to settlement. No Special Status plant Species were found within the Project area.

Greater Prairie-Chicken Lek Surveys

Two greater prairie-chicken leks were confirmed during 2011 surveys. One lek was previously identified in the original Project area in 2008 and 2009, but its location had shifted northward in 2011. Greater prairie-chickens are known for lek site fidelity and may be expected to return to observed leks in subsequent years (Robb and Schroeder 2005). The observation that this lek moved 0.13 miles north from its prior location in 2009 may indicate a localized habitat change.

In May 2008, a letter from CPW to CHW recommended a buffer zone of 0.5 miles from any lek for turbines and transmission lines; no turbine maintenance before 10 A.M. and after 5 P.M. between March 1 and June 30 to protect prairie-chickens; and that prairie-chicken lek surveys be conducted between late March to mid-April. In recent discussions with CPW (Marty Stratman, personal communication), Walsh has learned that CPW has shown flexibility with these recommendations on a Project specific basis.

Raptor Nest Surveys

The species found nesting in the Project area and within a 0.5-mile buffer around the Project boundary include ferruginous hawk, red-tailed hawk, Swainson's hawk, great horned owl, and burrowing owl. No golden eagle nests were found nesting on the site and no golden eagles were or observed during point counts. Ferruginous hawks have multiple nests within a territory and will often use the same nest or an alternate each year (Bechard and Schmutz 1995). Ferruginous hawks are a Special Status Species (non-statutory) in Colorado, due to declining populations (CDOW 2011). Red-tailed hawks are known to use either the same nest or a nest in the same area from year to year, and can also be expected to be found nesting within the Project area in subsequent years (Preston and Beane 2009). Swainson's hawks can be quite variable with their nest locations, but are also expected to continue nesting within the same general area (Bechard et al. 2010). Great horned owls, which are known to thrive in rural areas, could be expected to nest in this area using nests of other species as they do not build their own (Kingery 1998). Burrowing owls, a state threatened species, may also be nesting onsite, although no nest burrows were directly observed during 2011 surveys (CDOW 2011). Because of the variability of raptor nest sites and activity year to year, surveys are recommended immediately prior to construction activities.

Avian Spring Point Count Surveys

Avian species observed during the spring survey period were typical of the habitats encountered within the Project area and included a mix of specialist and generalist avian species. Grassland species that

typically nest on the ground or in low shrubs were found in the open prairie areas, which comprise the largest portion of the Project area.

Species richness was the same in the spring of 2009 when compared to 2011 (44 species), although the species composition differed slightly. The total number of observations was fairly similar (2,346 in 2009 and 2,033 in 2011).The potential risk index significantly decreased from 0.89 in the spring of 2009 to 0.06 in 2011. The number of species flying within the RSA was also much lower for 2011 when compared with 2009 (4 species in 2011 and 25 species in 2009). Walsh is unaware of any factors that would have contributed to this pattern.

Songbirds

Most songbirds observed during the spring surveys were below the RSA. Many of these were ground-nesting birds that tend to fly close to the ground during the breeding season. Tree-nesting species were seen flying more often within the RSA and may be at higher risk for collision with turbines. The mourning dove had the highest potential risk index for all songbirds, and the second highest for all species perhaps because of its relative abundance within the RSA, which affects the risk index.

Migratory birds, their eggs, and active nests are protected under the Migratory Bird Treaty Act (MBTA). Nest destruction that results in the unpermitted take of migratory birds or their eggs is prohibited under the MBTA. Take is defined as: pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. In Colorado, all non-game birds except for European starling, house sparrow, and rock dove are protected under the Act (USFWS 1918). The MBTA does not prohibit the dismantling of an unoccupied bird nest (without birds or eggs), however unoccupied nests may not be collected.

Although no wind energy project can be free of risk to birds, by implementing recommendations listed at the end of this document, risk may possibly be reduced. However, as stated previously there are few studies correlating the risk index to post construction mortality estimates.

Raptors

With the construction of wind turbines, the risk to raptor species can take three forms: direct habitat loss, effective habitat loss, and fatality. Direct habitat loss is due to the construction footprint of turbines, roads, and other infrastructure associated with the wind farm. For example removal of trees that raptors use for roosting would result in direct habitat loss. Effective habitat loss is the decreased use of otherwise suitable habitat because of avoidance of disturbance, for example if raptors avoid a foraging area or nesting site due to human activity. Direct and effective loss of habitat can be measured by decreases in habitat and relative abundance of birds. Fatalities are due to collisions of birds with turbines and other associated structures. Fatalities are measured by post-construction carcass searches.

Raptor species comprised 1.3 percent of all avian observations, and 3 of the 6 observations within the RSA. The average raptor risk was 0.02, which was slightly higher than songbirds. The northern harrier had the highest risk value of all avian species, and the Swainson's hawk had the third highest risk value. Raptors were seen more often flying within the RSA because they soar and fly at high elevations, and therefore may be at higher risk for collision with turbines than ground-nesting songbird species.

Fatalities of avian species at wind projects have been documented to be low compared with other sources of mortality (Erickson et al. 2005) and new research shows that collision fatalities at communication towers and buildings buildings do not have a discernible effect on avian populations (Arnold and Zink 2011).

Recommendations

There are several recommendations that could minimize impacts to plant communities and wildlife on the Colorado Highlands Wind Farm site. These include:

- Continued coordination with CPW and USFWS. Frequent and open communication with these agencies provides important feedback and can improve overall Project planning and construction in terms of minimizing impacts to native vegetation and wildlife.
- Develop the smallest possible footprint for turbines, access roads, and other infrastructure.
- Employ Best Management Practices (BMPs) such as erosion and sedimentation controls to minimize lay-down impacts and minimize potential for introduction or spread of noxious weeds.
- Consider a cross-check with the Colorado Renewables and Conservation Collaborative Best Management Practices. (www.interwest.org/crcc_overview.htm).
- As suggested by Avian Power Line Interaction Committee (APLIC 2006), fit new power and communication towers with perch guards; design powerline conductor spacing to minimize the potential for raptor electrocutions (60 inches apart for raptors); design transmission lines to have the top two wires (lightning/ground wires) made visible; and equip permanent meteorological towers with Bird Flight Diverters to minimize the potential for avian collisions with guy wires.
- Because raptor nest use is dynamic, be aware of the potential need to repeat raptor nest surveys throughout the site and 0.5 mile buffer zone outside the Project boundary prior to project construction.
- Create a project constraints map with recommended buffer zones for nesting raptors (buffer distances shown in Attachment 1) to show areas to be seasonally avoided for construction activities.
- Minimize development in sensitive habitats such as, prairie dog colonies, and ephemeral creeks. Minimize removal of native trees.
- If road and facility construction is necessary during the nesting season, conduct nesting bird sweeps from approximately April 15 to July 15 to limit disturbance to maintain compliance with the Migratory Bird Treaty Act.
- To help prevent nighttime collisions by migratory songbirds that are attracted to lights, eliminate all skyward facing and flood lighting at structures and turn off lighting inside the nacelles.
- For all ground-level outdoor lighting at operation and maintenance facilities, USFWS recommends using motion-sensor switches (USFWS 2010) to prevent lights being left on overnight, attracting migrating birds to the wind farm and near turbines.
- For any tall structures requiring Federal Aviation Administration warning lights, use only red or white flashing strobe lights instead of steady non-flashing red lights. All strobe lights should synchronously fire throughout the site to help reduce the attraction of migratory songbirds at night (USFWS 2010).
- Bury collector lines in the Project area.

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January 19, 2009

Mitigation Action Plan

Colorado Highlands Wind Project
Logan County, Colorado

Project Overview. Western Area Power Administration (Western) a power marketing agency of the U.S. Department of Energy (DOE) proposes to approve interconnection of the Project with Western's transmission system and the connected action of the Project. Colorado Highlands Wind LLC (CHWP) applied (via predecessor project owner Wind Energy Prototypes) to Western to interconnect a 90-megawatt (MW) wind power facility with Western's existing Sterling-Frenchman Creek 115-kV transmission line. Approval of the Interconnection Agreement would allow the Project to interconnect with Western's proposed Wildhorse Creek Switchyard. In accordance with the DOE NEPA Implementing Procedures, Western prepared an environmental assessment (EA) on Western's action and the Project. The EA evaluates the potential environmental impacts associated with Western's decision on the Interconnection Agreement and the Project. As referenced in the FONSI, this Mitigation Action Plan (MAP) required by 10 CFR § 1021.331 will be implemented by the Project.

A detailed description of the Project is in the EA.

Mitigation Action Plan. The DOE requirements for preparing a Mitigation Action Plan (MAP) are specified in 10 C.F.R. §1021.331(b) These regulations state that, where mitigation measures are required to render the impact of a proposed action not significant, DOE must prepare a MAP, which "shall address all commitments to such necessary mitigations and explain how mitigation will be planned and implemented." The MAP must be prepared before and referenced in the FONSI. This MAP addresses the construction, operation, and maintenance of the Colorado Highlands Wind Project.

Two distinct sets of mitigation measures were identified in the EA: (1) Western's Standard Construction, Operation, and Maintenance Practices, and (2) Colorado Highlands Wind Project-committed mitigation measures. Of the several mitigation measure commitments described in the EA, the following would ensure that potential impacts are insignificant. Other mitigation measures, such as the standard construction mitigation measures and applicant-committed mitigation measures will be implemented as described in the EA during project design, construction, and operation. These

measures will be implemented to avoid, reduce, or eliminate project impacts related to CHW's Project.

Federally Listed, Proposed, and Candidate Species and Species of Concern

To mitigate potential impacts from the water depletions occurring during construction, operations and maintenance, CHW is participating in the South Platte River Water Related Activities Program (SPRWRAP) component of the Platte River Recovery Implementation Recovery Program, as approved by the USFWS for compliance with the ESA.

Mitigation of Impacts to Cultural Resources

- Any cultural resources (prehistoric or historic site or object) discovered by CHW or any person working on its behalf would be reported immediately to Western. All operations in the immediate vicinity of the discovery would be suspended at once, and the area would be secured with temporary fencing and/or flagging. Western would document and evaluate the discovery and would determine appropriate actions to be taken in order to prevent the loss of significant cultural or scientific values. Western or CHW may consult with the Colorado State Historic Preservation Office (SHPO) to determine National Register of Historic Places eligibility or mitigation measures. CHW would be responsible for the cost of evaluation, and any decision as to proper mitigation measures would be made by Western after consulting with CHW. Operations in the vicinity of the discovery would not resume until written authorization to proceed has been received from SHPO.

- Western, at the expense of CHW, will complete consultation under Section 106 of the National Historic Preservation Act, on the one remaining identified site (Site 5LO677). The consultation process will be completed to the satisfaction of the State of Colorado Historic Preservation Officer, Western, the Advisory Council on Historic Preservation (if required) and CHW.

Mitigation of Impacts to Paleontological Resources

Paleontological resource discovered by CHW or any person working on its behalf would be immediately reported to CHW. If paleontological resources are encountered, additional avoidance and mitigation measures are described in Section 3 of the EA. While unlikely, if oversight is deemed necessary, monitors would also receive training in the identification of paleontological resources specific to the site.

Wildlife

The following measures would be implemented to minimize impacts to wildlife.

- CHW would incorporate Colorado Division of Wildlife (CDOW) and U.S. Fish and Wildlife Service (FWS) recommendations (which included to

reference to Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines [FWS 2003]) as agreed to in a meeting that occurred on June 25, 2008, and as set forth in a letter to the CDOW dated July 18, 2008, in addition to the letters received from both the CDOW and FWS as provided in Appendix A of the EA.

- Surface occupancy (i.e. structures) and surface-disturbing activities would be prohibited as follows for the following species:
  - great horned owls - no surface occupancy within 402 m (0.25 mi) of nest; no construction within 805 m (0.5 mi) of nest from January 1 to July 15;
  - red-tailed hawk - no surface occupancy within 402 m (0.25 mi) of nest; no construction within 805 m (0.5 mi) of nest from February 15 to July 15;
  - Swainson's hawk - no surface occupancy within 402 m (0.25 mi) of nest; no construction within 805 m (0.5 mi) of nest from April 1 to July 15;
  - burrowing owl – no construction within 46 m (150 feet) of an active nest area from March 1 through October 31; and
  - greater prairie chicken lek – no surface structures or overhead construction within 805 m (0.5 mi) of lek.
- Additional mitigation for raptors would be designed on a site-specific basis, as necessary, in consultation with the FWS and CDOW. CHW would notify the FWS or CDOW immediately if raptors are found nesting on Project facilities (i.e., power poles, towers).
- Power line construction would follow the recommendations of the Avian Power Line Interaction Committee (APLIC 2006) to avoid electrocution of raptors and other avifauna.
- CHW would minimize noise, prohibit hunting, fishing, dogs, or possession of firearms by its employees and its designated contractor(s) in the Project area during construction, operation, and maintenance.
- Surface disturbance would be avoided or minimized in areas of high wildlife value (e.g., prairie dog colonies, playas, shelterbelts, and stock ponds).
- Potential increases in poaching would be minimized through employee and contractor education regarding wildlife laws. If violations are discovered, the offending employee or contractor would be disciplined and may be dismissed by CHW and/or prosecuted by the CDOW.
- CHW would set and enforce speed limits on roads to minimize wildlife mortality due to vehicle collisions, travel would be restricted to designated roads; no off-road travel would be allowed except in emergencies.
- Where practical, CHW would use state-of-the-art wind turbines and wind industry standard practices.
- CHW would conduct raptor nest searches and avoid activities in buffer areas around active nests during construction. The raptor nest searches would be conducted monthly in February and March, and every two weeks from April through July during construction. These searches coincide

with other ongoing surveys (winter raptor surveys, spring avian surveys, etc.) during construction.

- CHW would minimize surface disturbance and conduct prompt reclamation, including restoration of shortgrass prairie.
- CHW would use best management practices to minimize erosion and harm from spills.

- CHW would conduct post-construction mortality monitoring (for both avian and bat species) in accordance with National Wind Coordinating Committee recommendations. If post-construction monitoring indicates the potential for unacceptable avian mortality, CHW will consult with CDOW and FWS to evaluate practicable mitigation alternatives in accordance with current best management practices.

If other species of concern are found nesting in the Project area, CHW will consult with CDOW and FWS regarding recommended buffer zones. As is currently the case for the identified species, the buffer distance and restriction dates may vary on a case-by-case basis, depending on such factors as the activity status of the nest, species involved, natural topographic barriers, line-of-sight distances, and other conflicting issues. Exceptions may be granted in writing by the FWS and/or CDOW.

Attachment 2. Scientific Names of Plants and Animal Listed in Report Text.

Plants	
Alfalfa	*Medigaco sativa*
Blowout grass	*Redfieldia flexuosa*
Blue grama	*Chondrosum gracile*
Buffalograss	*Buchloe dactyloides*
Chamomile	*Anthemis* species
Cheatgrass	*Anisantha tectorum*
Indian ricegrass	*Achnatherum hymenodies*
Juniper	*Juniperus* species
Lemon scurfpea	*Psoralidium lanceolatum*
Little bluestem	*Schizachyrium scoparium*
Plains cottonwood	*Populus deltoides*
Ponderosa pine	*Pinus ponderosa*
Prairie sandreed	*Calimovilfa longifolia*
Purple mustard	*Chorispora tenella*
Purple prairie clover	*Dalea purpurea*
Rabbitbrush	*Chrysothamnus* species
Russian thistle	*Salsola* species
Sand bluestem	*Andropogon hallii*
Sand dropseed	*Sporobolus cryptandrus*
Sand sagebrush	*Artemisia filifolia*
Siberian elm	*Ulmus pumila*
Skunkbrus	*Rhus aromatica* var. *trilobata*
Smooth brome	*Bromopsis inermi*
Yucca	*Yucca glauca*
Switchgrass	*Panicum vergatum*
Western wheatgrass	*Pascopyrum smithii*

Birds	
Anseriformes (Waterfowl)	
Mallard	*Anas platyrhynchos*
Galliformes (Game birds)	
Ring-necked Pheasant	*Phasianus colchicus*
Greater prairie-chicken	*Tympanuchus cupido*
Pelecaniformes (Pelicans, Herons, and Allies)	
Great blue heron	*Ardea herodias*
Accipitriformes (Vultures, Hawks and Eagles)	
Northern harrier	*Circus cyaneus*
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
Buteo species	*Buteo* sp.
Falconiformes (Falcons)	
American kestrel	*Falco sparverius*
Prairie falcon	*Falco mexicanus*
Charadriiformes (Shorebirds)	
Killdeer	*Charadrius vociferus*
Columbiformes (Doves)	
Mourning dove	*Zenaida macroura*
Strigiformes (Owls)	
Great horned owl	*Bubo virginianus*
Caprimulgiformes (Nightjars)	
Common nighthawk	*Chordeiles minor*
Passeriformes (Songbirds)	
Western kingbird	*Tyrannus verticalis*
Eastern kingbird	*Tyrannus tyrannus*
Loggerhead shrike	*Lanius ludovicianus*

Birds	
Passeriformes (Songbirds) continued . . .	
Horned lark	*Eremophila alpestris*
Cliff swallow	*Petrochelidon pyrrhonota*
Barn swallow	*Hirundo rustica*
American robin	*Turdus migratorius*
Northern mockingbird	*Mimus polyglottos*
Sage thrasher	*Oreoscoptes montanus*
Brown thrasher	*Toxostoma rufum*
European starling	*Sturnus vulgaris*
Cassin's sparrow	*Peucaea cassinii*
Chipping sparrow	*Spizella passerina*
Vesper sparrow	*Pooecetes gramineus*
Lark sparrow	*Chondestes grammacus*
Lark bunting	*Calamospiza melanocorys*
Grasshopper sparrow	*Ammodramus savannarum*
Lincoln's sparrow	*Melospiza lincolnii*
Sparrow species	Sparrow species
Northern cardinal	*Cardinalis cardinalis*
Lazuli bunting	*Passerina amoena*
Dickcissel	*Spiza americana*
Red-winged blackbird	*Agelaius phoeniceus*
Western meadowlark	*Sturnella neglecta*
Brewer's blackbird	*Euphagus cyanocephalus*
Common grackle	*Quiscalus quiscula*
Brown-headed cowbird	*Molothrus ater*
Bullock's oriole	*Icterus bullockii*
House sparrow	*Passer domesticus*

Avian Surveys
Spring and Summer 2012
Colorado Highlands Wind Farm

Logan County, Colorado

August 21, 2012

Prepared for:

Colorado Highlands Wind, LLC

Prepared by:

Walsh
an ecology and environment company

Table of Contents

List of Tables

Figures

Attachments

List of Abbreviations and Acronyms

APLIC	Avian Power Line Interaction Committee
BMP	Best Management Practice
CDOW	Colorado Division of Wildlife
CPW	Colorado Parks and Wildlife
CRP	Conservation Reserve Program
GPC	Greater prairie-chicken
GPS	Global Positioning System
MBTA	Migratory Bird Treaty Act
Project	Colorado Highlands Wind Farm
RSA	Rotor Swept Area
USFWS	United States Fish and Wildlife Service
Walsh	Walsh Environmental Scientists and Engineers, LLC

Executive Summary

The Colorado Highlands Wind Project encompasses approximately 12,540 acres in Logan County, Colorado. This report summarizes greater prairie-chicken lek surveys, raptor nest surveys, and avian point count surveys conducted during the spring and summer of 2012, and provides an overall comparison with surveys from 2009, 2010 and 2011 combined.

Two leks were observed within the Project area during the 2012 spring surveys; they were also observed in prior years. Outside the Project area, two leks were observed, one of which was historic and one was new.

All raptor nest locations observed were marked and assessed for activity. Seventeen active raptor nests were found. There were three active ferruginous hawk nests, four active red-tailed hawk nests, four active great horned owl nests, and six active Swainson's hawk nests.

Twelve point count stations were established to assess avian use across the entire Project site. Each point was visited six times throughout the spring and early summer for a total of 72 point count surveys. A total of 1,327 individuals were documented on the Project site during the point count surveys. Mean relative abundance was 18.43 birds per point count. Many of these were prairie songbird species that tend to fly close to the ground and will remain below the RSA. The most abundant bird species was the western meadowlark. Only one percent of all bird observations were in the height of the RSA.

No Federal Endangered, Threatened, or Candidate species were detected during these spring and summer surveys. One State Species of Special Concern, the ferruginous hawk, was seen in the Project area. All native birds are protected by the Migratory Bird Treaty Act.

Recommendations and potential mitigation actions for avian species are listed at the end of the report.

Introduction and Project Description

Walsh Environmental Scientists and Engineers, LLC (Walsh) was retained by Colorado Highlands Wind, LLC, to conduct various avian spring surveys at the Colorado Highlands Wind Project (Project) and additional land area considered for potential expansion. This effort involved conducting greater prairie-chicken (GPC) lek surveys, raptor nest surveys, and avian point counts to document migrating and breeding bird occurrence during spring and early summer of 2012. This report presents the results of these surveys.

The Project is located northeast of the town of Fleming approximately 3.5 miles north of Highway 6 in Logan County, Colorado (Figure 1). It is situated within the Crook, Fleming, Haxtun West, and Tamarack Ranch USGS 7.5 Minute Quadrangle Maps in the following Townships, Ranges, and Sections:

Crook Quad: T9N, R48W, Sections 7, 13, T9N, R49W, Sections 13, 14;

Fleming Quad: T9N, R48W, Sections 19, 30, T9N, R49W, Sections 23, 24, 25;

Haxtun West Quad: T9N, R48W, Sections 20, 21, 22, 23, 24, 29;

Tamarack Ranch Quad: T9N, R48W, Sections 2, 3, 4, 8, 9, 10, 11, 12, 14, 15.

The Project area encompasses approximately 12,540 acres. It is composed primarily of agricultural land, grassland, and Conservation Reserve Program (CRP) seeded grassland.

This report of findings represents the eleventh report documenting results of four years of wildlife surveys conducted by Walsh for the Project. Previously prepared reports are:

1. Habitat and Wildlife Assessment for Colorado Highlands Wind Farm Project, September 9, 2008;
2. Habitat Mapping for Colorado Highlands Wind Farm Project, September 10, 2008;
3. Addendum to Habitat and Wildlife Assessment and Habitat Mapping Reports for Colorado Highlands Wind Farm Project, November 11, 2008;
4. Fall 2008 Baseline Acoustic Monitoring of Bat Populations Colorado Highlands Wind Project, January 14, 2009;
5. Winter Raptor Survey Report for Colorado Highlands Wind Farm, May 26, 2009;
6. Avian Spring Surveys for Colorado Highlands Wind Farm, October 16, 2009;
7. Avian Fall Surveys for Colorado Highlands Wind Farm, April 8, 2010;
8. Winter Raptor Surveys for Colorado Highlands Wind Farm, Winter 2009-2010, May 19, 2010;
9. Habitat Assessment and Avian Spring Surveys for Colorado Highlands Wind Farm, January 11, 2012; and
10. Pre-Construction Songbird Nest Sweeps for Colorado Highlands Wind Farm, June 15, 2012.

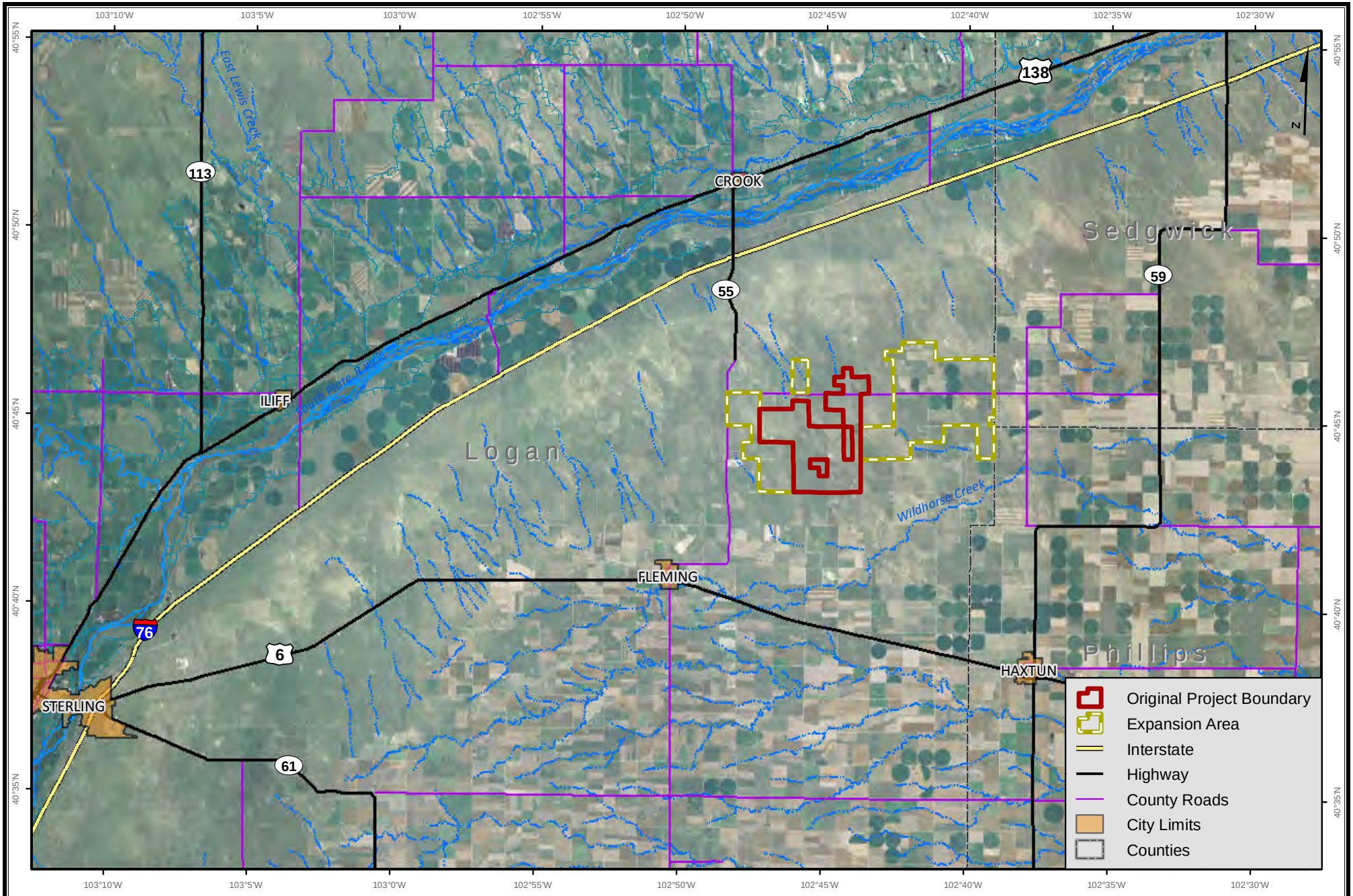

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Figure 1.
Vicinity Map
Colorado Highlands Wind Farm
Logan County, Colorado, 2012

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Methods

Greater Prairie-Chicken Lek Surveys

During a site reconnaissance visit in spring 2008, Colorado Parks and Wildlife (CPW, formerly Colorado Division of Wildlife {CDOW}) personnel informed Walsh biologists of the location of a known GPC lek within the original Project area. During the spring of 2009, the known lek was revisited and lek surveys were completed according to the guidelines provided by CPW to determine if there were additional leks. In 2011, with the inclusion of additional land in the Project area, the original survey route was expanded to cover the additional leased land. In 2012, the larger Project area was again surveyed for GPC. This expanded survey route consisted of 16 points and the Walsh biologists drove through the Project area and transmission line from one half-hour before sunrise to two hours after sunrise. Walsh biologists stopped every mile to listen for five minutes for booming and other vocalizations and to look for prairie-chicken lekking activities. If booming was heard, a researcher walked to the location of the lek and took a Global Positioning System (GPS) reading. These surveys were conducted on March 28, and April 5, 19, and 20, 2012. The lek survey route focused on prairie-chicken breeding habitats on site including sand sage prairie, short grass prairie, and CRP lands, as well as a thorough assessment of the footprint of the Project area (Figure 2).

Raptor Nest Surveys

Raptor nest surveys were conducted throughout the Project area and inclusive of a two-mile buffer around the entire Project area from March through July to capture all stages of nest activity. During the nine days of surveys, researchers visited all known raptor nests (including nests documented during 2010 surveys) by vehicle and foot and searched the expanded Project area for nests. Biologists determined whether each nest was active, inactive, or undetermined. Follow-up searches revealed whether the active nests were abandoned or fledged young. Additional nests found during this survey were marked with a GPS unit and the activity status of these nests was determined.

Avian Spring Point Count Surveys

Avian point count surveys were conducted using the standard methodology that was used for the wildlife surveys completed in 2009. This methodology is consistent with U.S. Fish and Wildlife Service (USFWS) Land-based Wind Energy Guidelines (USFWS 2012). Survey points were located in representative habitat types across the expanded Project area. Nine new points (plots), distributed evenly within the expanded Project area and three points from the original survey were surveyed to provide continuity between the original Project area and the expanded area (Figure 2). This allowed for some degree of awareness of potential year-to-year differences. Thus a total of 12 points were visited each survey. Six point count surveys were conducted from mid-April to mid-July (four surveys in April and May, two surveys in June and July) to capture both migratory and breeding bird use of the Project area. Sampling protocol addressed variability in time (number of times a particular plot was sampled) and space (number of plots on site).

Avian surveys were conducted during the morning and late afternoon, up to four hours after sunrise and starting four hours prior to sunset, to capture the time of maximum bird activity. Data sheets listed exact time, species, and number of individuals observed. Also listed were distance from observer, height above ground, behavior of the bird, direction of flight, and habitat. Information on cloud cover, wind

speed, and temperature were recorded. Each point count survey was conducted for 10 minutes, during which two biologists would identify and count all birds detected within the plot, defined by an 800-meter radius. A total of 72 point count surveys (6 surveys x 12 points) were completed. Point counts are the most widely accepted method of land-bird survey techniques in bird population studies (USDI 2006). Data analysis included species present on the site in spring, relative abundance, and a potential risk index for each species.

All data were recorded in field notebooks and subsequently entered into Excel spreadsheets. Quality assurance/quality control consisted of proofing the spreadsheet against original data in the field notebook.

Relative abundance (A) is a standard ecological measure of a species' relative representation. Relative abundance was calculated as the number of observations divided by the field effort. The relative abundance for horned larks would be the total number of individual horned larks observed within all 12 point count station areas divided by 72 (the number of surveys conducted): 314 observations/72 surveys = 4.36.

Potential risk of a species flying in the rotor-swept area (RSA) of the proposed wind turbines was calculated. A potential risk index (R) was calculated for each bird species observed during the point count surveys by multiplying relative abundance of each species with the proportion of observations of each species observed flying (Pf) and the proportion of observations of each species observed flying in the rotor-swept area (Prsa):

$$R = A * Pf * Prsa$$

This calculation incorporates a single species' abundance, the probability that the species is flying, and the probability that the species is flying within the RSA, as determined by data collected during point count surveys. The possible turbines to be deployed within the Project area have a rotor-swept height of 30 to 130 meters.

The ability of this index to predict actual conditions has not been demonstrated. Few studies have compared this index with post-construction fatality estimates, and it is not known if a correlation exists (NWCC 2001, 2011).

Results

Greater Prairie-Chicken Lek Surveys

Two greater prairie-chicken leks were observed within the Project area, Leks 2 and 3 (Figure 3, Table 1). Lek 2 was seen and heard northeast of the intersection of County Roads 42 and 87, just east of a Lek found in 2011. A maximum of ten individuals were observed at this lek. Lek 3, south and east of County roads 42 and 87, contained four birds and was in the same location as observed in 2008 and 2009. Two leks were observed outside the Project area: Lek 1 was seen and heard south of County Road 42 approximately .25 miles west of the Expansion Area boundary. A maximum of 14 individuals were observed at this lek. A new lek, Lek 4 containing 10 birds, was discovered roughly 0.45 miles north of the Project boundary. A group of three greater prairie-chickens was also observed southwest of the intersection of County Roads 56 and 85 north of the Project. This does not comprise a lek, as four birds are the threshold for that definition per CPW (Wendy Figueroa, personal communication).

Table 1. Greater Prairie-Chicken Lek Location and Data, Colorado Highlands Wind Farm, Spring 2012

Lek Name	Greatest Number of GPC Observed	Location (Degrees, Decimal Minutes)
1	14	N40 43.879 W102 47.382
2	13	N40 44.027 W102 44.514
3	4	N40 43.823 W102 44.643
4	10	N40 46.050 W102 45.365

Raptor Nest Surveys

Seventeen active raptor nests were found and their locations marked with a GPS during the 2011 surveys (Figure 4, Table 2). There were three active ferruginous hawk nests, four active red-tailed hawk nests, four active great horned owl nests, and six active Swainson's hawk nests. Eleven additional nests found were inactive.

Out of the 17 active nests, 8 were abandoned, and 9 fledged young. By species, ferruginous hawks fledged young from two of their three nests, great horned owls fledged young from all four nests, red-tailed hawks fledged young from two of their four nests, and Swainson's hawks fledged young from one of their six nests.

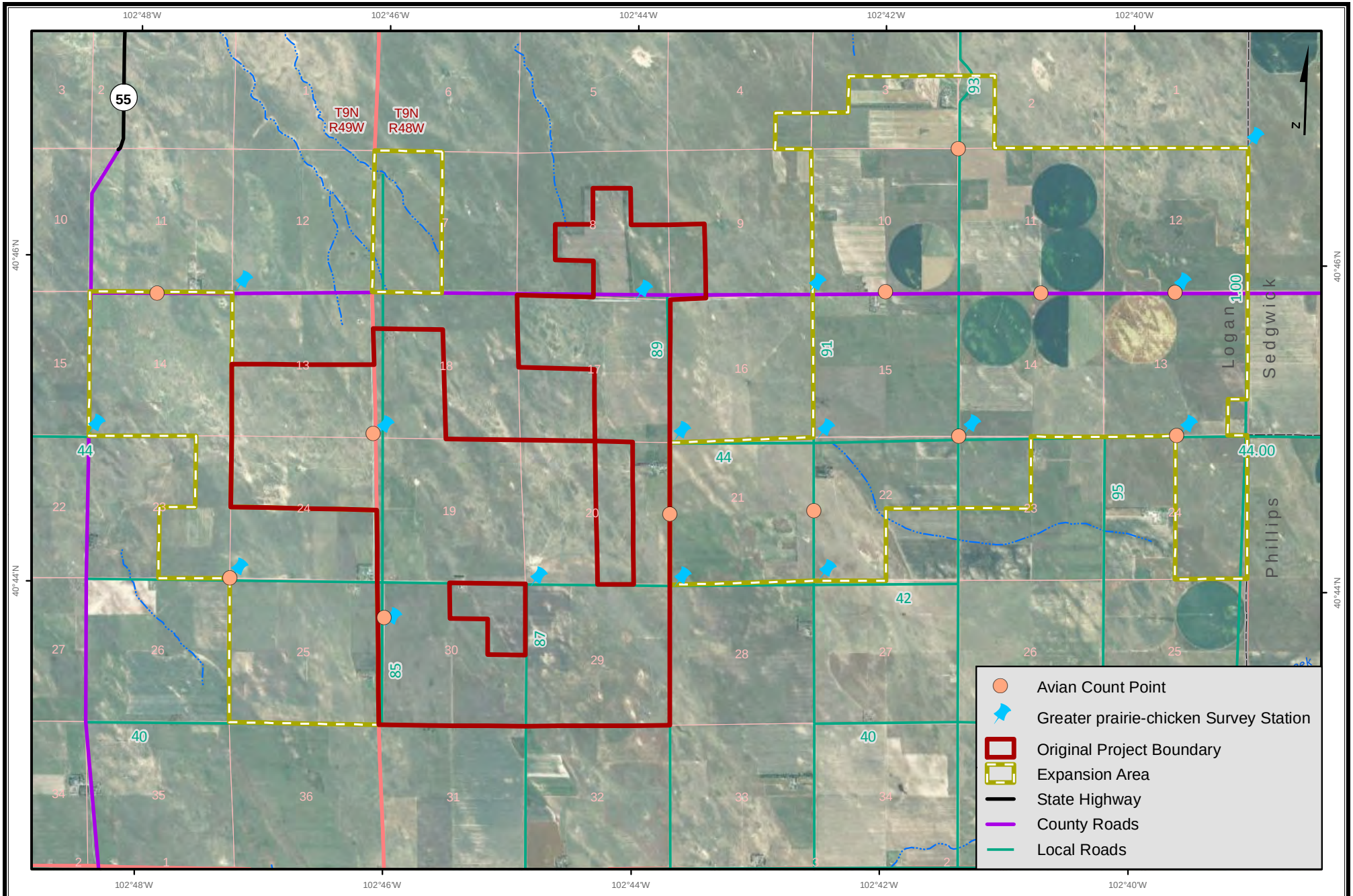

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Figure 2. Avian Count Points and Greater Prairie-Chicken Survey Stations Colorado Highlands Wind Farm
Logan County, Colorado, 2012

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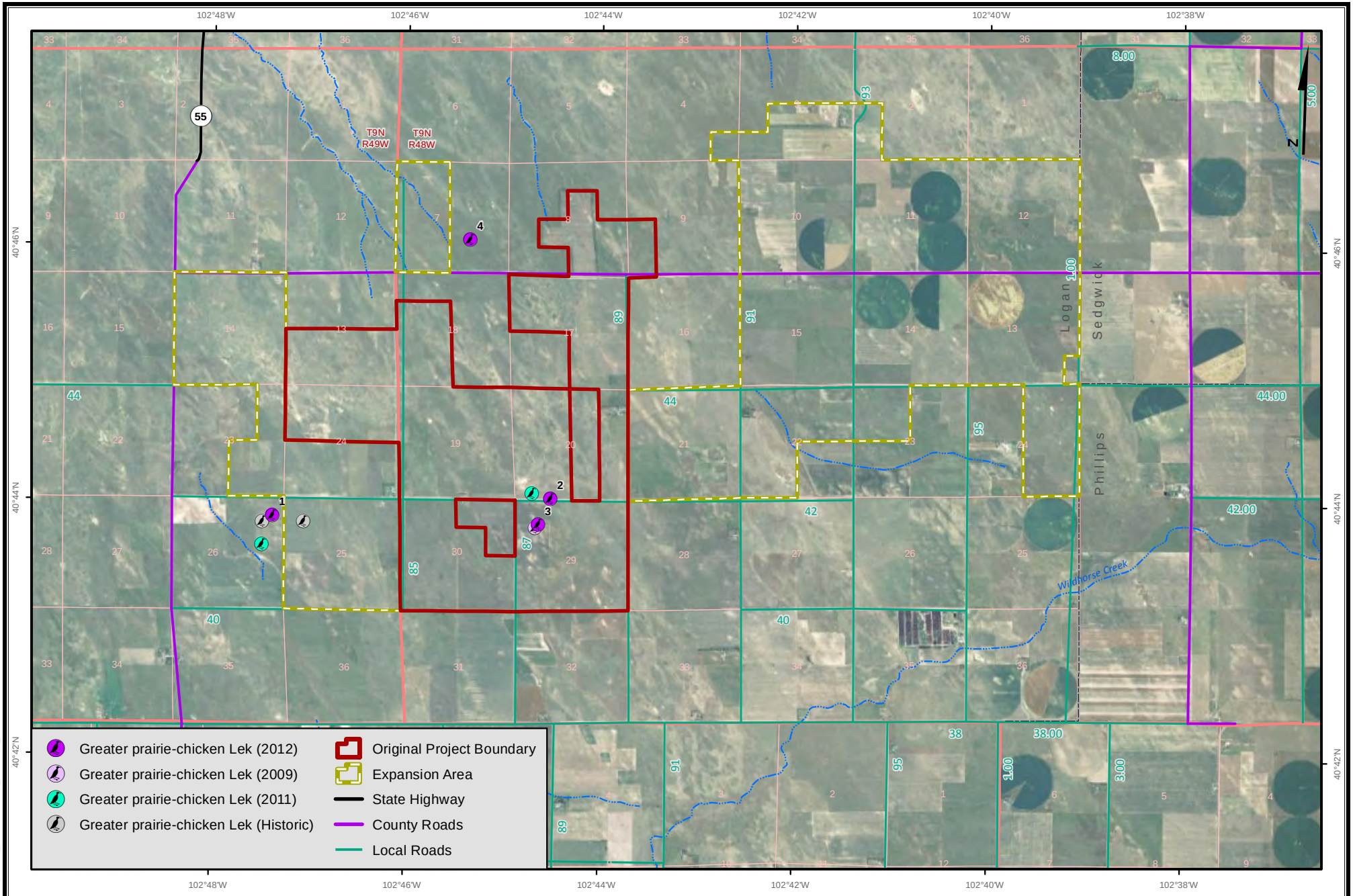

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Figure 3.
Greater Prairie-Chicken Lek Locations
Colorado Highlands Wind Farm
Logan County, Colorado, 2012

Table 2. Active Raptor Nest Locations and Nest Outcome, Colorado Highlands Wind Farm, Spring 2012

Nest Number	Species	Coordinates	Nest Outcome
1	Ferruginous hawk	40° 43.943'N 102° 46.813'W	Abandoned
2	Great horned owl	40° 43.999'N 102° 47.666'W	Fledged
4	Ferruginous hawk	40° 46.018'N 102° 46.195'W	Fledged
6	Great horned owl	40° 45.523'N 102° 45.976'W	Fledged
7	Red-tailed hawk	40° 45.530'N 102° 45.994'W	Abandoned
10	Ferruginous hawk	40° 45.342'N 102° 44.938'W	Fledged
13	Red-tailed hawk	40° 47.267'N 102° 38.284'W	Fledged
15	Great horned owl	40° 45.129'N 102° 42.476'W	Fledged
16	Red-tailed hawk	40° 44.669'N 102° 42.430'W	Abandoned
17	Swainson’s hawk	40° 43.823'N 102° 42.681'W	Abandoned
18	Great horned owl	40° 44.699'N 102° 43.736'W	Fledged
21	Red-tailed hawk	40° 42.141'N 102° 40.960'W	Fledged
23	Swainson’s hawk	40° 46.251'N 102° 39.146'W	Abandoned
24	Swainson’s hawk	40° 44.120'N 102° 46.231'W	Abandoned
25	Swainson’s hawk	40° 45.690'N 102° 40.796'W	Abandoned
26	Swainson’s hawk	40° 41.369'N 102° 39.921'W	Abandoned
28	Swainson’s hawk	40° 43.139'N 102° 48.083'W	Fledged

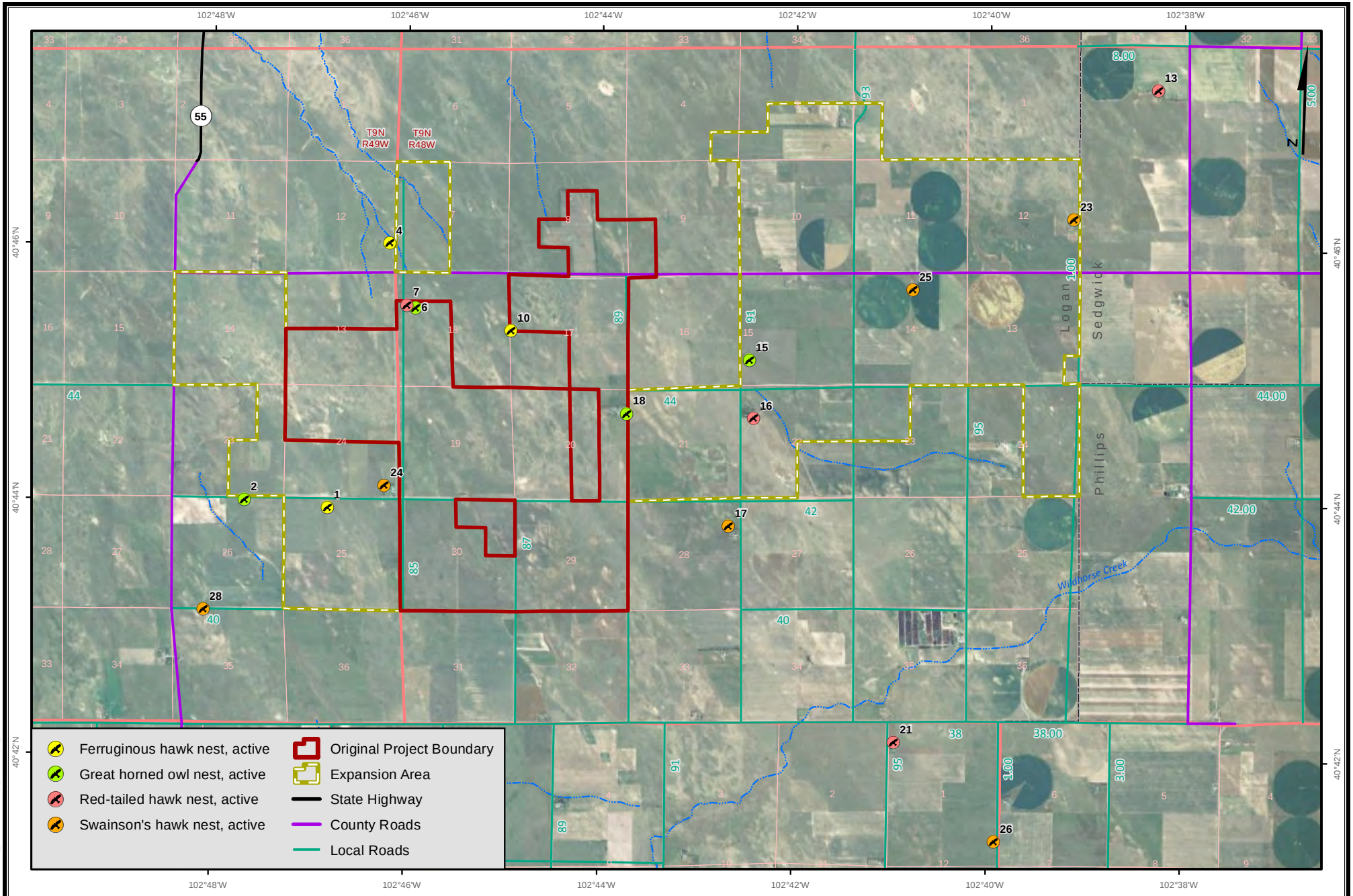

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Figure 4.
2012 Raptor Nest Locations
Colorado Highlands Wind Farm
Logan County, Colorado, 2012

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Avian Spring Point Count Surveys

A total of 44 avian species (1,327 individual birds) were identified on the Project site during the avian spring and early summer 2012 point count surveys (Table 3). Two unknown sparrow species and two unknown Buteo (red-tailed, Swainson's, or ferruginous hawk) species were also observed and included in these counts.

Species composition included 77 percent songbirds (34 species), 16 percent raptors (7 species), 5 percent game birds (2 species), and 2 percent shorebirds (1 species). The number of individuals observed was: 1,218 songbirds (92 percent), 84 game birds (6 percent), 22 raptors (2 percent), and 2 shore birds (<1 percent). Mean relative abundance was 18.43 birds per point count survey. The most common bird species observed was the western meadowlark, with horned lark, lark bunting, mourning dove, grasshopper sparrow, and ring-necked pheasant being the next five most abundant species (Table 3). Other abundant species included the lark sparrow and brown-headed cowbird.

Table 3. Avian Species, Number Observed and Relative Abundance, Colorado Highlands Wind Energy Project, Logan County, Colorado 2012

Species	Number Observed	Relative Abundance (A)*
Western meadowlark	226	3.14
Horned lark	193	2.68
Lark bunting	188	2.61
Mourning dove	133	1.85
Grasshopper sparrow	94	1.31
Ring-necked pheasant	73	1.01
Lark sparrow	60	0.83
Brown-headed cowbird	52	0.72
Barn swallow	32	0.44
Cassin's sparrow	30	0.42
Western kingbird	30	0.42
Common grackle	27	0.38
Red-winged blackbird	24	0.33
American robin	20	0.28
European starling	17	0.24
House sparrow	16	0.22
Eurasian-collared dove	14	0.19

Table 3. Avian Species, Number Observed and Relative Abundance, Colorado Highlands Wind Energy Project, Logan County, Colorado 2012

Species	Number Observed	Relative Abundance (A)*
Greater prairie chicken	11	0.15
Common nighthawk	10	0.14
Brewer's blackbird	9	0.13
Killdeer	8	0.11
Dickcissel	7	0.10
Northern harrier	7	0.10
Northern mockingbird	6	0.08
Red-tailed hawk	5	0.07
Vesper sparrow	4	0.06
American kestrel	3	0.04
Ferruginous hawk	3	0.04
House finch	3	0.04
Upland sandpiper	3	0.04
Blue grosbeak	2	0.03
Buteo species	2	0.03
Cassin's finch	2	0.03
Orchard oriole	2	0.03
Sparrow species	2	0.03
Swainson's hawk	2	0.03
Brewer's sparrow	1	0.01
Brown thrasher	1	0.01
Cliff swallow	1	0.01
Cooper's hawk	1	0.01
Downy woodpecker	1	0.01
Loggerhead shrike	1	0.01
Yellow warbler	1	0.01

Table 3. Avian Species, Number Observed and Relative Abundance, Colorado Highlands Wind Energy Project, Logan County, Colorado 2012

Species	Number Observed	Relative Abundance (A)*
Total number observed and mean relative abundance	1,327	18.43

* Relative abundance (A) = number observed/total number of surveys

Potential Risk Index

Of the 44 bird species observed, 6 species (14 percent) were observed within the RSA (between 30 and 130 meters above the ground) (Table 4). Of the 1,327 individuals seen, 14 individuals (1 percent) were observed in the RSA. The potential collision index for all birds was 0.13, with common nighthawk and horned lark having the highest risk of collision.

Table 4. Proportion of Birds Flying, Proportion in the Rotor-Swept Area, and Potential Risk Index at Colorado Highlands Wind Farm, Logan County, Colorado, Spring 2011

Common Name	Relative Abundance (A)	Proportion Observed Flying (Pf)	Proportion Observed Flying in RSA (Prsa)	Potential Risk Index (R) R = A*Pf*Prsa
Common nighthawk	0.14	0.70	0.50	0.05
Horned lark	2.68	0.66	0.02	0.03
Common grackle	0.38	0.41	0.11	0.02
Northern harrier	0.10	1.00	0.14	0.01
American kestrel	0.04	1.00	0.33	0.01
Buteo species	0.03	1.00	0.50	0.01

Discussion

Greater Prairie-Chicken Lek Surveys

Once listed as a State Endangered Species between 1973 and 1993, CPW recovered the population of GPCs from a low of 600 birds to approximately 10,000 to 12,000 birds, and now it is classified as a small game bird (CPW 2010), although the CPW (2011) does not permit hunting of GPC in Logan County.

Two greater prairie-chicken leks within the Project boundary were confirmed during the 2012 surveys. Lek 2 was previously confirmed as a lek identified in 2011. Lek 3 was identified as a satellite lek in 2012, and was the only lek location identified in 2009. Greater prairie-chickens are known for lek site fidelity and may be expected to return to observed leks in subsequent years (Robb and Schroeder 2005). Slight lek location changes from year to year may indicate a localized habitat change.

Two leks were observed outside the Project boundary. Lek 1 was identified as a historic lek, with nearby locations for this lek in earlier years. Lek 4 was newly discovered during Walsh surveys.

In May 2008, a letter from CPW to G.E. Alliance recommended a buffer zone of 0.5 miles from any lek for turbines and transmission lines; no turbine maintenance before 10 A.M. and after 5 P.M. between March 1 and June 30 to protect GPC; and that prairie-chicken lek surveys are conducted between late March and mid-April. In recent discussions with CPW (Marty Stratman, personal communication), Walsh has learned that CPW has shown flexibility with these recommendations on a Project specific basis.

Raptor Nest Surveys

Raptors found nesting in the Project area and within a 2-mile buffer include ferruginous hawk, red-tailed hawk, Swainson's hawk, and great horned owl. These are all species typically nesting on Colorado's eastern plains. Ferruginous hawks have multiple nests within a territory and will often use the same nest or an alternate nest each year (Bechard and Schmutz 1995). Ferruginous hawks are a Special Status Species (non-statutory) in Colorado, due to declining populations (CPW 2011). This species is especially prone to nest abandonment during incubation if disturbed.

Red-tailed hawks are known to use either the same nest or a nest in the same area from year to year, and can be expected to be found nesting within the Project area in subsequent years (Preston and Beane 2009). Swainson's hawks can be quite variable with their nest locations, but are also expected to continue nesting within the same general area (Bechard et al. 2010). Great horned owls, which are known to thrive in rural areas, could be expected to nest in this area using nests of other species as they do not build their own (Kingery 1998).

Avian Spring Point Count Surveys

Avian species observed during the spring and early summer survey period were typical of the habitats encountered within the Project area and included a mix of specialist and generalist avian species. Grassland species that typically nest on the ground or in low shrubs were found in the open prairie areas, which comprise the largest portion of the Project area.

Species richness was the same in the springs of 2009 and 2011 (44 species) when compared to 2012, although the species composition differed slightly. The total number of observations in 2012 was less than in past years (2,346 in 2009, 2,033 in 2011, and 1,327 in 2012), most likely due to drought conditions. The potential risk index significantly decreased in 2011 from 0.89 in the spring of 2009 to

0.06, but slightly increased in 2012 to 0.13. The number of species flying within the RSA was also much lower in 2011 when compared with 2009 (4 species in 2011 and 25 species in 2009), but then increased to 7 species in 2012. Walsh is unaware of any factors that would have contributed to this pattern, other than increased drought conditions in 2012.

Migratory birds, their eggs, and active nests are protected under the Migratory Bird Treaty Act (MBTA). Nest destruction that results in the unpermitted take of migratory birds or their eggs is prohibited under the MBTA; take is defined as to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. In Colorado, all non-game birds except for European starling, house sparrow, and rock dove are protected under the Act (USFWS 1918). The MBTA does not prohibit the dismantling of an unoccupied bird nest (without birds or eggs), however unoccupied nests may not be collected.

Although no wind energy project can be free of risk to birds, by implementing recommendations listed at the end of this document, risk may possibly be reduced. However, as stated previously, there are few studies correlating the risk index to post construction mortality estimates.

Songbirds

Most songbirds observed during the spring and early summer 2012 surveys were below the RSA. Many of these were ground-nesting birds that tend to fly close to the ground during the breeding season. Tree-nesting species were seen flying more often within the RSA and may be at higher risk for collision with turbines.

The common nighthawk had the highest potential overall risk for all species, perhaps because of its relative abundance within the RSA, which affects the risk index. Common nighthawks are known to fly relatively high over treetops and buildings in search of insects. Males may feed at heights up to 175 meters above ground (Rust 1947). They also perform a song flight, which is usually 15 to 40 m above ground, with the highest reported at 250 m above ground (Brigham et al. 2011, Wedgwood 1973).

An abundant songbird species that had the second highest risk (0.03) was the horned lark. The horned lark is one of the more abundant grassland nesting species in northeastern Colorado, and it was the second most abundant bird on the site after the western meadowlark. Males sing in flight at 80 to 250 meters (Beason 1995), putting them within the RSA.

Raptors

With the construction of wind turbines, the risk to raptor species can take three forms: direct habitat loss, effective habitat loss, and fatality. Direct habitat loss is due to the construction footprint of turbines, roads, and other infrastructure associated with the wind farm. For example, removal of trees that raptors use for roosting would result in direct habitat loss. Effective habitat loss is the decreased use of otherwise suitable habitat because of avoidance of disturbance, for example, if raptors avoid a foraging area or nesting site due to human activity. Direct and effective loss of habitat can be measured by decreases in habitat and relative abundance of birds. Fatalities are due to collisions of birds with turbines and other associated structures. Fatalities are measured by post-construction carcass searches.

Raptor species comprised 2 percent of all avian observations, and 21 percent of observations within the RSA. The average raptor risk was 0.03, which was lower than songbirds. All three species had the same risk of 0.1. Raptors were not observed flying in the RSA during the spring and summer of 2012, compared to 2011. The number of raptors observed flying in the RSA can be variable from year to year.

Fatalities of avian species at wind projects have been documented to be low compared with other sources of mortality (Erickson et al. 2005) and new research suggests that collision fatalities at

communication towers and buildings do not have a discernible effect on avian populations (Arnold and Zink 2011).

Recommendations

There are several recommendations that could minimize impacts to plant communities and wildlife on the Colorado Highlands Wind Farm site. These include:

- Continued coordination with CPW and U.S. Fish and Wildlife Service (USFWS). Frequent and open communication with these agencies provides important feedback and can improve overall Project planning and construction in terms of minimizing impacts to native vegetation and wildlife.
- Employ Best Management Practices (BMPs) such as erosion and sedimentation controls to minimize lay-down impacts and minimize potential for introduction or spread of noxious weeds.
- Consider a cross-check with the Colorado Renewables and Conservation Collaborative Best Management Practices. (http://www.pljv.org/windandwildlife/co/crcc.php).
- As suggested by Avian Power Line Interaction Committee (APLIC 2006), fit new power and communication towers with perch guards; design powerline conductor spacing to minimize the potential for raptor electrocutions (60 inches apart for raptors); design transmission lines to have the top two wires (lightning/ground wires) made visible; and equip permanent meteorological towers with Bird Flight Diverters to minimize the potential for avian collisions with guy wires.
- Because raptor nest use is dynamic, be aware of the potential need to repeat raptor nest surveys throughout the site and 0.5 mile buffer zone outside the Project boundary prior to project construction.
- Create a project constraints map with recommended buffer zones for nesting raptors (buffer distances shown in Table 5) to show areas to be seasonally avoided.
- To help prevent nighttime collisions by migratory songbirds that are attracted to lights, eliminate all skyward facing and flood lighting at structures and turn off lighting inside the nacelles.
- For all ground-level outdoor lighting at operation and maintenance facilities, USFWS recommends using motion-sensor switches (USFWS 2010) to prevent lights being left on overnight, attracting migrating birds to the wind farm and near turbines.
- For any tall structures requiring Federal Aviation Administration warning lights, use only red or white flashing strobe lights instead of steady non-flashing red lights. All strobe lights should synchronously fire throughout the site to help reduce the attraction of migratory songbirds at night (USFWS 2010).

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Attachment 1. Scientific Names of Plants and Animal Listed in Report Text.

Birds	
Anseriformes (Waterfowl)	
Mallard	*Anas platyrhynchos*
Galliformes (Game birds)	
Ring-necked Pheasant	*Phasianus colchicus*
Greater prairie-chicken	*Tympanuchus cupido*
Accipitriformes (Vultures, Hawks and Eagles)	
Northern harrier	*Circus cyaneus*
Cooper's hawk	*Accipiter cooperii*
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
Buteo species	*Buteo* sp.
Falconiformes (Falcons)	
American kestrel	*Falco sparverius*
Charadriiformes (Shorebirds)	
Killdeer	*Charadrius vociferus*
Upland sandpiper	*Bartramia longicauda*
Columbiformes (Doves)	
Eurasian collared-dove	*Streptopelia decaocto*
Mourning dove	*Zenaida macroura*
Strigiformes (Owls)	
Great horned owl	*Bubo virginianus*
Caprimulgiformes (Nightjars)	
Common nighthawk	*Chordeiles minor*
Piciformes (Woodpeckers)	
Downy woodpecker	*Picoides pubescens*
Passeriformes (Songbirds)	

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M E M O R A N D U M

To: Bruce Pohlman, Colorado Highlands Wind LLC.

From: Jessie Dulberger, Wildlife Biologist

Date: September 23, 2013

Subject: Habitat Assessment, Colorado Highlands Wind Project, Phase III

The Colorado Highlands Phase III Project (Project) is located northeast of the town of Fleming, approximately 3.5 miles north of Highway 6 in Logan County, Colorado. The Project is located east of the northeast corner of Colorado Highlands Wind Farm Phase I, off of County Road 46 and County Road 89. It is situated within the Crook and Fleming U.S. Geological Survey (USGS) 7.5 Minute Quadrangle Maps in the following Townships, Ranges, and Sections:

Crook Quadrangle: All or part of Sections 9 and 16; T9N R48W

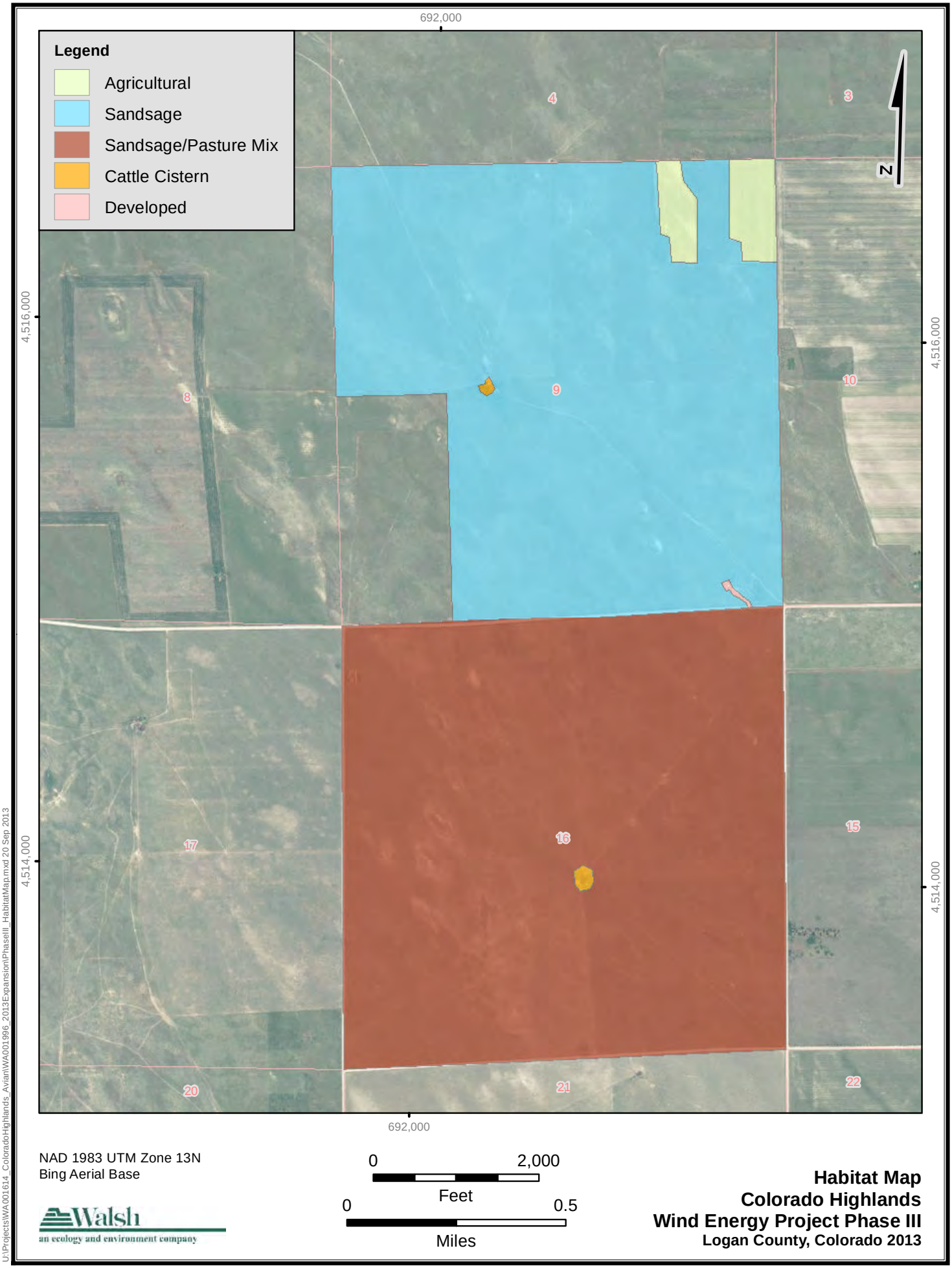
The Project boundary encompasses 1,237 acres. Phase III will use 12 General Electric 1.7-MW wind turbine generators and produce 20.4 megawatts upon completion. In addition to the turbines, the Project will include buried electrical collector lines, a collector substation, overhead 115 kilovolt (kV) transmission line, and access roads.

Walsh conducted one day of onsite field mapping of the dominant habitat types on the Project site, using Geographic Information System (GIS) and an aerial map. All habitat types were delineated on the aerial map and later digitized (Figure 1).

Section 9 and 16 are state lands. The primary land use for both sections is grazing for cattle. The Project habitat summary is: 53 percent sandsage/pasture mix, 45 percent sandsage, 2 percent agricultural lands, and less than 1 percent developed.

Section 9 is predominately sandsage habitat with two small areas of agricultural lands in the northeast corner. There is also a small section in the southeast corner that was developed with a microwave tower. Section 16 is predominantly sandsage-pasture mixture. A cattle cistern is centrally located within each section.

The habitat types stated above are typical for this region.



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Habitat Map
Colorado Highlands
Wind Energy Project Phase III
Logan County, Colorado 2013

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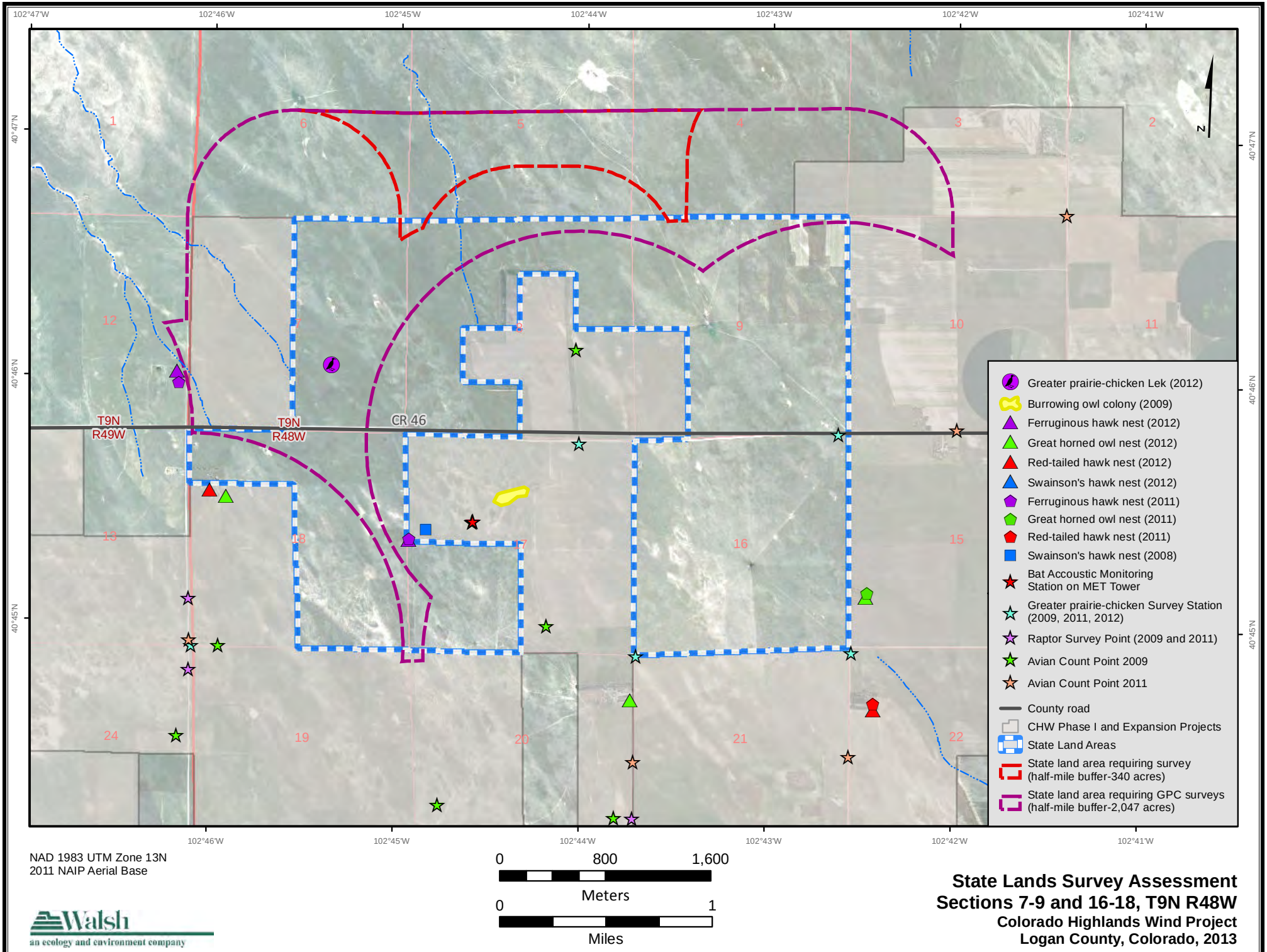

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State Lands Survey Assessment
Sections 7-9 and 16-18, T9N R48W
Colorado Highlands Wind Project
Logan County, Colorado, 2013

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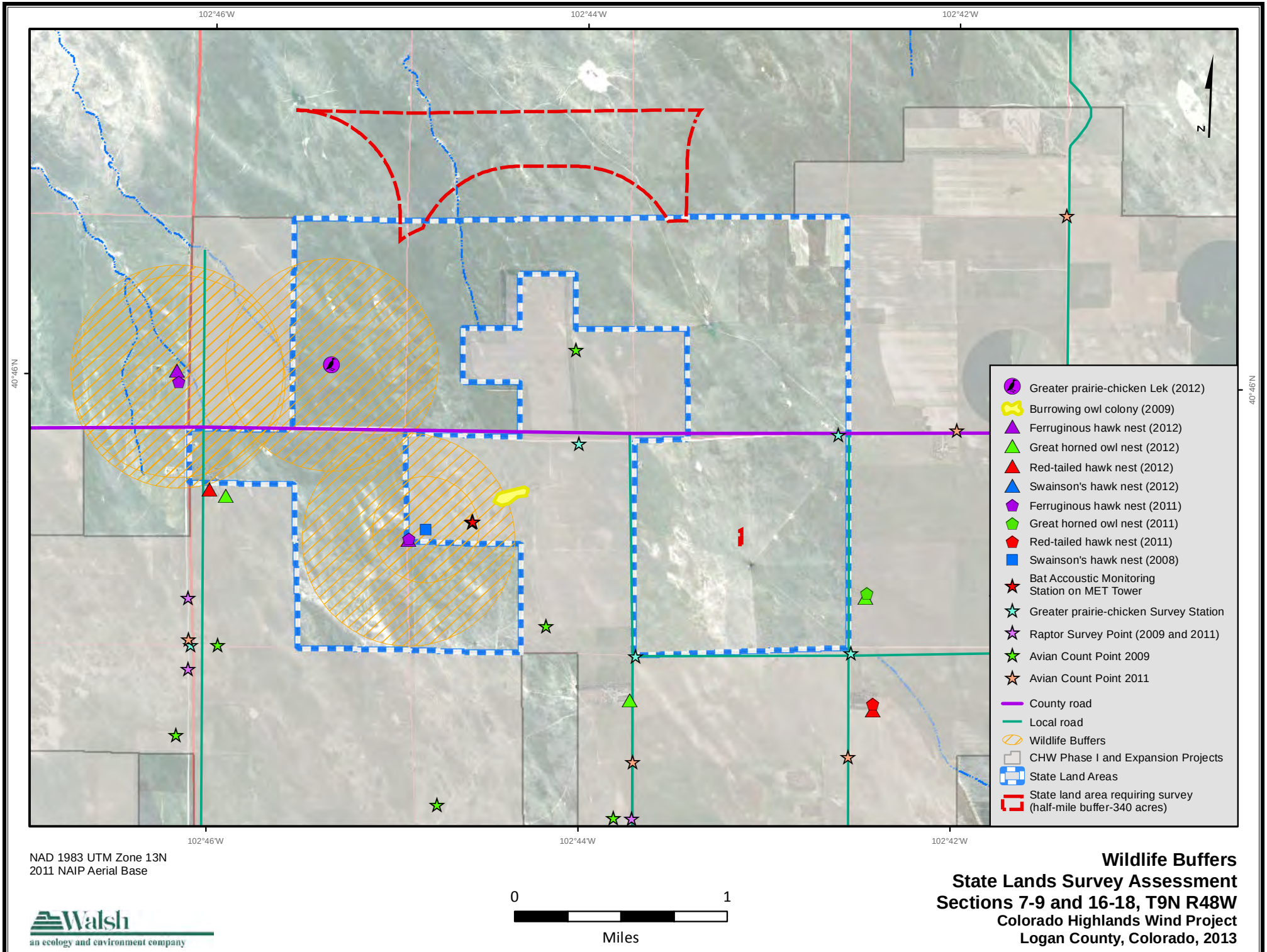

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Wildlife Buffers
State Lands Survey Assessment
Sections 7-9 and 16-18, T9N R48W
Colorado Highlands Wind Project
Logan County, Colorado, 2013

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Post- Construction
Bird and Bat Fatality Study
Phase I
Colorado Highlands Wind Project
Logan County, Colorado

December 13, 2013

Prepared for:

Colorado Highlands Wind, LLC

Prepared by:

Walsh
an ecology and environment company

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Table of Contents

List of Tables

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List of Abbreviations and Acronyms

BBCS	Bird and Bat Conservation Strategy
CHW	Colorado Highlands Wind Project, LLC
CI	confidence interval
CPW	Colorado Parks and Wildlife
CRP	Conservation Reserve Program
DWP	density weighted proportion area searched
EA	Environmental Assessment
ESA	Endangered Species Act
FONSI	Findings of No Significant Impact
GPS	Global Positioning System
Guidelines	USFWS Land Based Wind Energy Guidelines
kV	kilovolt
MAP	Mitigation Action Plan
MBTA	Migratory Bird Treaty Act
MW	megawatt
NEPA	National Environmental Protection Act
O&M	Operations and Maintenance
Project	Colorado Highlands Wind Farm
SCW	Spring Canyon Wind Project
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
Walsh	Walsh Environmental Scientists and Engineers, LLC

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Executive Summary

The Colorado Highlands Wind Project Phase I (Project) encompasses approximately 4,131 acres and houses 42 General Electric 1.6 megawatt (MW) turbines in Logan County, Colorado. This report summarizes the results of the post-construction bird and bat fatality study at the Project. The objective of this study is to estimate the potential operational fatality impacts of the Project on birds and bats. This document presents the methods, data, and analyses for this assessment and compares the results to the range seen in similar regional data (Walsh 2013) and described in the U.S. Fish and Wildlife Service (USFWS) Final Land-Based Wind Energy Guidelines (Guidelines) (USFWS 2012a).

Standardized carcass searches were conducted by trained surveyors at approximately 25 percent of the turbines (i.e., 10 turbines) in the Project area. Study turbines were randomly selected and stratified across the available community types. Carcass searches were conducted weekly for three months during the spring (May), late summer (August), and fall (September 16-October 13), resulting in 13 surveys at each of the 10 turbines.

Searcher efficiency trials and carcass persistence trials were conducted in conjunction with the carcass searches to calibrate for searcher bias. An adjustment was made to the searcher efficiency trials in summer and fall to correct for the carcasses that may have been removed by scavengers and thus not available to be found during searcher efficiency trials. Sample sizes were insufficient to do so for the spring data.

United State Geological Survey (USGS) fatality estimator software was used to estimate bird and bat fatalities (Huso 2011, Huso et al. 2012). This estimator utilizes the data from the carcass searches, adjusts for searcher bias as determined by the searcher efficiency and carcass persistence trials, and calculates a fatality estimate per turbine, per MW, and for the entire Project. Fatality estimates for the spring sampling period could not be calculated due to a skewed carcass persistence data distribution. The fatality estimator requires normally distributed data to run the model. At the end of the spring carcass persistence trial, 83 percent of the carcasses remained, providing insufficient data about carcass persistence. Therefore, seasonal parameter estimates could not be calculated.

A total of 8 bird and 32 bat fatalities were found during carcass searches. Of the eight avian fatalities, two were raptors, and six were songbirds. All the bat fatalities were the three tree-roosting migratory bats. A ferruginous hawk was the only Special Status Species fatality; it is not a Federally-listed species.

Every turbine surveyed had at least one fatality, except turbine 33. Turbine 17 had the largest number of fatalities, one birds and six bats. One bat fatality was found in the spring. In the summer 3 birds and 18 bats and were found. In the fall 6 birds and 12 bats were found.

The total calculated estimate of bird and bat fatality for the entire Project was 437 fatalities [per study period], with an estimated 6.50 fatalities per MW per study period. The bird fatality for the entire site was 94 birds per study period, with an estimated 1.39 bird fatalities per MW per study period. The bat fatality estimate for the entire site was 344 bats per study period, with an estimated 5.11 bat fatalities per MW per study period.

The bird fatality estimate was within what was predicted for the Project, compared to other wind farms in the area as described in the Bird and Bat Conservation Strategy (Walsh 2013). The bat fatality estimate was higher than predicted. An expanded dataset of all available regional studies with similar vegetation community types shows the Project to be entirely within the ranges presented for the region. Bird fatalities ranged from 0.6 to 3.0 per MW per study period and there were 1.39 birds per MW in the present study. Bat fatalities ranged from 0.8 to 8.9 per MW per study period and there were 5.11 bats per MW per study period in the present study.

Introduction

Purpose

This document summarizes the results of the post-construction bird and bat fatality study at the Colorado Highlands Phase I energy generation project (Project) conducted by Walsh Environmental Scientists and Engineers, LLC (Walsh). The objectives of this post-construction bird and bat fatality study are to determine the potential operational fatality impacts of the Project on birds and bats. This document presents the data and analyses required to assess the Project's fatality risk to birds and bats, as determined from the range of fatalities presented in the Bird and Bat Conservation Strategy (BBCS) (Walsh 2013) and described in the U.S. Fish and Wildlife Service (USFWS) Final Land-Based Wind Energy Guidelines (Guidelines) (USFWS 2012a). Fatality estimates computed using the United States Geological Survey (USGS) Fatality Estimator (Huso et al. 2012).

Project Location and Description

The Project is located northeast of the town of Fleming approximately 3.5 miles north of Highway 6 in Logan County, Colorado (Figure 1). The Project boundary encompasses 4,131 acres. It is situated within the Crook, Fleming, Haxtun West, and Tamarack Ranch USGS 7.5 Minute Quadrangle Maps in the following Townships, Ranges, and Sections:

Crook Quadrangle, T9N, R49W, S13; T9N, R48W, S18

Fleming Quadrangle, T9N, R48W, S19, 30; T9N, R49W, S24

Haxtun West Quadrangle, T9N, R48W, S17, 20-22, 24, 29

Tamarack Ranch Quadrangle, T9N, R48W, S2, 3, 4, 8-15, 17

The Project area is located in the Lower South Platte River watershed of the central short-grass prairie ecoregion of the United States (Hazlett 1998) and the southern portion of the Great Plains-Palouse Dry Steppe Province (Bailey 1995). The Project area's rolling terrain is formed by a series of roughly east-west trending ridges. Moisture regime is limited due to the rain shadow effect created by the Rocky Mountains (Hazlett 1998). Over the past 100 or more years since settlement, the landscape has been shifted from short-grass prairie to pasture and agricultural lands with remnants of short-grass prairie in level, low-lying areas and remnants of sandsage prairie on ridges. Since 1985 much of eastern Colorado's lands have been enrolled in the Natural Resource Conservation Service's Conservation Reserve Program (CRP), which offers payments to farmers that remove land from annual crop production and plant back to native, perennial grassland communities in order to lessen erosion and water-quality problems on a long-term basis. The Project site comprises native prairie, CRP grassland, and small areas of shelterbelt.

Colorado Highlands Wind LLC (CHW) constructed a 67- MW wind farm on private land, with 42 General Electric 1.6-MW wind turbine generators. The Project includes buried electrical collector lines, a collector substation, 115kV overhead transmission line, operations and maintenance building, and access roads.

CHW applied to the Western Area Power Administration to interconnect the Project to Western's existing Sterling-Frenchman Creek 115 kV transmission line. Western is the lead Federal agency for compliance with the National Environmental Policy Act of 1969 (NEPA) as amended. An Environmental Assessment (EA) was prepared in accordance with NEPA to assess the impacts of constructing and operating the Project, which was enabled by Western's execution of the interconnect agreement (a Federal action) (U.S. DOE 2009). Western issued a Finding of No Significant Impact (FONSI) and Mitigation Action Plan (MAP) for the Project on February 9, 2009. CHW implemented the mitigation measures specified in the FONSI, MAP, and EA during construction of the Project. CHW is completing the post-construction bird and bat survey requirements identified by Western in the FONSI, MAP and EA.

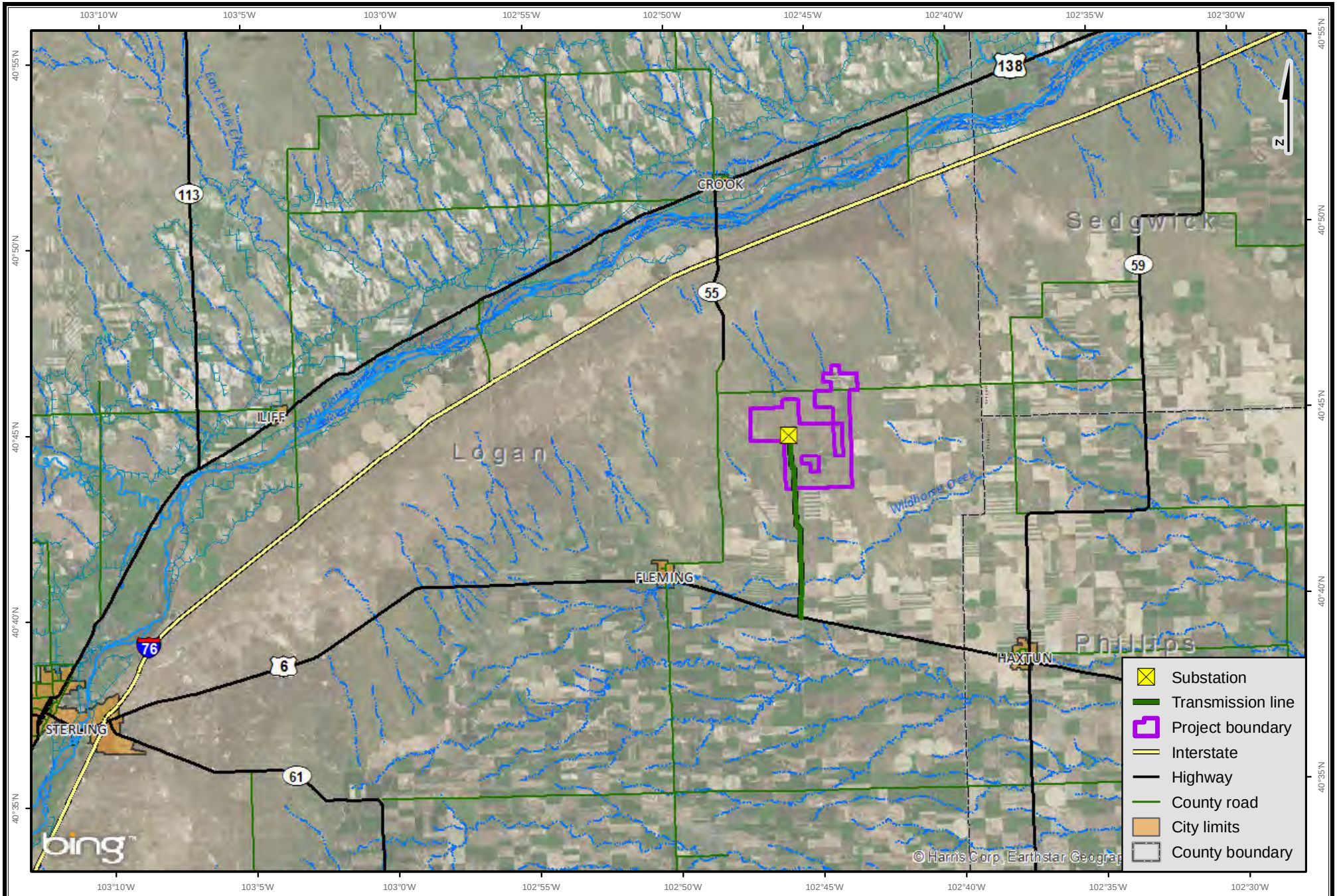

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Figure 1.
Vicinity Map
Colorado Highlands Wind Farm
Phase I
Logan County, Colorado, 2013

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Methods

Walsh Environmental Scientists and Engineers, LLC (Walsh) biologists and CHW staff conducted this study. Walsh biologists provided organization and training for field work, species identification, and approximately 66 percent of the field work staff time. In spring, Walsh set out carcasses for the searcher efficiency trial, and CHW staff conducted carcass searches, searcher efficiency and carcass persistence trial. During the summer and fall months, CHW staff set out carcasses for the searcher efficiency trial, and Walsh conducted carcass searches, searcher efficiency and carcass persistence trials.

Field Methods

Field work for this study comprised three components:

- carcass searches,
- searcher efficiency trials, and
- carcass persistence trials

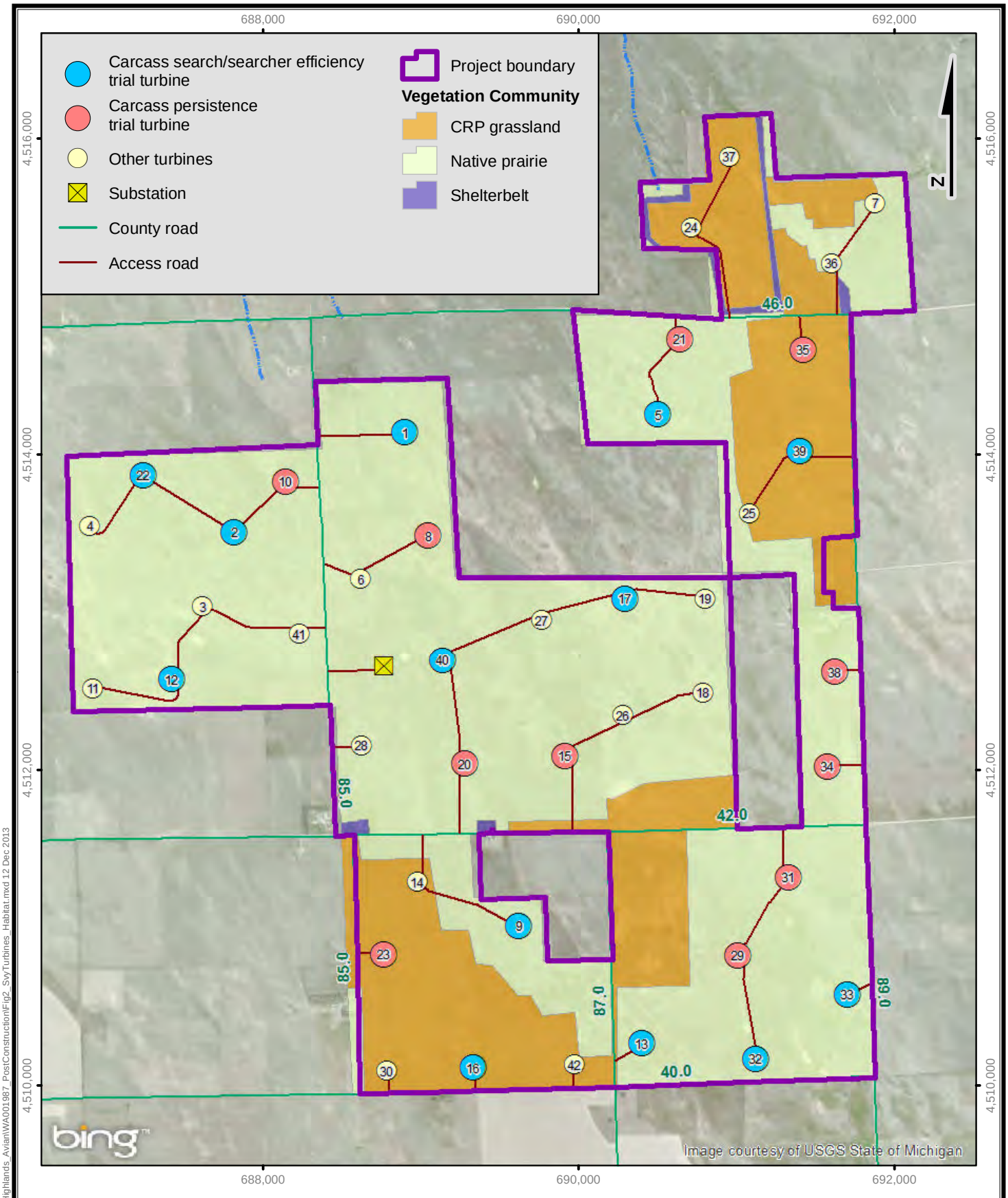
All three components were conducted at approximately 25 percent of the Project turbines (10 turbines. Vegetation community type was factored in the selection of turbines to be searched, by random selection of turbines in proportion to community type representation: eight turbines on native prairie and two turbines on CRP grassland communities.

Carcass Searches

Standardized carcass searches were conducted by trained surveyors on search areas that comprise a 120-meter x 120-meter (394-foot x 394-foot) search plot centered on the turbine tower (Figure 2). The plot was divided by parallel transects placed 3 meters (9.8 feet) from the edge of the plot and then spaced 6 meters (19.7 feet) parallel to each other so that the effective search area was 3 meters on either side of the transect line (Figure 3). Carcasses were purchased from Layne Laboratories Inc., for use in the searcher efficiency and carcass persistence trials. These included mice, and quail as surrogates for small birds and large birds, respectively.

In January 2013, a Migratory Bird Special Purpose Salvage Permit application was submitted to the USFWS (USFWS 2010), and a Scientific Collection License application was submitted to Colorado Parks and Wildlife (CPW). The USFWS permit has not been received to-date, therefore any bird fatalities found during carcass searches were marked and left in place. CPW did grant the Scientific Collection License which was effective as of February 8, 2013. This license allowed Project and Walsh staff to collect bat carcasses located during the carcass searches for use in searcher efficiency trials.

Carcass searches were conducted weekly for three months during the spring (May), late summer (August), and fall (September 16-October 13), resulting in 13 surveys at each of the 10 turbines. These time periods were selected to capture fall migration (Adams 2003, Andrews and Righter 1992), and were based on migration patterns observed previously at the Project, and bird and bat mortality rates observed at the Spring Canyon Wind Energy Project in Logan County, Colorado (TRC 2008b). These periods also overlapped with the expected presence of any Special Status species at the site (Walsh 2013). Special Status Species are defined here as those species listed under the Endangered Species Act by the U.S. Fish and Wildlife Service (USFWS 2012b) as Threatened, Endangered or Candidate; and those listed by the State of Colorado (CPW 2011) as Threatened, Endangered, or Species of Special Concern. Searches were conducted during daylight hours and were temporarily delayed if severe weather or other safety hazards occurred.



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Bing Maps Aerial Base

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Figure 2.
Turbine Layout and Surveys with Mapped Vegetation Communities
Colorado Highlands Wind Farm
Phase I
Logan County, Colorado 2013

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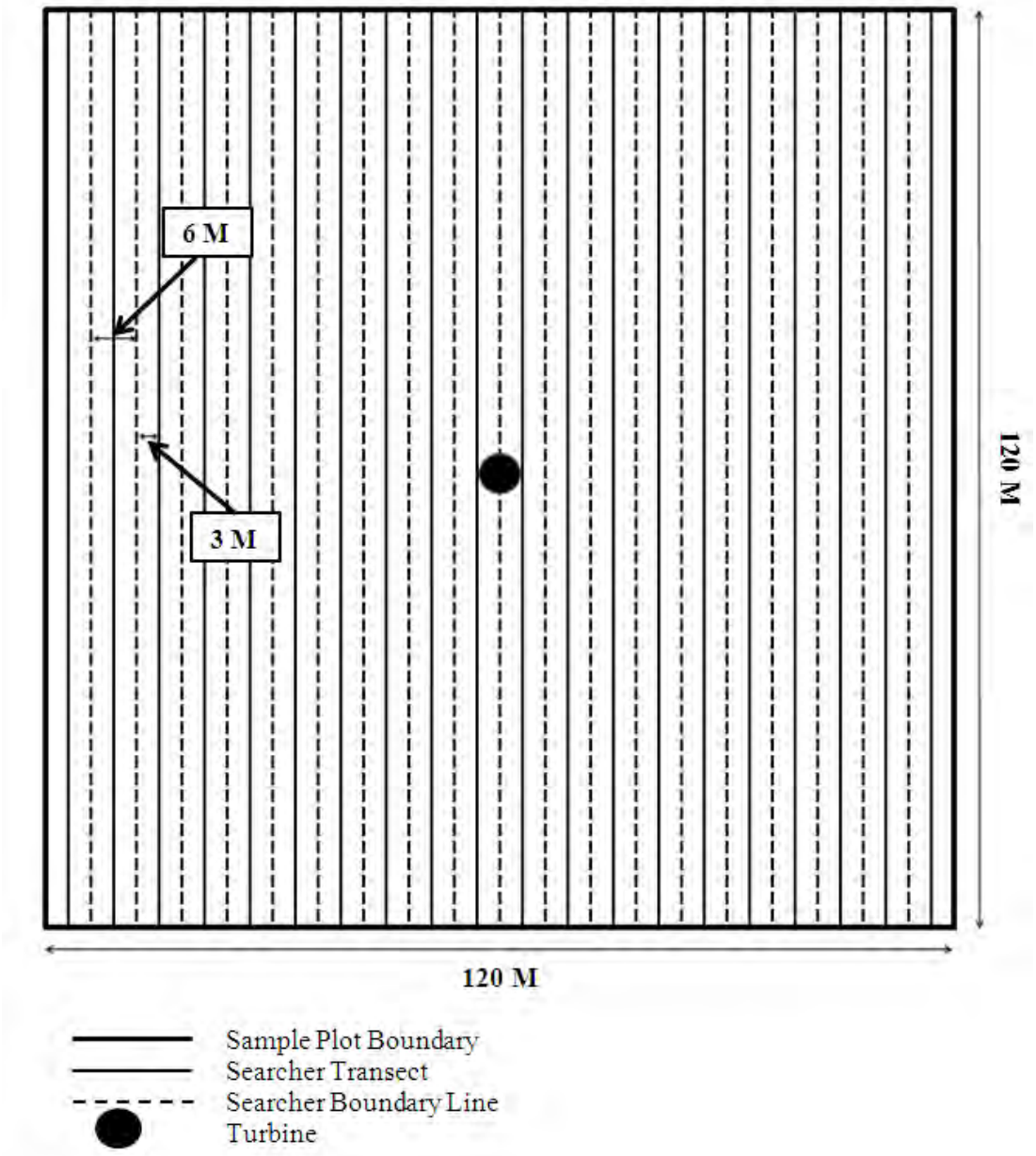
Figure 3. Graphic Layout of the Turbine Survey Plot and Transects



A Global Positioning System (GPS) unit was used within the search plots to establish the transect boundaries. Slight field modifications of transect lines were occasionally necessary to avoid areas that were inaccessible, such as pits or steep slopes. Within each plot the actual search area could vary due to terrain, presence of woody vegetation, or other features that limited accessibility by the searchers. A density-weighted proportion area searched (DWP) was incorporated into the fatality rate estimates to account for the actual area searched (Huso et al. 2012). The DWP value is between 0 and 1. If the entire plot is searchable, this factor is 1.

Transects were walked at a steady rate of 40 meters (131 feet) per minute, with searchers scanning the ground surface to locate any bird or bat carcasses, including portions of carcasses or feather piles. One CHW staff (spring searches) or two Walsh biologists (summer and fall searches) completed each carcass search plot within 60 to 90 minutes.

During carcass searches, any observed carcasses were marked with a flag and the search continued until all transects at that turbine were completed. Upon completion of the turbine search, any carcasses located were processed, recording the following information onto a Carcass Search form:

- Date, search start and end time, observer, and turbine number;
- Location on a plot marked with GPS coordinates and unique identification (ID) number recorded on GPS;
- Distance and bearing from the turbine;
- Distance and bearing from the transect from which the carcass was first spotted;
- Condition of the carcass (injured, intact, dismembered, bones only, or feathers/fur only) and condition of eyes (fluid filled, partially dehydrated, flat, sunken, empty, or not applicable [N/A]) as a measure to estimate the length of time the carcass had been there;
- Presence of insects on the carcass or signs that the carcass had been scavenged;
- Species, age, and sex, if determinable;
- Digital photographs of the observation, showing (i) the position in which it was found; (ii) the dorsal and ventral sides; (iii) for bats, close-ups of reproductive organs, feet, and fur; (iv) for birds, any identifying characteristics such as bill, foot, wing, tail shape, or plumage coloration;
- Plant species present within 2 meters (6.6 feet) of carcass; and
- Substrate conditions (visibility) for each carcass recorded within a 1-meter (3.3 foot) square plot around the carcass according to one of four ground cover classes:
    - Easy: 90 percent or greater bare ground cover with vegetation <15.3 centimeters (6 inches) in height

- Moderate: 25 percent or greater bare ground cover with a sparse cover of vegetation <15.3 centimeters (6 inches) in height
- Difficult: 25 percent or less of bare ground, and 25 percent or less vegetation ground cover that is <30.5 centimeters (12 inches) high; and
- (Very Difficult: little or no bare ground and >25 percent vegetative ground cover over 30.5 centimeters (12 inches) in height.

In addition, staff documented daily weather conditions including temperature, precipitation, wind speed, wind direction, cloud cover, and the presence/absence of fog. These weather parameters may be incorporated into the discussion of the relationship between weather conditions and occurrence of fatalities observed.

Because the USFWS salvage permit was not received, all bird carcasses were left in place and marked with a pin flag. Bat carcasses were labeled with a unique number, individually bagged, and retained in a freezer at the Project O&M building. Carcasses that were not immediately identifiable to species were stored and later identified to the extent possible by a Walsh biologist. Any carcasses collected during the survey that were in good condition were used for subsequent searcher efficiency trials and/or carcass persistence trials.

Data were entered into the Project database from the Carcass Search forms. Data were reviewed during data entry and cross-checked for errors.

Carcass Search Biases

Three primary biases include: the proportion of searchable area under a turbine or the DWP (Density-Weighted Proportion Area Searched); the ability of searchers to find carcasses (detection bias or searcher efficiency); and the length of time that carcasses remain beneath a turbine before being removed by scavengers (removal bias or carcass persistence). Any or all of these can affect the final fatality estimate (Strickland et al. 2011). There were no landscape characteristics such as rocky cliffs, heavily treed areas, or dense shrubs that prevented ful area searches. The majority of search plots were flat grassland with sparse vegetation and therefore 100 percent of the area under the turbine was searchable and the DWP was estimated to be 1. Around five percent of the area searched had some rutting from erosion, but these areas were still searchable. Searcher efficiency trials and carcass persistence trials were conducted in conjunction with the carcass searches and are discussed below.

Searcher Efficiency Trials

Each searcher was subject to searcher efficiency trials. These trials were conducted concurrently with carcass search surveys. Searcher efficiency trial results were used to quantify each searcher's ability to successfully locate carcasses in the search area, based on what percent of known carcasses present on a specific date were actually found. Estimates of searcher efficiency were used to adjust the final fatality estimate to account for carcasses that were not detected.

Within the survey month, three carcasses were placed randomly under each search turbine. Each carcass placed for a searcher efficiency trial was discreetly marked with a clear labeled zip-tie. The number of efficiency trial carcasses, the placement at search turbines, and the day of the trial were not known by the searcher(s) conducting the carcass searches. Measures were taken to randomize the searcher efficiency carcass location and minimize tracks in the mud or grass when trial carcasses were placed. To accurately assess searcher efficiency in various vegetation communities, the placement of carcasses was stratified across the available community types. Efficiency trial carcasses randomly assigned to a road surface were moved at least 5 meters off of the road to avoid cars destroying carcasses. Walsh or CHW staff documented the date, time, and location (using a GPS) of each carcass. When surveyors located a marked carcass, they noted the finding on the Carcass Search datasheet. The percentage of planted bats and birds located by searchers was used to generate a correction factor to estimate the actual number of bats killed, based on the proportion of fatalities found. Searcher efficiency trials had the potential to be compromised because carcasses placed out for the trial but removed by scavengers prior to beginning the trial were not available to be found during the searcher efficiency trials. This outcome would underestimate searcher efficiency and lead to higher fatality estimates. An adjustment to account for this issue is described under the section on statistical analysis, below.

Ninety small birds, large birds, and bats or mice carcasses were used for searcher efficiency trials; 30 carcasses placed during each of the three months. Brown mice were used as a surrogate for bats, unless or until bat carcasses became available.

Carcass Persistence Trials

Carcass persistence trials provide estimates of how long carcasses remained on the Project site before being scavenged, completely decompose, or otherwise rendered unobservable. The results of these trials were incorporated into the fatality estimates. Carcass persistence trials were conducted at 10 turbines not used for the carcass searches and searcher efficiency trials. The placement of carcasses was determined using a stratified random design based on the proportion of vegetation community types present. Carcass persistence trials were conducted each month that carcass searches were conducted. It was necessary to obtain monthly carcass persistence rates to address potential changes in scavenging over time, since scavengers may adapt to a novel food source. Separate carcass persistence rates were determined for small birds such as passerines, large birds such as raptors, and bats.

Ninety carcasses consisting of small birds, large birds, and bats or brown house mice were used over three months (30 carcasses per month). Carcasses used in the persistence trials were as fresh as possible, because long-frozen carcasses have shown to be more difficult to find and less attractive to scavengers. The position and location of all placed carcasses were recorded using a GPS unit. All animals used in the carcass persistence trials were handled with disposable nitrile gloves or an inverted plastic bag to avoid leaving a scent on the carcasses (Arnett et al. 2009). Project operations personnel were notified when carcass persistence trials were being

conducted, which turbines were being searched, and that carcasses placed at those turbines should not be disturbed.

Locations of the trial carcasses were visited daily in the first week after placement and then every two days thereafter until the carcasses were removed or decomposed. Carcasses remained for a total of 26 to 29 days, at which point any remains were removed. On each check, the location and condition of the carcass was recorded to determine if any scavenging had occurred. Notes on tracks, scat, marks, or other signs of scavenger activity, if any, were noted on every placed carcass.

Incidental Carcass Finds

Incidental finds are defined as any bird or bat carcass found in the vicinity of a Project turbine but not as part of the carcass searches. These include carcasses found by CHW or Walsh staff, at turbines that are not part of the standardized carcass searches, at times outside of the search period, or during a day when carcass searches are not being conducted. Staff used the Bird and Bat Reporting Form to record information on these carcasses. Data were checked for accuracy and entered into the project database. Incidental finds are not included in fatality estimates, but are summarized separately. A Walsh biologist reviewed all incidental finds of potential Special Status Species to confirm identifications. All carcasses found by staff were labeled and either stored in the freezer or marked with a pin flag, as described for carcass searches.

Special Status Species

Any fatalities of Special Status Species encountered were documented as such. Six potential Special Status species could occur within the Project: ferruginous hawk (State Species of Special Concern), golden eagle (federally protected by the Bald and Golden Eagle Protection Act), American peregrine falcon (State Species of Special Concern), burrowing owl (State Species of Special Concern), mountain plover (State Species of Special Concern), and long-billed curlew (State Species of Special Concern),.

Statistical Analyses

Fatality Estimation

Fatalities at wind sites are calculated using fatality estimators, because searcher efficiency is less than 100 percent, and many times carcass persistence is shorter than the search interval. To account for these biases, the USGS fatality estimator software (Data Series 729) was used to estimate bird and bat fatalities (Huso et al. 2012). This estimator utilizes the data from the carcass searches, adjusts for the biases from the searcher efficiency and carcass persistence trials, and calculates a fatality estimate per turbine, per MW, and for the entire Project. The Huso Estimator (Huso 2010) is defined as:

$$\hat{f} = \frac{c_{ijk}}{\hat{r}_{ijk} * \hat{p}_{ijk} * \hat{v}_{ijk}}$$

Here is an example using the spring searcher efficiency and carcass persistence values in spring.

$$22\ bat\ fatalties = \frac{1\ observed\ bat\ fatalities}{0.9 * 0.05\ *\ 1}$$

Where:

$\hat{f}$ is the estimated fatality

i is an arbitrary turbine

j is the arbitrary search interval

i is the arbitrary carcass category

c_{ijk} is the observed number of carcasses

$\hat{p}$ is the estimated searcher efficiency

$\hat{r}$ is the average probability of persistence

$\hat{v}$ is the proportion of the interval sampled

A fatality estimate was calculated by size class (small birds, large birds, and bats) for the summer and fall study period. These two seasons were combined to increase sample size and normalize the carcass persistence data, in order for the fatality estimator to run properly. Fatality estimates for spring could not be calculated due to a skewed data distribution in the carcass persistence trial; without spring, seasonal estimates could not be calculated. The fatality estimator will only run with a minimum of 10 trials for each combination of variables, but Huso (2011) recommends using 20 for reliable results.

One thousand bootstrap resamples were used for all datasets (Manly 1997). Bootstrapping is a computer simulation technique that is used to calculate point estimates, variances, and confidence intervals for complicated test statistics. For each iteration in the bootstrap simulation, the turbines and associated datasets (carcass searches, searcher efficiency, and carcass persistence) were sampled with replacement. Akaike's Information Criterion for small samples (AICc) was used to rank models used in the fatality estimator. The best fitting or most parsimonious model has the lowest AICc value and the most optimal combination of minimal bias and maximal precision (Burnham and Anderson 2002, 2004). The significance level was set at 0.05 for alpha with 95 percent confidence intervals.

Searcher Efficiency

The purpose of searcher efficiency is to estimate the probability that an observer detects all available carcasses during carcass searches. Searcher efficiency was modeled using no explanatory variables other than size class. The sample size was too small to model for visibility; therefore searcher efficiency was assumed to be equal for the different visibility classes, and no AICc values were calculated.

The estimated searcher efficiency is defined by Huso (2010) as:

$$\hat{p} = \frac{n_i}{k_i}$$

Where n_i is the number of trial carcasses found for the *i*th carcass category, and k_i is the number of trial carcasses available to be found for the *i*th carcass category.

An adjustment was generated to searcher efficiency values for summer and fall by employing the carcass persistence value (described below) to account for carcasses that may have been removed by scavengers and thus not available to be found during searcher efficiency trials. This was accomplished by utilizing the searcher efficiency carcass placement dates for the summer and fall trials as the basis for determining the number of days that a carcass would potentially be present at the searcher efficiency turbines. For each species group (large birds, small birds, bats), comparison of this number of days with the presence of carcasses up to an equal number of days in the carcass persistence trials yielded the set of carcasses that were likely to have remained available to be found. All other carcasses for that species group were assumed to have been scavenged and not available to be found during the searcher efficiency trials. To effect this adjustment, k_i in the above equation is replaced by $(c_i - s_i)$ where c_i = the number of carcasses placed and s_i = the number of carcasses likely to have been scavenged for the *i*th carcass category. This adjustment was not made for the spring data due to skewed distribution of the data and the inability to run the model.

Carcass Persistence

Carcass persistence, or the number of days a carcass persists under a turbine before it is removed, is used to account for removal bias. Carcass persistence was modeled using an interval-censored parametric failure time model. This type of survival model determines whether size influences carcass persistence. Carcass persistence was modeled as a function of size class, using four distribution models to fit the carcass persistence data: Weibull, exponential, loglogistic, and lognormal. The average probability of persistence is defined by Huso (2010) as:

$$\hat{r} = \frac{\hat{\bar{t}}(1 - e^{-1/\hat{\bar{t}}})}{min(\hat{\bar{I}}, I)}$$

Where: $\hat{\bar{t}}$ is the average carcass persistence time, I is the actual search interval, and $\hat{\hat{I}}$ is the effective search interval.

The carcass persistence data were fit to four distribution models: Weibull, exponential, loglogistic, and lognormal. The DWP was assumed to be 1, due to flat, treeless plots. The DWP did not need to be adjusted for areas within the survey plot that were not searchable, because staff could search all turbine plots. Visibility was recorded for all fatalities encountered during carcass searches, but not during searcher efficiency or carcass persistence trials. Therefore visibility cannot be included as a parameter in the analysis, and we assume all visibility classes are equal. This assumption may bias the fatality estimate low.

The majority of the turbine search areas had easy visibility since the ground under the turbines was reseeded and bare ground. In the spring, all search areas were easy, except for small undeveloped grassland sections that were far from the turbine base, but still inside the plots. These areas contained sand sage and other native plants and grasses; the visibility was moderate to difficult. Throughout the growing season, more vegetation grew under turbines, changing the visibility from easy to moderate in some areas.

Results

Fatalities

A total of 40 bird and bat fatalities were found during carcass searches. Twenty percent (8 carcasses) were birds and 80 percent (32 carcasses) were bats (Table 1).

Table 1. Species, Number, and Percent of Fatalities of Birds and Bats, Colorado Highlands Wind Farm, Logan County, Colorado 2013

Species	Carcass Search Fatalities	
	Number	Percent
Birds		
Lark sparrow	2	5
Chipping sparrow	1	2.5
Nashville warbler	1	2.5
Wilson's warbler	1	2.5
Horned lark	1	2.5
American kestrel	1	2.5
Ferruginous hawk	1	2.5
Total Birds	8	20
Bats		
Hoary bat	20	50
Eastern red bat	8	20
Silver-haired bat	4	10
Total Bats	32	80
Total		
Total Birds and Bats Combined	40	100

Of the eight avian fatalities, two were raptors, and six were songbirds. Seven individual bird species were found including American kestrel, ferruginous hawk, chipping sparrow, lark sparrow, horned lark, Nashville warbler, and Wilson's warbler. Lark sparrows comprised two

fatalities. No bird fatalities were found in the spring, 38 percent were found in the late summer, and 62 percent were found in the fall.

All bat fatalities were from three tree-roosting migratory bat species. Hoary bats comprised 20 fatalities, eastern red bats had 8 fatalities, and silver-haired bats had 4 fatalities. Fifty-six (56) percent of bat fatalities were found in the summer, 41 percent in the fall, and 3 percent in the spring.

Fatalities by Turbine

Of the 10 turbines surveyed, 3 turbines were moved after the first summer survey due to the erosion mitigation work. Turbine 1 was moved to the turbine 2 location, turbine 12 was moved to the turbine 22 location, and turbine 33 was moved to the turbine 32 location (Figure 4). Every turbine surveyed had at least one fatality, except turbine 33, which was only surveyed during the spring period before being moved to the turbine 32 location. Turbine 17 had the largest number of fatalities (7) (Figures 4 and 5). The next four turbines with the largest number of fatalities were turbine 9, 16, and 32 with five fatalities each, and turbine 13 with four fatalities.

Fatalities by Season

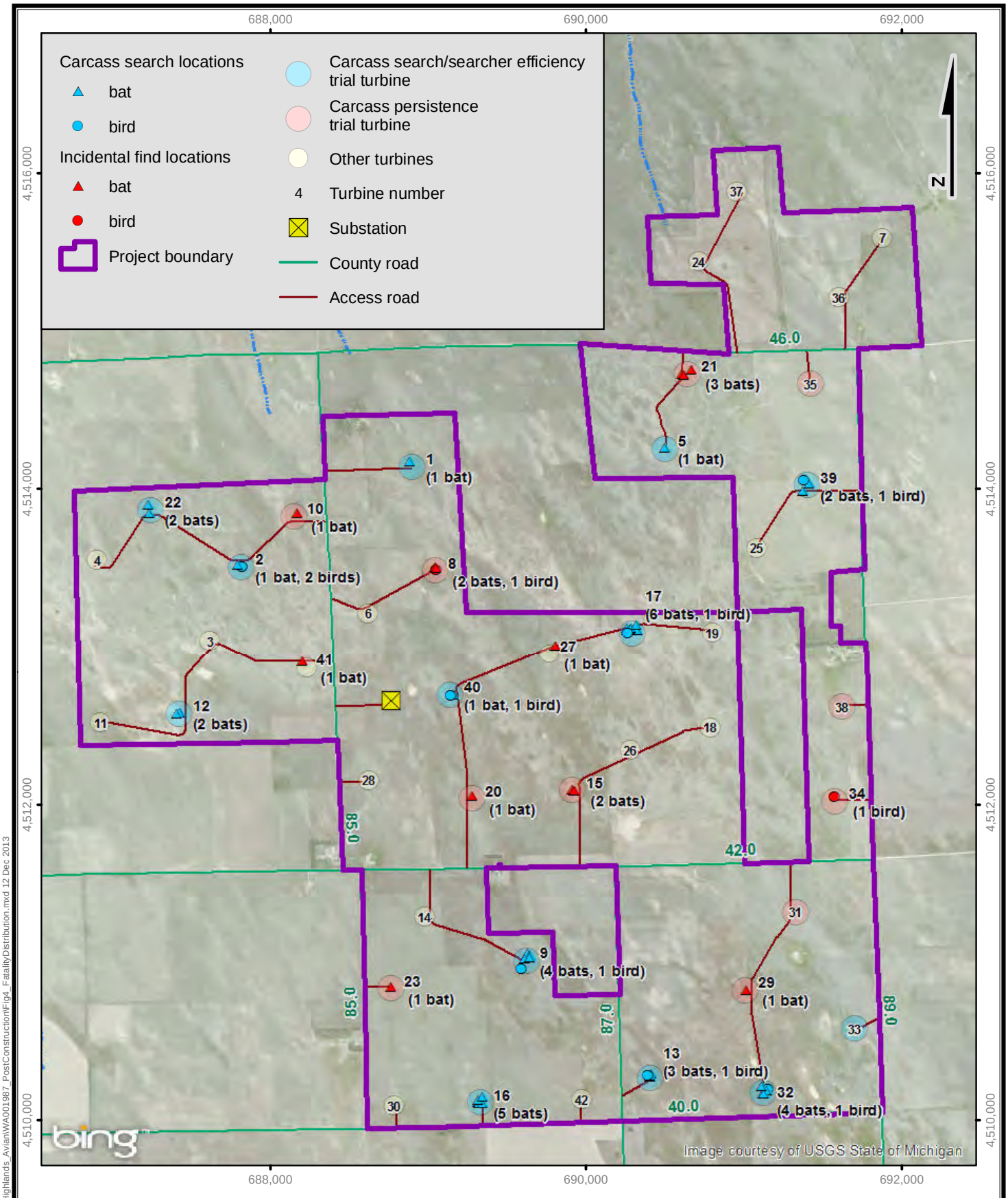
Only one bat fatality was found in the spring. In the summer 3 birds and 18 bats were found. In the fall 5 birds and 13 bats were found (Figure 6).

In the summer there were two bird species represented: American kestrel and two lark sparrow. In fall there were five bird species fatalities: chipping sparrow, ferruginous hawk, horned lark, Nashville and Wilson's warbler.

Eighty-three percent (15 individuals) of hoary bat fatalities were in summer, and all silver-haired bat fatalities (4) were observed in the fall. Eastern red bat fatalities (8) were observed in both summer and fall.

Incidental Carcasses

A total of 15 incidental carcasses were found during the three months of surveys (Table 2); 2 birds and 13 bats. The majority were found during carcass persistence trials. Of the 15 carcasses, the bird species included chipping sparrow and greater prairie chicken. The 13 bats included 12 hoary bats, and 1 eastern red bat.



NAD 1983 UTM Zone 13N
Bing Maps Aerial Base

0 0.5 1
Miles

Figure 4.
Distribution of
Bird and Bat Fatalities
Colorado Highlands Wind Farm
Phase I
Logan County, Colorado 2013

Walsh
an ecology and environment company

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Figure 5. Number of Bird and Bat Fatalities by Turbine, Colorado Highlands Wind Farm, Logan County, Colorado, 2013

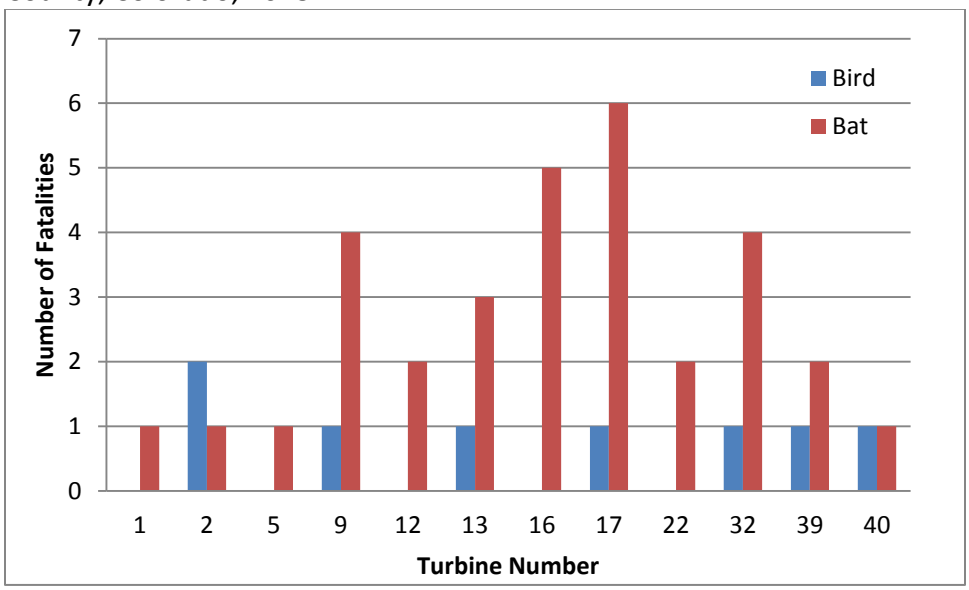

Figure 6. Bird and Bat Fatalities Detected by Season, Colorado Highlands Wind Farm, Logan County, Colorado, 2013

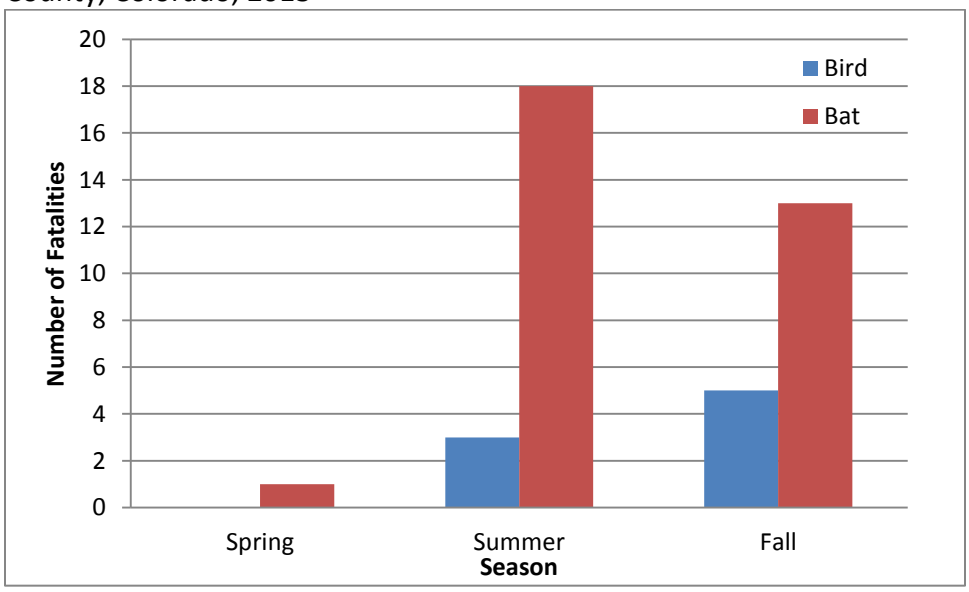

Table 2. Incidental Bird and Bat Carcasses, Colorado Highlands Wind Farm, Logan County, Colorado, 2013

Species	Number of Incidental Carcasses
Birds	
Chipping sparrow	1
Greater prairie chicken	1
Total Birds	2
Bats	
Hoary bat	12
Eastern red bat	1
Total Bats	13
Total All Species	15

Special Status Species

The ferruginous hawk was the only Special Status Species fatality. It is a State Species of Special Concern

Carcass Search Biases

Searcher Efficiency

Results of searcher efficiency trials were notably different in the spring month compared to the summer and fall months and are presented separately. The fatality estimator was not able to calculate the estimated searcher efficiency and confidence interval (CI) for spring due to the small percentage of carcasses found. Of 30 carcasses placed in the spring, two large birds, one small bird, and one bat were found (Table 3). Searcher efficiency was 0.13 in the spring, indicating that thirteen percent of carcasses were found during the spring trial. Searcher efficiency was 0.1 for large birds and 0.05 for small birds and bats for the spring survey period.

Of the 51 searcher efficiency carcasses placed in the summer and fall, 28 were found. The searcher efficiency was 0.55 (0.41-0.69) for all birds and bats: 0.47 for small birds, 0.55 for large birds, and 0.64 for bats for the combined summer and fall survey period (Table 4).

Table 3. Spring Searcher Efficiency, Colorado Highlands Wind Farm, Logan County, Colorado, 2013

Species Group	Placed[1]	Found	Searcher Efficiency
Small bird	10	1	0.10
Large bird	10	2	0.20
Bat	10	1	0.10
TOTAL	30	4	0.13

Table 4. Summer and Fall Searcher Efficiency for Bird and Bat Carcasses, Colorado Highlands Wind Farm, Phase I, Logan County, Colorado, 2013

Species Group	Placed[1]	Found	Searcher Efficiency
Small bird	17	8	0.47
Large bird	20	11	0.55
Bat	14	9	0.64
TOTAL[2]	51	28	0.55 (0.41-0.69)

[1] Placed carcasses are reduced to the number remaining after adjustment for persistence of carcasses.

[2]Total searcher efficiency is generated from the model, with confidence intervals, whereas individual species groups are generated arithmetically.

Carcass Persistence

The spring carcass persistence data were not analyzed, due to the inability of the estimator to function correctly with the non-normal data distribution. The summer and fall data were analyzed together in order to analyze the three size class parameters with a large enough sample size. One carcass persistence turbine had to be relocated due to erosion mitigation work.

Of the thirty carcasses placed in the spring carcass persistence trial, 3 were removed during the first visit, 2 were removed in between the second and last visit, and 25 were present at the end of the study trial. Although the estimator was not able to calculate a value for spring carcass persistence, 83 percent of the carcasses remained by day 28 (the end of the study trial), which would indicate a high number of carcass persistence days.

Of the 30 carcasses placed in the summer, 28 were removed between the second and last visit, and 2 were present at the end of the study trial. Of the 30 carcasses placed in the fall, 26 were removed between the second and last visit, and 4 were present at the end of the study trial.

The AICc results in the fatality estimator showed the lognormal model to have the best fit to the data. The best fitting model has the lowest AICc value, is the most parsimonious, and has the most optimal combination of minimal bias and maximal precision. Out of the four models tested in the fatality estimator, the lognormal provided the most parsimonious model, with the lowest carcass persistence AICc value for each size classes. During the combined summer and fall months, the carcass persistence of small birds was 10.42 days, for large birds was 13.04 days, and for bats was 7.61 days (Table 5).

Table 5. Carcass Persistence Results in Summer and Fall, Colorado Highlands Wind Farm, Logan County, Colorado, 2013

Bias Trial	Placed	Carcass Persistence (days)	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Small bird	20	10.41	6.98	16.07
Large bird	20	13.02	9.5	18.09
Bat	20	7.61	5.17	11.89
All	60	10.14	8.14	12.67

Fatality Estimates

The combined total bird and bat fatality for the Project in the summer and fall was an estimated 437 fatalities (with 95 percent confidence intervals of 280-668) per study period for the entire site, and an estimated 6.50 fatalities per MW per study period (Table 6).

Bird fatality for all birds was estimated to be 94 birds per study period for the entire site, with 1.39 bird fatalities per MW per study period. These are calculated by addition, and confidence intervals are not generated. The small bird fatality for the entire site in the summer and fall was 68 (24-121) birds per study period, with an estimated 1.01 bird fatalities per MW per study period. The large bird fatality for the Project in the summer and fall was 26 (9-66) birds per study period, with an estimated 0.38 bird fatalities per MW per study period.

The bat fatality estimate was 344 (208-539) bats per study period for the entire site, with an estimated 5.11 bat fatalities per MW per study period.

Fatality estimates could not be annually extrapolated, because the monthly fatality rate changes throughout the year. The estimates address late summer and fall fatality at the site. The fatality estimates for spring could not be calculated due to the small sample size of placed carcasses and carcass finds (1 bat) and low searcher efficiency (13 percent), and due to non-normal carcass persistence data distribution.

Table 6. Fatality Estimates for Birds and Bats in Summer and Fall, Colorado Highlands Wind Farm, Logan County, Colorado, 2013

Size Group[2]	Number of Fatalities	Per Turbine			Per Megawatt[1]			Entire Site		
		Fatality Estimate	Lower 95% CI	Upper 95% CI	Fatality Estimate	Lower 95% CI	Upper 95% CI	Fatality Estimate	Lower 95% CI	Upper 95% CI
Small Bird	6	1.6	0.56	2.87	1.01	-	-	68	24	121
Large Bird	2	0.61	0.2	1.56	0.38	-	-	26	9	66
All Birds[3]	8	2.21	0.76	4.43	1.39	-	-	94	-	-
Bats	31	8.17	4.93	12.82	5.11	-	-	344	208	539
Total Birds + Bats	39	10.39	6.66	15.9	6.50	-	-	437	280	668

[1] Per megawatt was calculated dividing the fatality estimate for the entire site by 67.2 (the total number of MWs). No CIs were calculated.
[2] All size groups were analyzed in the estimator at the same time, but with size group as a parameter.
[3] All Birds was not calculated by the estimator, the small and large bird values were added together, therefore there are no confidence intervals.

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Comparison of Predicted Fatalities

Birds

A range of possible bird fatalities was previously projected for the Project (Walsh 2013). This predicted range of fatalities was determined using bird and bat fatality rates estimated at the Spring Canyon Energy Wind Farm (SCE), Foote Creek Rim Wind Plant (FCRWP), and Nebraska Public Power District (NPPD), as well as the average bird fatality rates at wind energy facilities in grassland communities (Strickland et al. 2011) (Table 7). The predicted bird fatalities from the above four studies for Project ranged from 0.9 to 2.41 birds per MW per study period (FCRWP bird fatality rate and grassland bird fatality rate). The bird fatality estimate from the present study per MW was 1.39, which falls in the predicted fatality range.

Additional regional studies were added to this comparison, including Blue Canyon II wind, Judith Gap Wind, and Great Plains wind farms. These expanded the range from 0.9 to 3.0 bird fatalities per MW per study period, with the present study falling within that range (Table 7).

Bats

A range of possible bat fatalities was previously projected at the Project (Walsh 2013), using bat fatality rates estimated at the SCE, FCRWP, NPPD, and other grassland wind farms (Table 7). The predicted bat fatalities for the Project from these studies ranged from 0.8 to 1.2 bats per MW per study period. Based on this range of predicted fatality rates, bat fatality rates at the Project were higher than predicted, 5.11 bat fatalities per MW per study period (Table 7).

Additional regional studies were added to this comparison, as described above. These expanded the range from 0.8 to 8.9 bats per MW per study period, with the present study remaining within that range (Table 7).

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Table 7. Comparison of Fatality Estimates with Predicted Ranges from Walsh (2013) and with More Recent Regional Studies*

Wind Farm	State	Year of Study	Number of Turbines	Study Length	Bird Fatality Estimate Per Study Period		Bat Fatality Estimate Per Study Period	
					Per Turbine	Per MW	Per Turbine	Per MW
Studies used for predicted range of fatality estimates as described in the Bird and Bat Conservation Strategy (Walsh 2013)								
Spring Canyon Energy[1]	CO	2008	40	Sept 2006-Aug 2007	4.67	1.7	2.88	1.1
Foote Creek Rim Wind Plant[2]	WY	2003	105	November, 1998 - June, 2002	1.75	0.9	1.3	0.8
Nebraska Public Power District Ainsworth Wind Farm[3]	NE	2007	36	March-Nov 2007	2.7	1.6	1.9	1.2
Wind Farms in Grassland (20 facilities)[4]	Many	Many 2011	Various	Combined average over multiple studies	-	2.41	-	-
Present Study								
Colorado Highlands Wind Farm	CO	2013	42	May, Aug, mid Sept –mid Oct	2.21	1.39	8.17	5.11
Additional Regional Studies for Comparison								
Blue Canyon II Wind[5]	OK	2010	84	March-June, Aug -Nov 2006-2008	1.16	0.6	7.63	4.2
Judith Gap Wind[6]	MT	2008	90	Aug-Oct 2006, Feb-May 2007	4.52	3.0	13.4	8.9
Great Plains Wind Farms (15 facilities)[7]	Many	Many, 2013	Various	Combined average over multiple studied	-	-	-	3.07

[1] TRC Environmental 2008b, [2] Young et al. 2003, [3] Derby et al. 2007, [4] Strickland et al. 2011, [5] Burba et al. 2010, [6] TCR 2008a, [7] Hein et al. 2013.These wind projects used various different study metrics for differing durations, and although still valuable, are not directly comparable to this Project.

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Discussion

An unusual amount of rainfall occurred in the summer and fall of 2013, which led to soil surface erosion at five of the turbines. This required CHW to conduct restoration operations. CHW staff worked with Walsh biologists to ensure the study was as unaffected as possible while surveys at these turbines were transferred to other randomly selected turbines with the same vegetation type (either CRP grassland or native prairie). For all impacted turbines (three carcass search and one carcass persistence turbines), carcasses already placed were picked up and moved to the new turbine. Both original and new trial turbines are shown.

The change of turbines due to erosion work most likely did not affect the study. The amount of rain may have moved some placed carcasses. Walsh staff witnessed two carcass persistence carcasses (one mouse and one bird) that were moved from their original locations due to heavy rain. The rain also resulted in unusually tall and dense vegetative growth for the eastern plains and many carcasses were more difficult to find than would have been the case in a typical year on the eastern plains of Colorado. Several thunderstorm events halted the carcass searches due to personnel safety concerns. This resulted in a one-day shift for the study, and one skipped carcass persistence survey check. The surface runoff erosion, restoration activities, and thunderstorm survey delay mainly affected the summer surveys. In late August, restoration activities significantly disturbed the vegetation growing under 9 out of 10 carcass search turbines (turbine numbers 2, 5, 9,13, 16, 17, 22, 39, and 40), as re-grading to remedy surface runoff erosion resulted in large earthen piles. These piles may have contained bird or bat fatalities, carcass persistence or searcher efficiency carcasses, that were then missed by the surveyors or assumed to be taken away by scavengers. Any natural fatalities at these carcass search plots that were removed, moved, or hidden during this process would have altered the true fatality estimate. Three fatalities found had been damaged in this process (under turbines 16, 17, and 40), and one of the three fatalities was found hidden in a clump of cleared vegetation. This disturbance was temporary, all the data were used for the fatality estimate, and no turbine plots were moved.

Fatalities

Birds

Avian fatality rates across North America range from 0.1 to 13.9 birds per MW per study period (Strickland et al. 2011). Across wind facilities throughout the U.S., avian fatality rates are fairly consistent; 42 of the 63 studies report fatalities of all birds at less than or equal to 3 fatalities per MW per study period (Strickland et al. 2011). The results of bird fatality for this study are consistent with most wind studies across the U.S. Relatively few fatalities occurred to bird species, resident or migrant.

The most common species occurring within wind farms are passerines. They make up the vast majority of avian fatalities found at modern wind facilities (Strickland et al. 2011). Seventy-five

percent of bird fatalities at the Project were passerines, and 25 percent were raptors. Eight bird species were detected during this study, seven as fatalities during carcasses searches and one species, greater prairie-chicken, was an incidental carcass find. All but two bird species found as fatalities were observed during point counts (Walsh 2011, 2012); namely the two night-time migrant species, the Nashville warbler and Wilson's warbler.

Bats

Studies have shown that large numbers of bats are being killed by wind farms across the U.S. (Cryan 2011, Ellison 2012, Huso 2011, Kuntz et al. 2007, Smallwood 2013). Hayes (2013) estimated bat fatalities in the U.S. in 2012 at 600,000 individuals. There is little published information on fatalities near the Rocky Mountains. All bat fatalities detected at CHW were migratory tree-roosting species, the majority being hoary bats, as is found for the large majority of bat fatalities at wind farms across the U.S. (Arnett et al. 2008, Johnson 2005, Kunz et al. 2007). The reason for high bat fatalities at wind farms is currently not well understood. Several hypotheses exist such as random collisions, migratory related collisions, and collisions associated with the bats potential attraction to turbines (Ellison 2012, Horn et al. 2008, Kuntz et al. 2007).

Fatalities by Turbine

Fatalities occurred at almost all turbine locations monitored. No clear pattern emerges to provide evidence for a particular turbine string or specific turbine being the source of the majority of fatalities.

Fatalities by Season

During the spring and fall migration, nocturnally migrating passerines are the most abundant species and the most common fatalities at most wind energy facilities (Strickland et al. 2011). Environmental conditions may cause annual variation in migration pathways for nocturnal migrants which may lead to temporal and spatial variation within a project site (Tetra Tech 2013).

Throughout the U.S and North America, studies of bat impacts have demonstrated that fatalities at wind farms peak in late summer and early fall, which also coincides with the migration period for many species (Arnett et al. 2008, Johnson 2005, Kunz et al. 2007a). There is also a smaller spike in bat fatalities during spring migration for some species at some facilities (Arnett et al. 2008). For this study, the months surveyed were selected to capture these spikes in bird and bat fatalities. This study showed similar results to the above studies.

Due to the small sample size of placed carcasses and carcass finds (1 bat), low searcher efficiency (13 percent), and skewed, non-normal carcass persistence data in the spring, the estimator was unable to generate a fatality estimate for spring, it is difficult to determine whether spring and summer/fall experienced differences in fatalities. The higher bird fatalities observed in late summer and fall may have been due to migration.

Incidental Carcasses

Incidental carcasses were found while driving between study turbines and during carcass persistence searches. Their tally, roughly half of what was found during active carcass searches, provides an informal measure of additional bird and bat fatalities across the Project, and supports the calculated fatality estimates. There was also one incidental fatality of a greater prairie-chicken. Although not a Special Status Species, CPW tracks this species and recommends pre-construction lek surveys which were conducted. There was also one incidental fatality of a greater prairie-chicken. Although not a Special Status Species, CPW tracks this species and recommends pre-construction lek surveys which were conducted.

Special Status Species

One adult ferruginous hawk fatality was found at turbine 32. Three ferruginous hawk nests were observed within a mile of the Project, and they were frequently observed in the Project area during pre-construction point counts. Ferruginous hawks are a Special Status Species (non-statutory) in Colorado, due to declining populations (CPW 2011). Raptors seem particularly vulnerable to collision with turbines, due to their tendency to fly within the turbine's rotor swept area. Strickland et al. 2011 found that although raptors are not as abundant as other avian species, six percent were observed as fatalities at North American wind farms.

Carcass Search Biases

There is some amount of bias associated with all available fatality estimators, due to the unknown variables that are estimated and factored into the estimates of fatality. When searcher efficiency and carcass persistence rates are constant over time, the Huso (2010) estimator has less biased results over other estimators although should the data not remain constant, there is increased bias.

Several challenges occurred with the types of carcasses used during bias trials. For the searcher efficiency trials in the spring and summer, the small birds used were of similar size, whereas in fall, the small birds were smaller than expected. This smaller size was more difficult to detect, which could have slightly biased the small bird fatality estimate higher. For the entire study and for both bias trials, large birds arrived smaller than expected. The large birds were all closed winged and the body size was smaller than all naturally found raptors. The large bird carcasses used for searcher efficiency and carcass persistence were not as easy to detect and not comparable to a raptor-sized bird. Mouse carcasses were used in the spring for the first searcher efficiency trial, while in the summer and fall bats were available from carcass searches and were used. Because there was no spring fatality estimate calculated, this difference did not affect estimates.

No areas within turbine plots were unsearchable. This was mainly due to the flat grassland habitat, which was mostly covered in short-grass prairie and sand-sage. Therefore the DWP was assumed to be 1.

Visibility is a measure of the substrate conditions categorized into visibility classes as easy, moderate, and difficult. This measure was not used as a covariate for the fatality estimate for

this study because the data were not collected. Not accounting for visibility most likely will bias the fatality estimates low for this study. Several challenges occurred when collecting visibility data. The placement of all carcasses was done randomly using GIS, and visibility was unknown at the time. Additionally, the visibility changed significantly from month to month. Rapid vegetation changes occurred and some turbine plots contained a large amount of fast growing non-native plants. The areas under the turbine plots began with the majority in the easy visibility category, because the turbines had been recently erected and the area under the turbines was mostly bare ground. A much larger number of carcasses are needed to account for three visibility classes in combination with three carcass size classes, for the searcher efficiency and carcass persistence trials when using the fatality estimator. Huso (2013) recommends using 20 carcasses per parameter, but the estimator can work using 10 carcasses per parameter.

Searcher Efficiency

Searcher efficiency was lower than expected in the spring (13 percent for birds and bats combined), and was higher in the summer and fall combined (47 percent for birds and bats combined). The estimator could not be used in the spring because the carcass persistence non-normal data distribution caused the estimator to operate incorrectly. The searcher efficiency for this site in summer and fall is comparable to others studies, which had a range of 56 to 63 percent (Derby 2007; TRC 2008a,b).

In spring, one CHW staff conducted searcher efficiency and carcass persistence trials, as well as the fatality searches. The resulting small number of searcher efficiency carcasses and carcass search carcasses may have been a result of not having a biologist's search image for animals, or possibly of having multiple duties and time constraints.

The correction for searcher efficiency to accommodate the persistence of carcasses presents a closer approximation to the actual estimate than the assumption that all carcasses remain available to be found. Therefore, this was integrated into the Project's searcher efficiency calculations used in the summer and fall period Project fatality estimates.

Carcass Persistence

Carcass persistence was not uniform throughout the study. The spring trial was notably different than summer and fall trials. The spring trial had differences in predator familiarity with the site and in staff conducting persistence trials, both of which may have contributed to the difference in study results. Spring was the first time carcasses had been placed for this study, and scavengers may not have been accustomed to this new resource. The later trials had the majority of the carcasses removed by the end the study by scavengers.

Carcass persistence for Spring Canyon Wind Project was fairly similar throughout the season: 9.5 day in the spring (March and June), 10.6 day in the summer (August), and 15.8 days in the fall (October) (TRC 2008). Carcass persistence for the Project was much higher (83 percent of carcasses remaining at the end of the trial), when compared with Spring Canyon Wind Project, whereas in the summer and fall carcass persistence for the Project (10.17 days) was similar to the Spring Canyon Wind Project (TRC 2008). The change may be due to the learned behavior of scavengers to the presence of carcasses, or because more scavengers were available due to an

increase in juveniles subsequent to the breeding season. Due to the non-normal data distribution for carcass persistence in the spring, the estimator could not calculate carcass persistence or the fatality estimate.

Fatality Estimates

The fatality estimates for spring could not be calculated due to the small sample size of placed carcasses and carcass finds (1 bat) and low searcher efficiency (13 percent), and due to non-normal carcass persistence data distribution. During spring, there was a lot of bare ground and the vegetation was not yet tall and the ease of carcass detection would have been high. These results may be due to the searcher not being a biologist, as discussed above.

During the analysis it was found that a larger sample of carcasses was needed for both searcher efficiency and carcass persistence trials, in order to include the covariates for visibility and carcass size class in the fatality estimate. The inclusion of these covariates would provide a more robust fatality estimate, and reduce the risk of underestimating fatality.

Comparison with Predicted Values and Other Wind Farms

The predicted bird fatality for the Project from the BBCS was 0.9 to 2.41 birds per MW per study period, and the predicted bat fatality was 0.8 to 1.2 bats per MW per study period (Walsh 2013). The estimated fatality for birds is within the predicted fatality, with 1.39 birds per MW.

With the additional regional wind projects chosen for fatality comparison, where bird fatalities range from 0.6 to 3.0 per MW and bat fatalities range from 0.8 to 8.9 per MW, the present study falls entirely within the ranges. Bird fatality for the Project's study was the third lowest, and bat fatality was the second highest of the seven studies.

SCW is one of the wind facility examples used to compare predicted fatality rates to this Project (TRC 2008b). SCW resides in the same county, and is the closest comparable wind farm to the Project. SCW had a lower bat fatality estimate than the Project, but a higher bird fatality estimate. The number of bird fatalities in August at the Project (3) was similar to SCW (4). Interestingly, only two of the same bird species were detected as fatalities at both sites (horned lark and Wilson's warbler). The number of bats in August at the Project (18) was higher than SCW (11). SCW did not survey for bats in September. SCW did not use the USGS fatality estimator, and had more survey months, so their fatality estimate is not directly comparable, although species and seasonal data are a useful comparison. The Huso estimator is more accurate than the estimators used by SCW, but with decreased biases fatality estimates tend to be higher. If the same estimators were used for these projects, the fatality estimates would potentially be more comparable. The other wind farms listed below conducted longer studies and calculated an annual fatality estimate, which this study did not.

There is currently a heightened concern regarding bat fatalities (Hayes 2013), which appear to increase as turbine sizes become larger. Additionally, bat fatalities are spread across fewer species (three tree-roosting migratory bats) compared to birds, and their population sizes are not known. In a review of 21 post-construction fatality studies from 19 North American wind facilities, bat fatality rates were highly variable depending on the geographical location (Arnett

et al. 2008). The Eastern U.S. recorded fatality rates of 14.9 to 53.3 bats per MW per study period, the Midwest recorded rates of 0.2 to 8.7 bats per MW per study period, and the Pacific Northwest recorded fatality rates of 0.8 to 2.5 bats per MW per study period. In the Great Plains region (including Colorado), fifteen post-construction wind sites were used to generate a mean bat fatality of 3.07 bats per MW, with a range of 0.12 bats per MW to 10.85 bats per MW (Hein et al. 2013, Table 7).

The comparisons are available and provide metrics, but they are also problematic. The studies presented in Table 7 were conducted over various months and for various durations, used different estimators, and had different turbine models. The science of predicting bird and bat fatality is relatively new, and will likely be improved over time. These comparisons are nonetheless of use, as it is valuable to note whether and where the Project's fatality estimate falls in relation to the range of other wind projects in the region, even if the comparisons are somewhat imprecise.

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Attachment A: Salvage Permits from CPW

STATE OF COLORADO
DEPARTMENT OF NATURAL RESOURCES
COLORADO PARKS AND WILDLIFE
SCIENTIFIC COLLECTION LICENSE

Amendment # 1

Fee: Non-exempt
Effective Date: **5/10/2013**
Date of Expiration: **12/31/2013**

2013

License No: **13SALV2043A1**
FederalPRT: **Pending**

Name of License Holder: **Pohlman, Bruce .**
Organization: **Colorado Highlands Wind, LLC**
MailingAddress: **2001 E. Easter Ave., Suite 100**
Centennial, CO 80122

The above named license holder is authorized to collect the following species of wildlife:

Species Collection and Location Information

Number Authorized	CommonName	ScientificName	Disposition
	Various spp. Of bats		**Salvage ONLY**
	Various spp. of non-T&E birds		**Salvage ONLY**

Collection Manner and Location:

Dead bats will be collected as encountered - no live take - in the following localities: Logan County T9N R48W - portions of Sections 8, 9, 18, 19, 20, 29 and 30 T9N R49W - portions of Sections 13 and 24.

AMENDMENT #1:
1) Dead bats may be also be collected from Boulder, Broomfield, and Denver Counties.
2) Scott Severs, Kent Adney, and Tyson Ramseier are also authorized as subpermittees.

1) Notification pre-collection must be made to AWM Tom Kroening (tom.kroening@state.co.us).
2) Dead bats collected may be used for training of field staff until December 31, 2013. If the applicant wishes to hold any specimens longer than that, they will need to renew the license and disclose which specimens they wish to use in 2014.
3) Any bats which are no longer needed after 2013 should be properly disposed of.
4) The following are authorized as submpermittees: Carron Meaney and Jessie Dulberger.
5) ANY BAT SHOWING INDICATIONS OF WNS MUST BE SUBMITTED TO THE CPW WILDLIFE HEALTH LAB AS INSTRUCTED IN #2 BELOW.

Standard Stipulations for Scientific Collection Permits handling bats
1. The latest USFWS Decontamination protocols must be followed. They can be found at: http://whitenosesyndrome.org/topics/decontamination . This includes decontaminating any equipment or clothing that is carried into bat habitats (caves and mines) and any equipment that comes into contact with bats. At no time should any equipment or clothing that has been used in a WNS-affected state or region be

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used in Colorado.
2. Any bats showing indications of WNS must be submitted to the CPW Wildlife Health Lab, 4330 West La Porte Avenue, Fort Collins, CO 80521, for evaluation. Please notify CPW that bats are being submitted by calling 303-291-7771 or emailing wildlife.batline@state.co.us.
3. The handling and processing time of bats should be kept to a minimum. When necessary to handle bats, the wings and tail membranes should be examined for scarring and damage associated with White-nose Syndrome, during spring and early summer. The Wing Damage Index developed by Reichard (http://www.fws.gov/northeast/PDF/Reichard_Scarring%20index%20bat%20wings.pdf) should be used when evaluating wing damage. Wing damage should be documented by photograph. If extensive damage is apparent, a wing punch should be taken (following the USFWS Decontamination guidelines for wing biopsies) in the area and preserved in 10% formalin. All punches should be submitted to the CPW Wildlife Health Lab for analysis (as described above).
4. If necessary, bats should be temporarily held individually in breathable bags. Disposable bags (such as paper bags) are preferred. Cloth bags are to be used to hold one bat per night and decontaminated between uses. Use of holding cages is not permitted.
5. Disposable gloves should be worn when handling bats. Gloves are to be changed with each bat handled.
6. New or decontaminated mist nets are to be used each night. Nets can be boiled for at least 15 minutes and dried between each night of use.
7. Protocols and procedures can change at any time due to new information on the presence or science of WNS infection. Permit holders should be prepared to respond to these changes when they occur.
8. Permit holders are required to contact the local CPW Wildlife Conservation biologist prior to field work, to review the decontamination protocols and ensure that the necessary equipment and supplies are available, and that the guidelines are fully understood. To ensure the protocols are being followed, field site visits by CPW personnel are possible.

Standard Stipulations:

1) PLEASE PRINT A COPY OF THIS LICENSE AND CARRY IT WITH YOU IN THE FIELD.

2) As a condition of this license, and prior to field work, the license holder must contact the Area Wildlife Manager (AWM) and District Wildlife Manager (DWM) in the wildlife office(s) nearest the locality(ies) of the field work (Reg #1316 B.2.) For the LOCATION AND PHONE NUMBER of the nearest Colorado Parks and Wildlife location, please go to:
http://wildlife.state.co.us/About/OfficesAndPhone/Pages/ContactNumbers.aspx

3) A report of all collection activities must be reported within 30 days of the expiration of this license (Reg #1316 C.1 and #1316 C.2). Submit your report electronically using the year-end report forms located at:
http://wildlife.state.co.us/RulesRegs/SpecialWildlifeLicenses/Applications/Pages/Applications.aspx

Student(s) enrolled in a university or college and under the supervision of an instructor who is/are in possession of a valid scientific collecting license shall not be required to obtain a scientific collecting license. Student(s) shall carry a copy of the license while engaged in field work. (Reg #1317 A.).

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STATE OF COLORADO
DEPARTMENT OF NATURAL RESOURCES
COLORADO PARKS AND WILDLIFE

SCIENTIFIC COLLECTION LICENSE

Amendment # 1

Subpermittee(s) are authorized as long as the subpermittee(s) is/are under the direct control of, or employed by, the permittee for the stated purpose in the license. Year-end reports are the responsibility of the license holder. (Administrative Directive L-4)

If the license holder is authorized to keep organisms (including vouchers), specimens, information regarding disposition of specimens or data generated from analysis of specimens is to be made available to the Division: 1) upon demand; 2) by a designated date; or 3) as part of the annual report, whichever is appropriate. (Administrative Directive L-4)

Amendment Details (if applicable):

Add collection localities and subpermittees.

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