Eagle Conservation Plan for the Goodnight I Wind Project Final Report

FGE Goodnight I, LLC

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EXECUTIVE SUMMARY

FGE Goodnight I, LLC (Goodnight I Wind) is developing the Goodnight I Wind Project (Project) on privately owned property in Armstrong County, Texas. Goodnight I Wind prepared this Eagle Conservation Plan (ECP) to support an application to the US Fish and Wildlife Service (USFWS) for an incidental eagle take permit (ETP) for bald and golden eagles under 50 Code of Federal Regulations 22.80 for take associated with operation of the Project. The ECP provides detailed information on the Project; pre-construction eagle studies; detailed analyses of risk including an estimation of anticipated levels of bald and golden eagle take; project siting, design, construction, and operational measures to avoid and minimize the take of eagles; post-construction monitoring; and adaptive management measures to ensure permit compliance.

Site-specific baseline surveys conducted at the Project from 2011 – 2014 included raptor nest reconnaissance surveys and avian use surveys; however, the survey methods do not meet the current data standards of Stage 2 of the USFWS Eagle Conservation Plan Guidance (ECPG) or 2016 Eagle Rule and as such, were not used as part of the risk assessment.

The Stage 3 risk assessment uses the USFWS Bayesian Collision Risk Model (CRM) to provide a quantitative prediction of the bald eagle and golden eagle mortality associated with the Project during operations. Pre-construction predictions typically utilize the CRM in conjunction with the pre-construction eagle use data collected during the pre-construction survey efforts. Given the limitation of the site-specific data available for the Project, the ECP presents the results of the USFWS national prior-probability distributions (priors-only models), which exclude the pre-construction eagle use data collected at the Project. Based on the priors-only CRM analyses for the Project, the estimated take is 5.28 bald eagles/year and 5.97 golden eagles/year (upper 80% credible limit). This is likely a conservative estimate, and USFWS discussed with Goodnight I Wind that it anticipates that the estimated level of eagle take will be adjusted following two years of post-construction eagle mortality monitoring at the Project.

USFWS estimates the local area population (LAP) of bald and golden eagles for the Project to be approximately 683 and 218 individuals, respectively, and the estimated annual take of the Project represents 0.77% and 2.74% of the LAP, respectively. The estimated take for the Project combined with the authorized take from overlapping projects could result in a total annual take of 0.77% and 2.86% of the LAP, respectively. This level of take is within the LAP thresholds established by USFWS.

Goodnight I Wind requests an eagle take an allocation of 5.28 bald eagles and 5.97 golden eagles per year, or up to 159 bald eagles and 180 golden eagles over the 30-year permit term. Goodnight I Wind will work in conjunction with the USFWS to develop a mitigation plan to offset the impacts of the predicted take using a mitigation ratio of 1.2 golden eagles to one golden eagle taken. The USFWS will determine the final compensatory mitigation requirements for the Project for golden eagles using a resource equivalency analysis (REA) focused on power pole retrofits. Offsetting compensatory mitigation for bald eagles is required only if 1) annual take exceeds the threshold

for the eagle management unit, or 2) annual take (together with cumulative effects) is greater than the LAP thresholds. Given these criteria and the current bald eagle populations, Goodnight I Wind does not anticipate the need for compensatory mitigation to offset bald eagle take for the Project. As such, no mitigation for bald eagles is proposed. Project-specific avoidance and minimization measures and eagle conservation actions have been identified to reduce eagle take.

Goodnight I Wind will monitor eagle mortality at the Project to ensure the level of estimated take remains within the level of take authorized by the eagle take permit. Goodnight I Wind and USFWS will review and agree upon the final monitoring plan prior to implementation. Goodnight I Wind and USFWS will re-assess fatality rates during an initial 2-year review period following permit issuance. This initial 2-year check-in will allow Goodnight I Wind and USFWS to review and evaluate the site-specific eagle fatality data and potentially revise the adaptive management triggers if warranted based on the post-construction monitoring data. Following the initial 2-year review period, fatality data and adaptive management triggers will be reviewed every five years for the remainder of the ETP term. Goodnight I Wind, in consultation with the USFWS, will determine the need for and implement conservation measures if concerns arise about the rate of eagle take, relative to authorized take.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION AND PURPOSE

1.1 Background

FGE Goodnight I, LLC (Goodnight I Wind) is constructing and will own and operate the Goodnight I Wind Project (Project) on privately owned property in Armstrong County, Texas (Figure 1). The Project area consists of approximately 19,662 acres (7,957 hectares) and will have 59 wind turbines supplying up to 265.5 megawatts (MW) of renewable energy, including a 7.9-kilometer (km; 4.9-mile) 345-kilovolt (kV) generation tie (gen-tie) transmission line that will run south from the Project's substation in Armstrong County (Figure 2). Construction on the Project began in September of 2022 and commercial operations are anticipated to start by the end of 2023.

Goodnight I Wind prepared this Eagle Conservation Plan (ECP) to support an application to the US Fish and Wildlife Service (USFWS or Service) for an incidental eagle take permit (ETP) for golden eagles (*Aquila chrysaetos*) and bald eagles (*Haliaeetus leucocephalus*) under 50 Code of Federal Regulations (CFR) 22.80 for take associated with operation of the Project.

Goodnight I Wind utilized the 2013 USFWS *Eagle Conservation Plan Guidance, Version 2* (ECPG[1]), USFWS Region 2, Southwest Region Final Outline and Components of an Eagle Conservation Plan (ECP) for Wind Development: Recommendations from USFWS Region 2 guidance document and updates to the eagle permit rule issued by the USFWS in 2016 to develop this ECP. The ECP is organized as follows:

1. Introduction and purpose
2. Stage 1 – Site Assessment
3. Stage 2 – Site Specific Surveys and Assessments
4. Stage 3 – Assessing Bald and Golden Eagle Risk and Predicting Fatalities
5. Stage 4 – Avoidance and Minimization of Risk Using Conservation Measures and Compensatory Mitigation
6. Stage 5 – Post-Permit Mortality Monitoring
7. Adaptive Management Process

1.2 Project Description

The Project is located near the town of Claude, Texas and is approximately 5.6 km (3.5 mi) east of the town of Goodnight, Texas (Figure 1). As stated in section 1.1, the Project has 59 wind energy turbines, supporting up to 265.5 MW of energy (Figure 2). The 4.5-MW turbines have a hub height of 82 meters (m; 269 feet [ft]) and a rotor diameter of 136 m (446 ft). The Project has several supporting facilities including but not limited to step-up transformers, underground communication cables, 34.5-kV underground collector lines, a permanent meteorological (met)

[1] USFWS 2013.

tower, a 7.9-km, 345-kV overhead gen-tie transmission line, a 34.5-kV/345-kV substation, a switchyard, an operations and maintenance (O&M) building, an aircraft detection lighting system, and other ancillary facilities or structures (Figure 2).

1.3 Environmental Setting

The Project is located primarily within the Llano Estacado Level IV Ecoregion of the High Plains Level III Ecoregion.[2] The Llano Estacado Ecoregion is an elevated plain with low drainage density and few streams, but numerous ephemeral pools (playa lakes) containing surface water on a seasonal basis. The ecoregion was once characterized by shortgrass prairie. Currently, 97% of the ecoregion is tilled for cropland (cotton [*Gossypium* spp.], corn [*Zea mays*], and wheat [*Triticum aevestium*]), all of which are irrigated with water from the Ogallala Aquifer.[3] In the 1930s, drought conditions in conjunction with unsustainable agricultural practices (i.e., no regulated irrigation practices) resulted in the Dust Bowl throughout the Great Plains region, the Llano Estacado ecoregion formed the core of the environmental catastrophe[4]. Presently, mitigation measures such as the development of irrigation practices have progressed farming in the ecoregion towards more sustainable agricultural operations, yet the limited capacity of the Ogallala Aquifer highlights the need for the expansion of water conservation[5].

The Project topography is an elevated plain. Elevation ranges from 948 m to 1037 m (3,110 to 3,402 ft) above mean sea level. According to the National Land Cover Database,[6] the majority of the land cover is composed of herbaceous land cover (approximately 63%), with smaller amounts of cultivated crops (approximately 26%) and shrub/scrub areas (approximately 6%; Figure 3).

The Project does not include named drainages, or perennial (year-round) streams or rivers; however, there are ephemeral (rain-dependent) playa lakes and intermittent (seasonal) streams within the Project. Playa lakes are unique ephemeral wetland features in the Southern High Plains of the United States, providing vital habitat for birds and other wildlife. The Playa Lakes Joint Venture[7] (PLJV) is a nonprofit organization that compiles online resources on known playa lakes. Data reviewed from the PLJV probable playa dataset indicates the presence of 36 playa lakes, totaling 397.0 acres (160.6 hectares) of playa lakes within the Project (Figure 4). Data from the National Wetlands Inventory (NWI) identifies approximately 531 acres (215 hectares) of wetlands, the majority of the wetlands which occur within the Project are freshwater emergent wetlands (Figure 4). The wetland and waterbody information in this ECP is based on publicly available desktop information, actual wetlands/waterbodies in the areas proposed for disturbance have been determined based on field surveys.

[2] Griffith et al. 2004
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Jin et al. 2019, Homer et al. 2020
[7] PLJV 2022

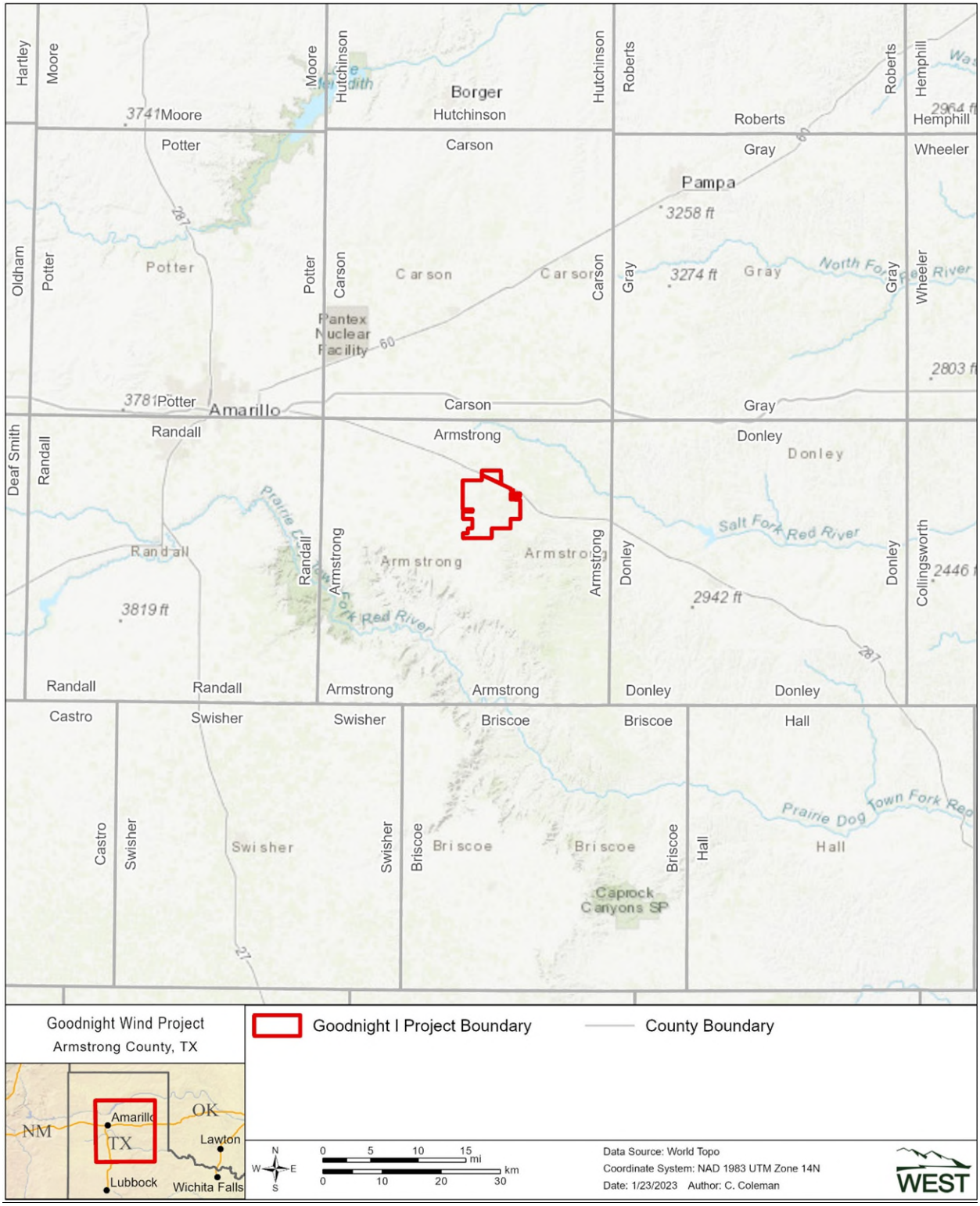

Figure 1. Location of the Goodnight I Wind Project, Armstrong County, Texas.

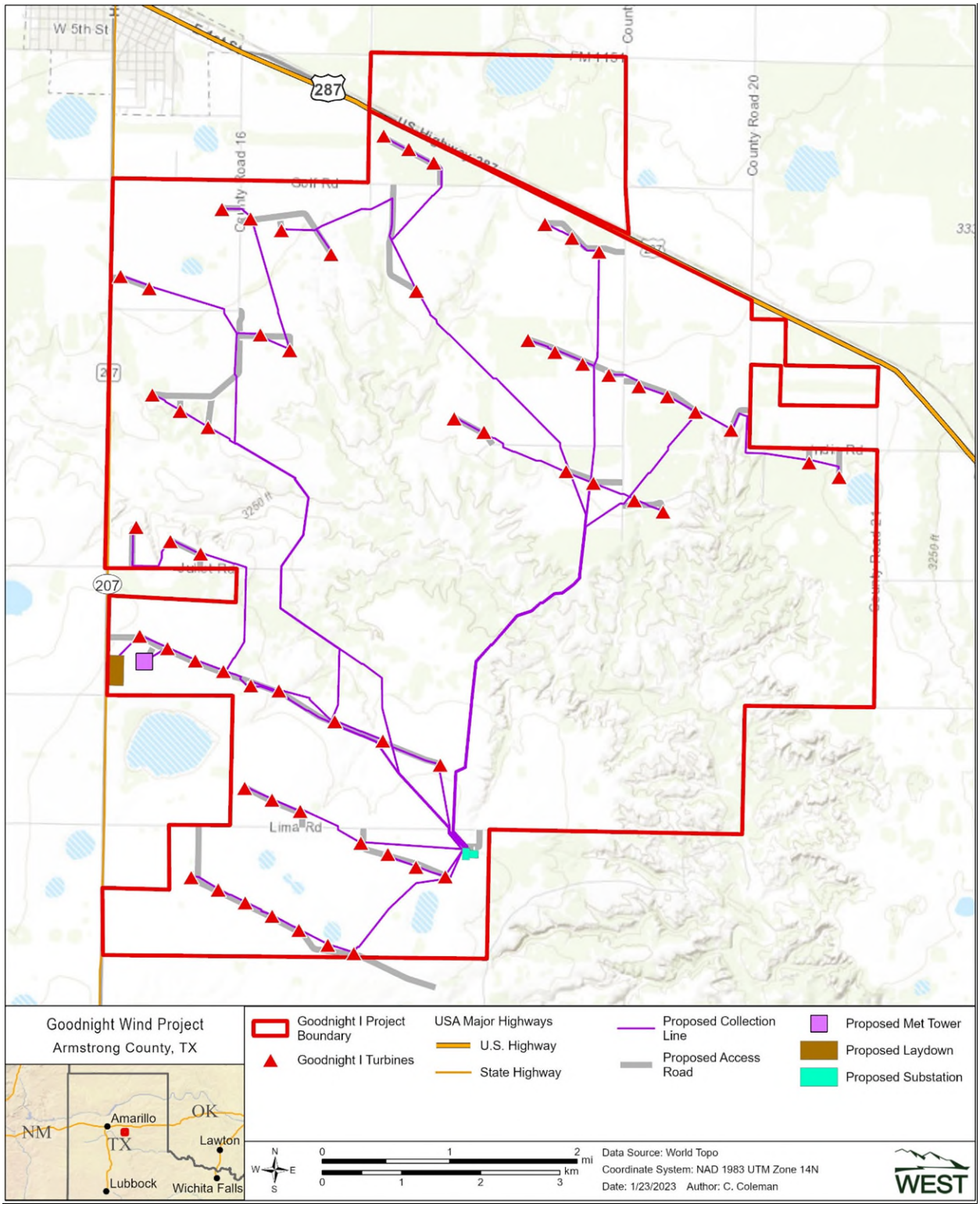

Figure 2. Goodnight I Wind Project with supporting infrastructure and turbine locations, Armstrong County, Texas.

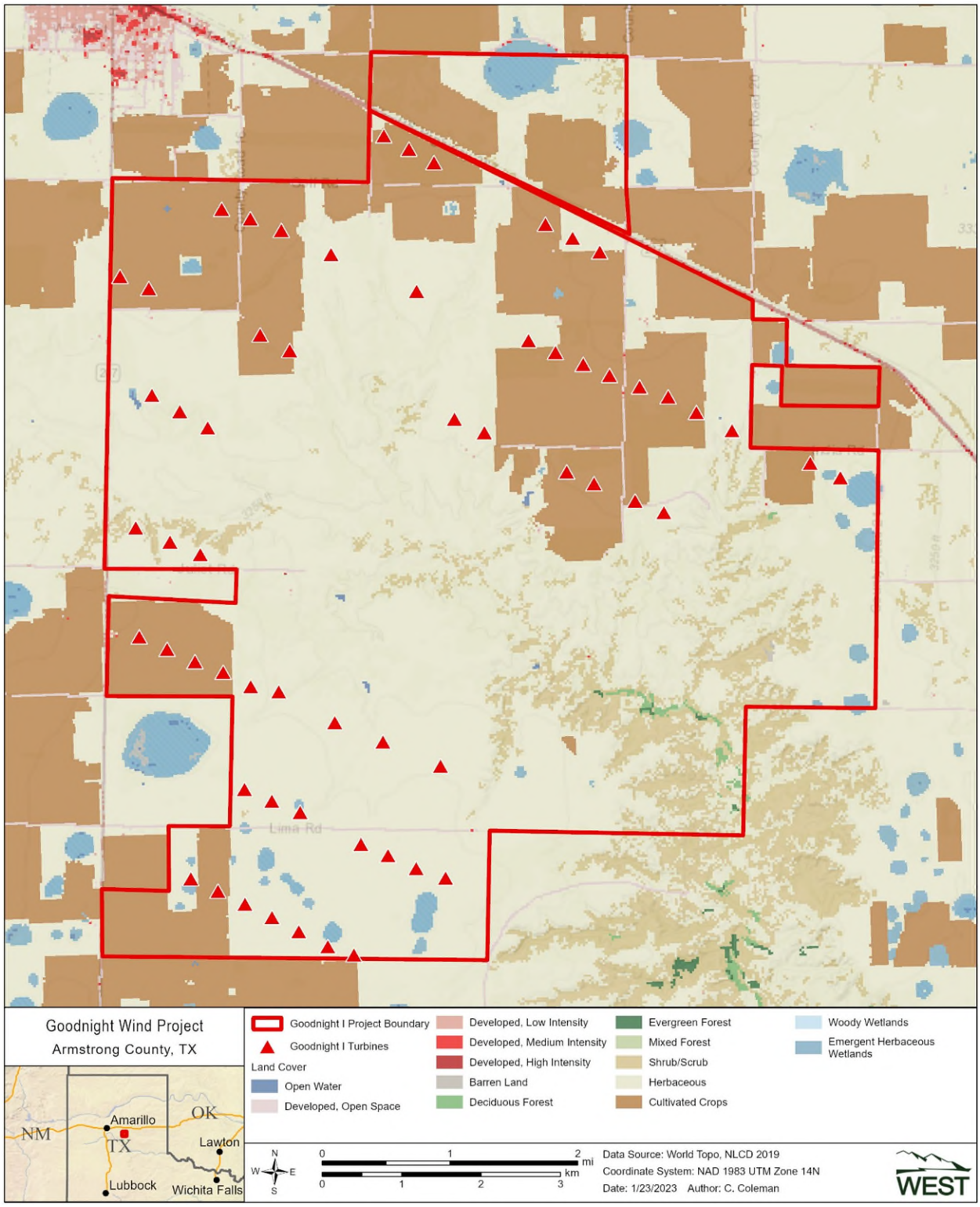

Figure 3. Land cover types present within and near the Goodnight I Wind Project, Armstrong County, Texas.

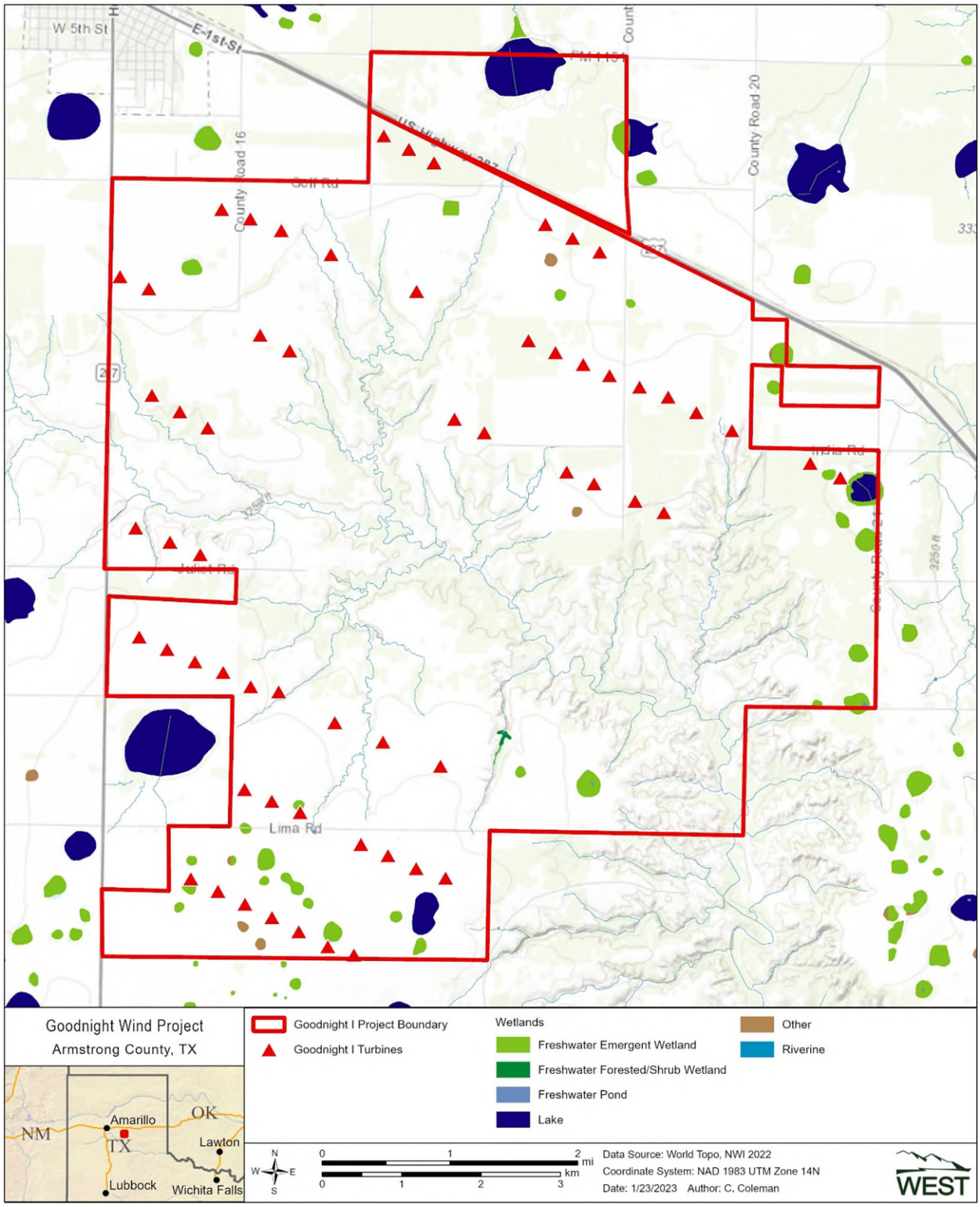

Figure 4. National Wetland Inventory wetlands present within the Goodnight I Wind Project, Armstrong County, Texas.

1.4 Regulatory Framework

1.4.1 Laws and Regulations

1.4.1.1 Bald and Golden Eagle Protection Act

Under the authority of the Bald and Golden Eagle Protection Act (BGEPA),[8] bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos)*, collectively referred to as "eagles", are afforded additional legal protection beyond the Migratory Bird Treaty Act (MBTA).[9] The BGEPA prohibits the take, sale, purchase, barter, offer of sale, purchase, transport, export or import, at any time or in any manner for any bald or golden eagle, alive or dead, or any part, nest, or egg thereof.[10] The BGEPA definition of eagle take is to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb."[11] The USFWS defines the term "disturb" to mean to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.[12]

In 2009,[13] the USFWS established rules for a permit program for the incidental take of eagles. In 2016, the USFWS revised the permit regulations for incidental take of eagles.[14] The 2016 revisions:

1. Modify the definition of the BGEPA's "preservation standard"
2. Remove the distinction between standardized and programmatic permits
3. Codify Data Standards for the collection of pre-construction eagle use data
4. Codify standardized mitigation requirements
5. Redefine the level of take for an eagle management unit to be within an administrative migratory flyway instead of a Bird Conservation Region
6. Extend the maximum permit length to 30 years; and
7. Add a practicability standard to the issuance criteria that implements measures to minimize the potential take of eagles to the maximum extent practicable

The 2016 regulations also included revisions to the permit fee schedule.[15]

[8] 16 US Code (USC) 668–668d (1940)
[9] MBTA 1918
[10] 16 USC 668(a) 1940
[11] 50 CFR 22.6 (1974)
[12] Idib.
[13] 50 CFR 22.80 (2009), 22.85 (2009)
[14] 50 CFR 22 (1974)
[15] 50 CFR 13.11 (2005)

1.4.1.2 Migratory Bird Treaty Act

The federal regulatory framework for protecting eagles includes the MBTA of 1918. In the United States, the MBTA is the cornerstone of migratory bird conservation and protection. The MBTA implements four treaties that provide international protection of migratory birds. The take prohibition for MBTA states:

> "Unless and except as permitted by regulations…[16] it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill… possess, offer for sale, sell …purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird ….[The Act] prohibits the taking, killing, possession, transportation, import and export of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior."

The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect."[17] The USFWS maintains a list of all species protected by the MBTA.[18] This list includes more than one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. A separate MBTA authorization for activities that take eagles, in addition to a BGEPA authorization, is not required because 50 CFR 22.10(b) (1999) exempts those with BGEPA permits from the requirement to obtain an MBTA permit.

1.4.1.3 National Environmental Policy Act

The issuance of an eagle take permit by the USFWS constitutes a discretionary federal action and thus requires an assessment of the potential environmental impacts associated with the action and alternatives under the National Environmental Policy Act (NEPA)[19]. The NEPA establishes national environmental policies and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within federal agencies.[20] The NEPA utilizes a systematic, interdisciplinary approach to ensure that potential environmental impacts of federal actions and appropriate mitigations are fully considered. All federal agencies are required to prepare detailed statements that assess the environmental impacts of, and alternatives to, major federal actions that could significantly affect the environment.

In promulgating the 2016 BGEPA regulations, USFWS conducted a NEPA analysis consisting of a draft and final Programmatic Environmental Impact Statement for the Eagle Rule Revision (PEIS).[21] As stated in the PEIS, the Service anticipates tiering subsequent Environmental Assessments (EAs) for site-specific projects involving incidental take of eagles off the 2016 PEIS.

[16] 16 USC 703 (1918)

[17] 50 CFR 10.12 (1973)

[18] 50 CFR 10.13 (1973)

[19] NEPA 1970

[20] 42 USC 4321 et seq. [1970]

[21] USFWS 2016c

1.4.2 Guidelines

1.4.2.1 Land-based Wind Energy Guidelines

The USFWS developed voluntary Land-based Wind Energy Guidelines (WEG) in March 2012[22] to help shape the siting, design, and operation of projects for the wind industry with regard to wildlife protection. The WEG also provides a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development, as well as BMPs for site development, construction, retrofitting, repowering, and decommissioning.

1.4.2.2 Eagle Conservation Plan Guidance and Technical Appendices

In April 2013, the USFWS published the ECPG, which supplements the WEG and includes recommendations on evaluating the risk to eagles posed by a proposed site for a wind generation facility; describes protocols for pre-construction and post-construction studies; provides options for mitigating impacts and emphasizes the importance of an adaptive management process. The ECPG delineates the conditions for issuance of permits for incidental eagle take under the BGEPA, with a particular focus on the wind energy industry. As described in the ECPG, conservation measures to avoid and minimize take to the maximum extent practicable must be implemented.

The ECPG recommends five stages in the development of the ECP to support an incidental take permit application for eagles:

- **Stage 1:** Prepare an initial site assessment using publicly available data to identify potential eagle use areas
- **Stage 2:** Complete rigorous on-site surveys designed to assess the potential risk of the project to eagles
- **Stage 3:** Predict eagle risk through the estimation of the annual number of eagle fatalities
- **Stage 4:** Identify and evaluate the avoidance and minimization measures, and if necessary, identify compensatory mitigation
- **Stage 5:** Monitor post-construction to determine whether actual take matches anticipated take and to determine if adaptive management is required

The sections below discuss the studies or actions taken by Goodnight I Wind, or the actions that Goodnight I Wind plans to take, to adhere to the recommendations presented in the ECPG for these five stages.

[22] USFWS 2012

2.0 STAGE 1 – SITE ASSESSMENT

Stage 1 of the ECPG is an initial site assessment performed by the wind project developer to evaluate relatively broad geographic areas and assess the relative importance to resident breeding and non-breeding eagles, and migrant and wintering eagles. A preliminary critical issues assessment and threatened and endangered species habitat assessment of the Project was conducted in 2011.[23,24] Additionally, threatened, and endangered species habitat and desktop reviews were also conducted in 2017[25] and 2020.[26]

The Stage 1 studies for the Project included reviewing the following available data: spatial datasets with information about topography, elevation, land use/land cover, wetlands, and wildlife distributions in Texas, as well as information from the USFWS, Texas Parks and Wildlife Department (TPWD), GAP Habitat Data,[27] Nature Serve Data,[28] Cornell Lab of Ornithology,[29] and the PLJV.[30]

The preliminary critical issues and threatened and endangered species habitat assessments revealed the presence of playa lakes which could provide a source of foraging habitat for bald eagles.[31] The Stage 1 assessments indicated that the playa lakes had moderate potential for bald eagle usage, providing suitable migratory stopover habitat and foraging areas.[32] Additionally, the tall cliff faces and ledges as well as large cottonwood trees (*Populus deltoides*) within the Palo Duro Canyon and Mulberry Canyon systems in the area could provide suitable nesting habitat and migratory pathways for bald and golden eagles.[33] In 2020, SWCA Environmental Consultants (SWCA) added the golden eagle to the species habitat desktop review, determining that the species may occur in the canyon areas as a foraging migrant or year-round resident in Armstrong County, Texas.

To further describe what is known about bald and golden eagles at the Project, a current review of existing information obtained from publicly available sources such as reports, published literature, online databases, and geographic information system data has also been included in this section.

[23] Turner Biological Consulting, LLC (TBC) 2011a
[24] TBC 2011b
[25] SWCA 2017
[26] SWCA 2020
[27] GAPServe 2011
[28] NatureServe Data 2011
[29] eBird 2022
[30] PLJV 2022
[31] TBC 2011a, 2011b; SWCA 2017, 2020
[32] TBC 2011a, 2011b; SWCA 2017, 2020
[33] TBC 2011b, SWCA 2017

2.1 Golden Eagles

Golden eagles are year-round residents in Texas. While non-migratory adults may build nests at any time of year, nest-building typically begins in January and breeding can occur from early February to November while non-resident wintering birds occur from late August to late April with most occurring between early October to mid-March.[34] Golden eagles nest in Texas as high as 8600 ft (2600 m), usually in remote areas on cliffs, trees, or anthropogenic structures.[35] The cliff features within the Palo Duro – Caprock Canyon Complex (portions of which occur within 1.0 mile from the Project) are known to support historic golden eagle nest sites.[36] In 1983, a separate study located 42 golden eagle nests within the canyon complex.[37] By 2006, Boal et al.[38] estimated a 60% decrease in historic golden eagle nest occupancy, suggesting that the breeding population in the Texas panhandle has decreased since 1983. Though these data are based on known historic nest locations, factors such as the conversion of prairie to cropland and persistent prairie dog control efforts[39] may have decreased the availability of primary prey resources for golden eagles in the region.[40] Recently, USFWS shared by email telemetry data of three tagged golden eagles near the Project (Kirsten McDonnell, USFWS, pers. comm., 2022). All three eagles were recorded within a 10-mile buffer of the Project; two appear to have entered the Project while one was occupying the surrounding area. Based on these telemetry data from 2021–2022, as well as known eagle activity in the region, USFWS has indicated a higher risk for golden eagles at the Project.

Available desktop information suggests that golden eagle use of the Project is infrequent and generally limited to winter. Although the Project is within the year-round range of the golden eagle, confirmed observations are scarce[41]. Data from eBird reviewed at the county level revealed eight golden eagle observations from 1993–2022 within Armstrong County where the Project are located with observations more concentrated in the winter.[42] The closest observations were four golden eagles in 2015 and 2016, recorded approximately 2.4 km (1.5 mi) north of the Project in Claude, Texas.

The National Audubon Society (Audubon) Christmas Bird Count (CBC) is a census of birds conducted once per year during winter (within two weeks of Christmas) by volunteer birders within 15 mi (24 km) diameter circular survey areas, administered by Audubon.[43] The objective of the survey is to provide population data to assess the health of bird populations and to help guide conservation action. There are five CBC survey areas within a 50-mile radius of the Project. One CBC circle plot (Tascosa – Seyffert: 18.1 miles northwest of the Project) was initiating surveys in 2022, but data was not yet available for this location. The nearest CBC (Amarillo) is south of

[34] Oberholser 1974
[35] Kochert et al. 2020
[36] Rideout et al. 1984
[37] Ibid.
[38] Boal et al. 2008
[39] Pruett et al. 2009
[40] Boal et al. 2008
[41] Katzner et al. 2020
[42] All About Birds 2023
[43] Audubon 2021

Amarillo in the Palo Duro Canyon and Timbercreek Canyon, approximately 13.2 miles west of the Project.[44] Although the CBC data for the Amarillo survey has 86 golden eagle sightings from 1954–2021, none have been observed since 2001.

The US Geological Survey (USGS) North American Breeding Bird Survey (BBS) is a collaborative effort between the USGS Patuxent Wildlife Research Center, and Environment Canada's Canadian Wildlife Service. The objective of the survey is to monitor the status and trends of North American bird populations via a standardized protocol performed once a year during the breeding season (spring) by participants along thousands of randomly established roadside routes throughout the continent.[45] There are four BBS routes (Pantex, Panhandle, Clarendon, and Lakeview) within an approximate 50-mile radius of the Project. The nearest route (Pantex) is approximately 15.6 mi north of the Project. Data have been collected at the Pantex route from 1974–2021 and there have been no recorded observations of golden eagles. All other BBS routes are more than 20 miles away from the Project or further. None of the other aforementioned BBS routes have recorded golden eagle observations.

2.2 Bald Eagles

In Texas, bald eagles are present year-round as migrants, breeders, or winter residents. Migratory bald eagles can arrive in Texas as early as August, but bald eagles are most abundant from early October to late May. Furthermore, bald eagle nesting varies with latitude with nesting ranging from late fall to early spring.[46] Bald eagles typically nest in large trees adjacent to bodies of water that support their primary prey base, fish.[47] Though eagles are opportunistic foragers, feeding on mammals, birds, and reptiles, the species usually feeds on fish over other food types.[48] Bald eagles most commonly forage near large, open lakes, reservoirs, and rivers. The presence of playa lakes and wetland areas within and near the Project can offer suitable habitat for prey (foraging opportunities), as well as habitat for migratory stopover. Additionally, riparian areas are suitable habitat for nesting and foraging bald eagles.[49] There are areas within the Palo Duro Canyon complex that provide riparian woodlands that bald eagles occupy in the spring, fall, and winter.[50]

A review of eBird data from 1978 to 2022 at the county level revealed 16 bald eagle observations within Armstrong County where the Project is located, occurring in the winter (November – February).[51] The highest frequency of observations occurred in late December and early February. The closest of these eBird observations was recorded in 2020 within 0.5 mi of the Project, along Highway 207.[52] According to the CBC data, there are 295 bald eagle sightings from 1954–2021 at the Amarillo survey area (located approximately 13.2 miles from the Project). The

[44] Audubon 2021
[45] Sauer et al. 2014
[46] Buehler 2022
[47] Idib.
[48] Ibid.
[49] Guilfoyle et al. 2000
[50] Seyffert and Hassell 2012
[51] eBird 2019
[52] Ibid.

last five years (2017–2021) have recorded one to seven bald eagles during each survey. Of the four BBS routes within approximately 50 miles of the Project, no bald eagles have been observed. The nearest route, Pantex, has recorded data from 1974–2021 and has had no recorded observations of bald eagles.

2.3 Eagle Risk Categorization for Stage 1

Based on the location of the Project in relation to canyons/drainage features (e.g., Palo Duro Canyon) as well as available information on the potential for eagles to occur in the area, the Project appears to meet a Category 2 designation for both bald and golden eagles. Category 2 projects are considered to have a high to moderate risk to eagles but there is the opportunity to mitigate impacts. According to the USFWS (ECPG),[53] "A project is in this category if it: (1) has an important eagle-use area or migration concentration site within the project area but not in the project footprint; or (2) has an annual eagle fatality estimate between 0.03 eagles per year and 5% of the estimated local-area population size; or (3) causes cumulative annual take of the local-area population of less than 5% of the estimated local-area population size.

3.0 STAGE 2 – SITE-SPECIFIC SURVEYS AND ASSESSMENTS

Site-specific pre-construction studies were initially conducted at the Project from 2011-2014[54] with some additional studies conducted in 2022–2023.[55] Site-specific studies consisted of 20 consecutive months of avian use surveys, a reconnaissance of a suspected eagle nest, and two raptor nest surveys (Table 1). The surveys involved the collection of data on all birds; however, for the purposes of this ECP, the following sections present the survey methods and results specific to eagles. Additionally, a concentrated prey base assessment was conducted in 2022[56] (Table 1). The following sections summarize the methods and results of the site-specific studies as they relate to eagles, which is useful for informing potential eagle activity at the Project; however, because the avian use surveys were conducted prior to the 2016 Eagle Rule,[57] the methods do not meet the current data standards; therefore, the results were not used in the risk assessment analysis (Section 4.2 below).

Table 1. Pre-construction surveys that provide site-specific eagle data for the Goodnight Wind I Project.

Study Component	Timing	Methodology	Source
Avian Use Surveys	July 2011 – February 2013	20-minute fixed-point bird use surveys at 5 points twice a month from July 2011 – April 2012. Starting April 2012, surveys transitioned to 30-minute surveys twice a month at 10 survey points located across the area.	TBC 2013
Eagle Nest Reconnaissance	May 2011	Reconnaissance of a suspected eagle nest within the Project area.	TBC 2011c

[53] USFWS 2013.
[54] TBC 2011c, 2013, 2014
[55] WEST 2022, 2023
[56] WEST 2022
[57] USFWS 2013, 2016b

Table 1. Pre-construction surveys that provide site-specific eagle data for the Goodnight Wind I Project.

Study Component	Timing	Methodology	Source
Raptor Nest Survey	January 2014	One aerial survey to locate eagle nests within the Project area.	TBC 2014
Prairie Dog Colony Mapping Effort	October and November 2022	Field-based black-tailed prairie dog colony delineation.	WEST 2022
Raptor Nest Survey	February and March 2023	Ground-based survey within the Project area plus a 2-mile buffer.	WEST 2023

3.1 Avian Use Surveys

An avian use study was conducted from July 2011 to February 2013 to understand the temporal and spatial use of the area by avian species including eagles.[58]

3.1.1 Methods

Monthly fixed-point avian use surveys were conducted from July 2011 to February 2013. At the initiation of the study in July 2011, biologists conducted surveys at five points, twice a month for 20-minutes. Following a meeting with the USFWS, five additional points were added in April 2012, totaling 10 points for the remainder of the study period. Points were established throughout the Project, included approximately 8% coverage of the study area, and were located within different habitat types representative of the study area.

A one-to-five-minute settling period was allowed upon arrival at the point, prior to starting the survey. Each survey point was the center of a circular survey plot with an 800-m (2,625-ft) radius for all birds, including raptors and eagles. Biologists recorded the following data for each bird observation: time of observation, wind speed, visibility, species, number of individuals, age and sex, behavior, flight height and direction, and bearing and distance from the observer at initial detection.

3.1.2 Results

Three hundred and ten bird use surveys were completed at 10 survey points from July 2011 to February 2013, resulting in 140 hours of survey effort. There were no bald eagle or golden eagle observations recorded during the study.

3.2 Raptor Nest Survey

In 2011, a visit was completed to evaluate a suspected eagle nest within the Project. Additionally, raptor nest surveys were conducted in January 2014[59] and February and March 2023.[60] In 2014, surveys were conducted for all raptor and eagle nests within the Project plus a 16-km (10-mile) buffer of the Project, consistent with the survey area recommendation in the ECPG. Although the aerial surveys in 2014 were conducted based on a previous boundary for the Project, the flight

[58] TBC 2013
[59] TBC 2011c, 2014
[60] WEST 2023

paths recorded during the 2014 eagle nest reconnaissance appear to sufficiently cover the current Project area.

In February and March 2023, a ground-based survey was completed within the Project and a surrounding 2.0-mile buffer based on the latest recommendations from USFWS.[61]

3.2.1 Methods

In May 2011, biologists from Turner Biological Consulting, LLC performed a ground-based reconnaissance on a suspected eagle nest based on personal communications with constituents of Ollinger Ranch. An aerial survey was conducted in 2014, in which the aircraft flew the Project and 16-km (10-mi) buffer while maintaining a speed under 60 knots in suitable nesting habitat (i.e. cliff edges) for eagles. The aircraft flight paths were recorded during the surveys in 2014 to keep track of areas already surveyed and sections that need to be surveyed. The location and species were recorded for all active raptor nests observed during surveys.

In 2023, two ground-based surveys were conducted with the first survey in February and the second survey conducted in March. Surveys were conducted within the Project area and a surrounding two-mile search area. Surveys were conducted by driving all public roads and traversing accessible areas within the Project area. Surveys within the two-mile search area were limited to public roads and/or accessible areas and as such, not all areas within the 2-mile search area were visible.

3.2.2 Results

There were no eagle nests recorded during the 2011 reconnaissance visit or during the raptor nest surveys in 2014 and 2023.

3.3 Concentrated Prey Base Assessment

This section provides an assessment of concentrated prey base resources for the Project. The ECPG references concentrated prey bases as areas that are rich in prey resources or that have a high prey density that may be used seasonally by eagles or other raptor species.

3.3.1 Methods

A desktop evaluation of the Project was conducted to evaluate areas of concentrated prey that eagles and other raptor species may potentially use. These include waterbodies used as avian migration stopover or foraging sites, fish habitat and farms, and designated hunting areas for big game. Information from TPWD and USFWS as well as the following publicly available sources was used to complete the desktop evaluation: eBird, NatureServe, and Aerial Imagery from Google Earth.[62] These data sources were used to evaluate the potential for concentration of prey species in and surrounding the Project based on species distributions and natural history characteristics.

[61] USFWS 2020a, 2020b

[62] NatureServe 2011, eBird 2022, Google Earth 2022

In addition to the desktop assessment, a field-based survey for black-tailed prairie dog (*Cynomys ludovicianus*) colonies were conducted within the Project in 2022.[63] The survey consisted of a ground-based (road and pedestrian) survey to confirm the presence, activity status, and to map the boundaries of any identified prairie dog colonies observed within 500 m of proposed Project infrastructure.

3.3.2 Results

The Project area is within the ranges of mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), and pronghorn (*Antilocapra americana*), which encompass much of the western US.[64] Mule deer populations in the High Plains ecoregion of the Texas panhandle typically inhabit the broken rough land of the Rolling Plains, along the Canadian River and Caprock Escarpment which includes the region in which the Project are located.[65] In Texas, Pronghorn are only found in the High Plains of the panhandle; therefore, they may occur within or near the Project.[66] The white-tailed deer range covers most of Texas, including the Project. In conclusion, there is potential for the aforementioned big game individuals to occur, and big game may provide a foraging source for eagles particular in the form of carrion.

Waterbodies within the Project such as freshwater emergent wetlands, and playas may provide temporary foraging opportunities for eagles because of their potential to support concentrated prey bases (e.g., waterfowl, sandhill cranes [*Antigone canadensis*], shorebirds, and other avian species). Such features are highly dependent on environmental factors such as rainfall and snowmelt and are expected to provide limited foraging opportunities primarily during the spring and fall migratory seasons. Based on a desktop review of the USFWS NWI dataset,[67] approximately 531 acres (251 hectares) of wetlands are within the Project area (Figure 4). However, previous assessments did not expect that waterbody features within the Project to be a significant attractant for eagles due to their size and seasonality.[68]

Managed wildlife areas may provide foraging opportunities for eagles because of their potential to support concentrated prey bases (e.g., waterfowl, other avian species, and other potential prey such as small mammals, big game carcasses, and fish). There are four areas managed for wildlife within 40 mi (64 km) of the Project, the closest of which is Palo Duro Canyon State Park, 12.6 (20.3 km) west of the Project (Figure 5). The state park provides habitat to several potential eagle prey species such as white-tailed and mule deer, small mammals, as well as Texas Longhorns.[69] Field survey data did not indicate the presence of prairie dog colonies within a 500-m buffer of proposed Project infrastructure.

[63] Marrugo and Palmer 2022a, 2022b
[64] USGS 2018
[65] Cantu and Richardson 1997
[66] TPWD 2022b
[67] USFWS NWI 2022
[68] SWCA 2017
[69] TPWD 2022a

3.4 Eagle Risk Categorization for Stage 2

Acknowledging that the site-specific avian use surveys do not meet the recommendations in the ECPG,[70] and that surveys were conducted over 10 years ago, the available data suggest that eagle abundance is relatively low (there were no eagles observed during 140 hours of surveys). However, existing information suggests that both bald and golden eagles occur in the area and as such, there is expected to be risk to eagles. There have been no eagle nests identified during site specific surveys although suitable nesting habitat exists outside the Project footprint in the canyons/drainage features, and not all habitat within the Project footprint was visible during surveys. While eagle prey occurs in the Project area, there have not been areas identified that would be expected to provide a concentrated prey resource for eagles (e.g., prairie dog colonies). As such, the site-specific Stage 2 information suggests that the Project meets a Category 2 designation for both bald and golden eagles.

4.0 STAGE 3 – ASSESSING BALD AND GOLDEN EAGLE RISK AND PREDICTING FATALITIES

The following section includes both qualitative and quantitative assessments of eagle risk at the Project in accordance with the recommendations in the ECPG.

4.1 Qualitative Risk Assessment

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

[70] USFWS 2013.

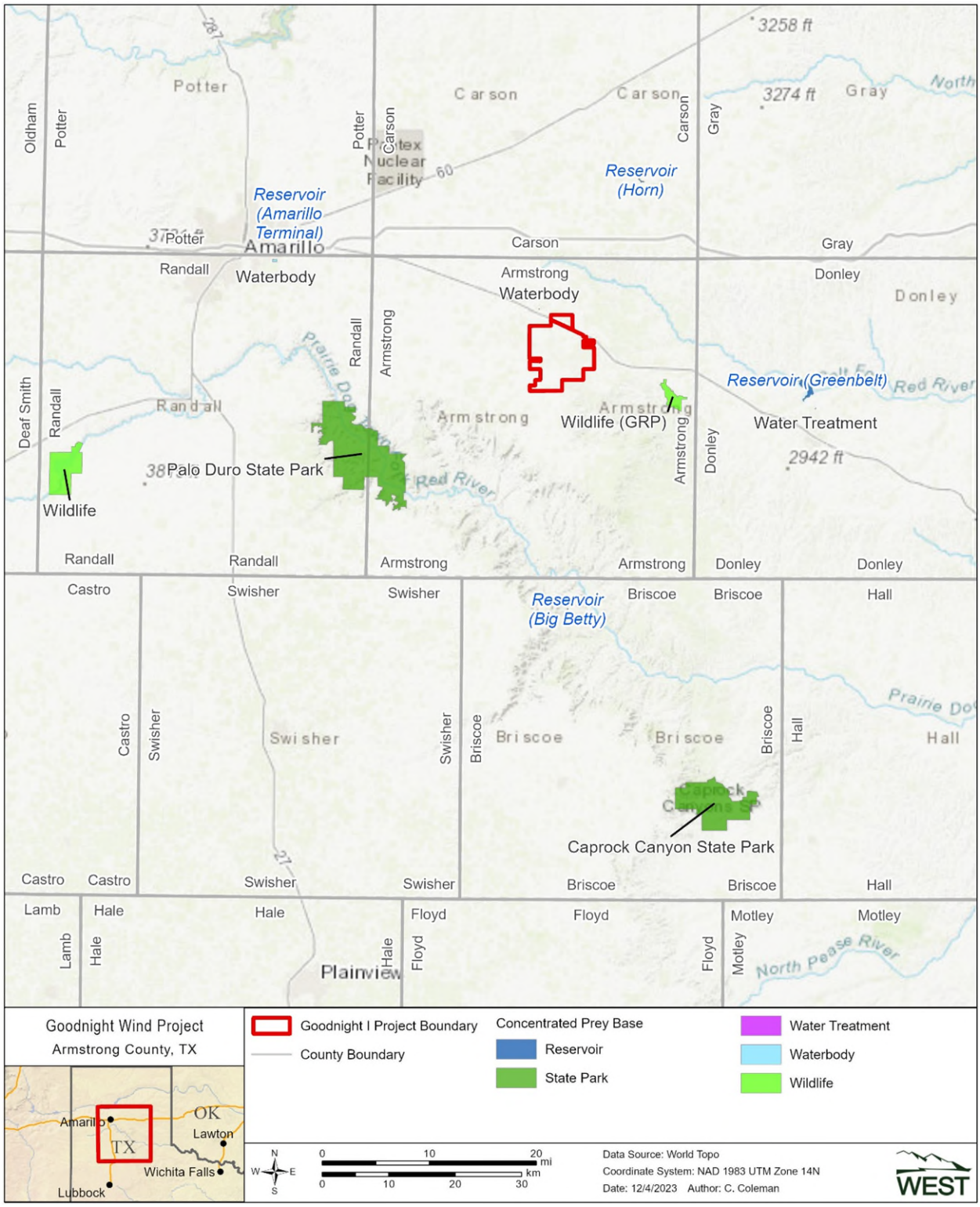

Figure 5. Locations of concentrated prey bases for eagles near the Goodnight I Wind Project.

The topography within the Project is relatively flat and would not be expected to create updrafts that would be expected to concentrate soaring eagles. Based on known eagle distributions, eagles are more likely to occur within and near the Project in the winter. eBird data in the area include more bald eagle observations in December and February, while golden eagle occurrences were largely in October and January.[71] Prey concentrations for eagles within the Project appear to be limited based on the field and desktop assessments. Avian species associated with playa lakes, small mammals, and carrion may provide foraging opportunities for eagles in the area. Less than one mile from the Project, the Palo Duro - Caprock Canyon complex has numerous cliffs that provide golden eagle nesting habitat. Historically, golden eagles have nested within the canyon complex.[72] No golden eagle nests were confirmed during the 2014 or 2023 eagle nest surveys, although telemetry data reveals there are golden eagles that have been documented within and near the Project. Additionally, personal communications with USFWS staff by email indicated that USFWS has records of known eagle nests in the general vicinity of the Project and recent telemetry research has shown golden eagle use within the Project footprint (K. McDonnell, USFWS, pers. comm. 2022). Bald eagles nest in large trees near waterbodies which do not occur within the Project. Based on the available information, both bald and golden eagles have the potential to occur in the Project and as such, there is potential collision risk for both species.

4.2 Quantitative Risk Assessment

4.2.1 Collision Risk Model

A Bayesian collision risk model (CRM) developed by the USFWS (USFWS 2013) was used to predict risk to bald and golden eagles associated with the operation of the Project. The CRM combines information on the amount of time eagles are flying at a facility, the probability that an eagle flying near a turbine would collide with that turbine, the number and size of turbines, and the amount of hours a facility is operational (Table 2). The Bayesian nature of the model allows existing knowledge of eagle use and probability of collision with a turbine gathered at other wind facilities (i.e., prior information, prior distributions, or priors) and site-specific data from the Project to be incorporated in the prediction of risk. The eagle use data collected at the Project do not meet the data quality standards required by incidental take permit regulations (50 CRF 22.80(d)(3)(ii)), or the assumptions of the CRM, including: (1) sampling was not conducted for 2 or more years, (2) spatial coverage of sample plots did not include at least 30 percent of the Project footprint, (3) sampling design was not spatially representative of the Project footprint, (4) duration of the survey for each visit to each sample plot was not at least 1 hour, and (5) eagle minutes were not recorded. In October 2021, USFWS met with FGE Goodnight I, LLC and approved use of a priors-only version of the CRM and stated that they would waive the required data standards as available survey data and methods are not of sufficient quality to predict the Project's risk to eagles. Should the USFWS issue a permit, the permit will require post-construction mortality monitoring of sufficient rigor and intensity to accurately update fatality estimates for the Project. The prior distributions defined in New et al. 2018 and accepted by the USFWS in May 2021[73] were used in this analysis.

[71] eBird 2019
[72] Rideout et al. 1984, Boal and Haralson 2009
[73] 86 Federal Register (FR) 23978 (2021)

Table 2. Variables used in the US Fish and Wildlife Service (USFWS) approach for predicting annual eagle fatalities from turbine collisions at a wind facility (USFWS 2013, New et al. 2018).

Symbol	Name	Description and units
F	Annual Fatalities	Annual eagle fatalities from turbine collisions
λ	Exposure Rate	The expected number of exposure events (eagle minutes) per survey hour per 3D survey area (hr × km^3)
C	Collision Probability	The probability of an eagle colliding with a turbine given exposure
ε	Expansion Factor	Product of daylight hours and total hazardous area (hr × km^3)
k	Eagle Minutes	Number of minutes that eagles were observed flying within 800 m and below 200 m during surveys
δ	Turbine Hazardous Area	Rotor-swept area around a turbine from 0 – 200 m above ground level (km^3)
n	Trials	Number of trials for which events could have been observed (the number of hr × km^3 observed)
τ	Risk Hours	Total hours eagles are at risk of collision during a given year or season (all daylight hours)
n_t	Number of Turbines	Number of turbines at the Project

hr = hour; km = kilometer; m = meter.

4.2.1.1 Exposure Rate

Exposure rate (λ) is defined as the expected number of exposure events (eagle minutes) per survey hour by cubic kilometer (hr × km^3). New et al. (2018) define the prior distribution for the three-dimensional (3D) exposure rate as Prior $\lambda \sim$ Gamma (α, β), with shape and rate parameters $\alpha = 0.287$ and $\beta = 0.237$ for golden eagles, and $\alpha = 0.077$ and $\beta = 0.024$ for bald eagles. When available, project-specific data from pre-construction eagle use surveys can be used to update the prior distribution to estimate the parameters for the posterior distribution. Project-specific data did not meet the data standards outlined in the 2016 Eagle Rule, therefore, Project-specific data on eagle exposure were not used to inform the model. Using the priors, the mean exposure rate was 3.21 for bald eagle and 1.21 for golden eagle (flight minutes observed per hr × km^3; Table 3).

Table 3. Estimated exposure rate (λ) for bald eagles and golden eagles at the Goodnight I Wind Project.

Variable	Bald Eagles	Golden Eagles
Goodnight I Wind Project		
1) Recorded eagle flight minutes	0	0
2) Number of surveys	0	0
3) Length of survey (hours)	NA	NA
4) Survey hours	0	0
5) Survey plot radius (meters)	800	800
6) Survey plot height (meters)	200	200
7) Eagle flight minutes (Line 1 + α)	0.08	0.29
8) Prior for survey effort (survey hours × area surveyed [km^3] + β)	0.02	0.24
9) Mean exposure rate (Line 7/Line 8)	3.21	1.21

km^3 = cubic kilometer.

4.2.1.2 Collision Probability

Collision probability (*C*) is defined as the probability of an eagle colliding with a turbine given one minute of eagle flight in the hazardous area surrounding turbines. New et al.[74] define the prior distribution for collision probability as Prior C ~ Beta (v,v') parameters v =1.29 and v'=227.6 for golden eagles, and v =1.61 and v'=228.2 for bald eagles. When available, project-specific data from post-construction eagle mortality monitoring can be used to update the prior distribution to estimate the parameters for the posterior distribution.

4.2.1.3 Expansion Factor

A project-specific expansion factor was multiplied by the eagle exposure rate to estimate the number of eagle exposure events expected at the Project after construction. The expansion factor scales the exposure rate to the total hours eagles are at risk of collision during a year (assumed to be all daylight hours at the Project location; τ) across the total 3D hazardous volume (δ_i) surrounding proposed turbine locations (n_t):[75]

$$\varepsilon = \tau \sum_{i=1}^{n_t} \delta_i$$

The USFWS defines the turbine hazardous volume (δ_i) as the 3D cylinder around each turbine with radius equal to the rotor radius and height of 200 m above ground level, or 25 m (82 ft) above the maximum turbine blade reach, whichever is greater.[76] The expansion factor (ε) was calculated for the Project, assuming 59 proposed turbines with a rotor radius of 68.00 m. The expansion factor for the Project is 762.53 hr × km^3 (Table 4).

Table 4. Estimated expansion factor (ε) at the Goodnight I Wind Project.

Variable	Overall
Daylight hours	4448.41
Goodnight I Wind Project	
10) Number of turbines	59
11) Turbine rotor radius (meters)	68.00
12) Turbine hazardous height (meters)	200.00
13) Turbine hazardous volume (km^3)	0.171
14) Expansion factor	762.53

4.2.1.4 Predicting Annual Fatalities

The CRM estimates the distribution of predicted annual fatalities as the product of the exposure rate prior distribution, the collision probability prior distribution, and the expansion factor:

[74] New et al. 2018
[75] USFWS 2013
[76] USFWS 2013, 2016b

$$F = prior\ \lambda \times prior\ C \times \varepsilon$$

A sample of 1,000,000 values from each distribution was used to estimate the distribution of predicted annual fatalities at the Project (*F*). The USFWS uses the 80th quantile of *F* for golden eagles and, when there are no usable site-specific data to update the prior-probability distribution, also uses the 80th quantile of *F* for bald eagles as the initial permitted take number for incidental take permits.

4.2.2 Risk Modeling Results

Based on the CRM with the recently approved priors,[77] USFWS estimated the eagle fatality rates for the Project (Appendix A). The predicted annual bald eagle fatality rate is 5.28 bald eagles/year (80th quantile; Table 5). The predicted annual golden eagle fatality rate is 5.97 golden eagles/year (80th quantile; Table 5).

Table 5. Predicted annual bald eagle and golden eagle fatality rates for the Goodnight I Wind Project.

Estimate	Bald Eagles	Golden Eagles
Goodnight I Wind Project		
Mean fatalities	17.10	5.19
Upper 80% credible limit	5.28	5.97

4.3 Cumulative Impacts

4.3.1 Local Area Population Analysis

The USFWS identifies take limits at two spatial scales to maintain stable or increasing eagle populations: (1) the Eagle Management Unit (EMU) which, for the Project, is defined as the Central Flyway (Central EMU); and (2) the Local Area Population (LAP) which is defined as a 175-km (109-mi) buffer area based on the natal dispersal distance for golden eagles, and a 138-km (86-mi) buffer of the Project, which is based on the natal dispersal distance for bald eagles.[78,79] The sustainable rate of golden eagle take within the EMU is zero unless otherwise mitigated; conversely, given the status of bald eagles, take permits may be authorized without the need to be offset by compensatory mitigation. The USFWS assessed the predicted take levels for a project relative to 5% of the LAP[80] (Appendix A). The USFWS analysis estimated the local area population (LAP) of bald and golden eagles for the Project to be approximately 683 and 218 individuals, respectively, and the estimated annual take of the Project represents 0.77% and 2.74% of the LAP, respectively. The estimated take for the Project combined with the authorized take from overlapping projects could result in a total annual take of 0.77% and 2.86% of the LAP, respectively. This level of take is within the LAP thresholds established by USFWS.

[77] New et al. 2018, 86 FR 23978 (2021)

[78] USFWS 2016a

[79] Ibid.

[80] Ibid.

4.4 Eagle Risk Categorization Stage 3

The ECPG bases its site risk categorization on: 1) whether or not there are important eagle use areas or migration concentration sites within the Project footprint or vicinity; 2) the predicted fatality estimate (i.e., is it less than or greater than 0.03 eagles per year or approximately one eagle over a 30-year period); 3) whether the annual predicted eagle fatality estimate is greater than 5% of the estimated LAP size; and 4) whether fatalities at the Project cause the cumulative annual take for the LAP to exceed 5% of the estimated LAP.

There have not been important eagle use areas or migration concentration sites identified within the Project footprint, but they may occur in the surrounding canyons/drainage features. The fatality estimates for both species are greater than 0.03 eagles per year, but less than 5% of the estimated LAP, and the cumulative annual take for the LAP will be less than 5% of the estimated LAP. Based on this information, the Project meets a Category 2 designation.

4.5 Requested Take and Permit Term

Based on the USFWS CRM priors-only model, operation of the Project may result in take of 5.28 bald eagles per year and 5.97 golden eagles per year, leading to a total requested take allocation of up to 159 bald eagles and 180 golden eagles over the 30-year permit term. This is likely a conservative estimate given that the predictions are based on priors only modeling and Goodnight I Wind is requesting that the permitted level of eagle take be reevaluated following two years of post-construction eagle mortality monitoring at the Project.

5.0 STAGE 4 – AVOIDANCE AND MINIMIZATION OF RISK USING CONSERVATION MEASURES AND COMPENSATORY MITIGATION

This section identifies the avoidance and minimization measures in the design, construction, and operation of the Project.

5.1 Avoidance and Minimization of Risk during Project Planning and Design

- With the exception of ephemeral playa lakes, the Project is located away from waterbody features that support a consistent prey base for eagles. Playa lakes may temporarily provide foraging opportunities for eagles. The Project area encompasses approximately 397.0 acres (160.6 hectares) of playa lakes (Figure 4)
- The Project avoided turbine placement near important habitat types: playa lakes, watercourses, other wetlands, substantial woodlands, and prairie dog colonies.
- The Project uses self-supporting tubular steel wind turbine towers that avoid the use of external ladders and platforms to minimize perching and nesting.
- All collection lines are buried underground and the Project did not require building any overhead lines (the Project connects to an existing overhead line).
- The Project was designed to minimize disturbance to the extent possible.
- Guy wires on the one permanent meteorological tower will be marked to minimize the potential for collision risk.

- Turbine and met tower lighting is designed to reduce skyward illumination.

5.2 Best Management Practices during Construction

The BMPs listed below are applicable to bald and golden eagles and represent a subset of measures Goodnight I Wind will implement at the Project to minimize impacts to wildlife and habitat during construction. These include practices that broadly relate to landscape management, wildlife management, and/or personnel management and are relevant to eagles. Goodnight I Wind is implementing the following BMPs to avoid or minimize impacts to eagles during the construction of the Project:

- Instruct all construction personnel on wildlife resource protection measures, including (1) applicable federal and state laws (e.g., those that prohibit animal collection or removal), and (2) the importance of these resources and the purpose and necessity of protecting them, and ensuring this information was disseminated to applicable contractor personnel, including the correct reporting procedures prior to construction.
- Train construction personnel to be aware of eagles within the Project and general relevant wildlife issues such as eagle prey base.
- Protect and preserve existing trees, vegetation, water resources, and wildlife habitat to the extent practical during construction.
- Minimize construction areas, ground disturbance, and vegetation clearance to the greatest extent possible. Including: minimize fragmentation by following section lines, field rows, and existing roads when possible; minimize number and length of access roads
- Restrict traffic to roads associated with the Project and minimize use of other roads to the extent possible. Speed limits (25 mph) were set to avoid wildlife collisions that could create carrion attractive to eagles.
- Minimize the creation of rock piles, which create habitat for small mammals that in turn attract eagles.

5.3 Avoidance and Minimization Measures during Operations

Goodnight I Wind will implement the following conservation measures relevant to eagles during the operation of the Project:

- Train all operations personnel on practices used to avoid and minimize impacts to wildlife and other biological resources, including identification of potential wildlife conflicts and the proper response, sensitivity to eagles and other wildlife, and education on wildlife laws.
- Take action to reduce vehicle collision risk to animals and remove carrion from the Project.
- Instruct Project personnel and visitors to drive at low speeds (<25 mph) and be alert for wildlife, especially in low visibility conditions.

- Implement a baseline eagle fatality monitoring study following the start of Project operations. The post-construction monitoring plan includes eagle-specific carcass surveys to estimate impacts to eagles at the Project and implementing the required post-permit eagle fatality monitoring described in Section 6.1.
- Implement a Wildlife Incidental Reporting Program (WIRP; see Section 6.2) at the start of operations of the Project to ensure operations personnel document eagle fatalities encountered during routine maintenance work or at any time when personnel are within Project. The WIRP will continue for the life of the Project to identify any additional eagle concerns through an environmental information management system. Eagle remains will be reported to TPWD and USFWS within 48 hours of the discovery.

5.4 Compensatory Mitigation

Compensatory mitigation occurs in the eagle permitting process if the conservation measures do not remove the potential for take, and the projected take exceeds calculated thresholds for the species-specific eagle management unit in which the project is located. To mitigate impacts, the USFWS uses a mitigation ratio for golden eagles of 1.2 eagles to one eagle taken.[81]

Goodnight I Wind recognizes that mitigation is required for impacts to golden eagles resulting from the operation of the Project and will work with the USFWS to develop a mitigation plan to offset the impacts of the predicted eagle take.[82] The USFWS determines the final compensatory mitigation requirements for the Project using a resource equivalency analysis (REA)[83] based on the final predicted level of take for the Project.

Goodnight will initially offset the predicted golden eagle take for the first 3 years of the permit term. Assuming permit issuance in 2024 and mitigation purchased and implemented in 2026, to offset the take of 18 golden eagles, 5.97 golden eagles annually for the first 3 years of the permit term, the REA indicates that 704 poles are needed for 10-year retrofits, or 307 poles are needed for 30-year retrofits, assuming the retrofits are completed before the golden eagle breeding season begins in 2027 (i.e., retrofits would be completed by the end of 2026). If a combination of 10-year and 30-year retrofits are implemented, the numbers will be different.

Following the first 2-year check in period, the USFWS will use the post-construction eagle mortality data to inform mitigation needs for subsequent review periods. The USFWS will credit any excess mitigated take to Goodnight I Wind for subsequent check-in periods under the permit if take estimates are less than mitigated take after the initial review period. If the estimated take is higher, USFWS will require additional mitigation. Goodnight anticipates that the mitigation plan will focus on power pole retrofits by either: 1) working directly with local utilities to compensate them for retrofitting poles or 2) utilizing other retrofit programs (e.g., an in-lieu fee program).

[81] USFWS 2016b

[82] USFWS 2013

[83] Ibid.

Offsetting compensatory mitigation for bald eagles is required only if 1) annual take exceeds the threshold for the eagle management unit, or 2) annual take (together with cumulative effects) is greater than the LAP thresholds.[84] Given these criteria and the current bald eagle populations, Goodnight I Wind does not anticipate the need for compensatory mitigation to offset bald eagle take for the Project. As such, no mitigation for bald eagles is proposed at this time. Project-specific avoidance and minimization measures and eagle conservation actions have been identified to reduce eagle take.

6.0 STAGE 5 – POST-PERMIT MORTALITY MONITORING

6.1 Eagle Mortality Monitoring Plan

Goodnight I Wind will monitor eagle mortality at the Project following issuance of the ETP. The purpose of the eagle mortality monitoring is to estimate the level of incidental take at the Project, assess the level of take relative to the authorized take limits, and to inform adaptive management decisions if warranted. This ensures that the level of estimated take of eagles remains within the level of take authorized by the ETP. To ensure permit compliance, Goodnight I Wind and USFWS will re-assess fatality rates following the first two years of eagle mortality monitoring and will have subsequent five-year reviews for the life of the permit term.[85]

The post-permit monitoring plan has two primary components: 1) systematic eagle mortality monitoring conducted by a qualified, independent, third party, and 2) incidental monitoring by the Project's field personnel in accordance with the WIRP (see Section 6.2 below) during all years of operation of the Project. Goodnight I Wind's eagle mortality monitoring plan will achieve the following:

- A cost-effective strategy that includes the metrics necessary to monitor take of eagles and effectiveness of the minimization measures; and
- A monitoring plan designed to facilitate evaluation of thresholds that indicate whether an adaptive management response is needed to maintain permit compliance

Unless otherwise agreed to in coordination with USFWS, fatality monitoring will initially include standardized carcass searches at all 59 turbines, searcher efficiency, and carcass persistence bias correction trials. The monitoring will be designed to achieve a minimum average detection probability of 0.35 over the review period. A minimum of one year of searcher efficiency trials will be completed during each permit review period and trials will be conducted for all methods of carcass searches. Searcher efficiency trials will be conducted during each of four seasons using a minimum of 20 eagle surrogates per season. Feathered turkey decoys will make up no more than 50% of the trial specimens with the remaining trial specimens consisting of large-bodied raptors to the extent possible. Carcass persistence trials will also be conducted during each of the four seasons using at least 10 eagle surrogates (large-bodied raptors and vultures if at all

[84] USFWS 2013, 2016a

[85] USFWS 2016b

possible) per season. A minimum of one year of carcass persistence trials will be completed during each review period.

The results of experimental bias trials (i.e., searcher efficiency and carcass persistence trials) will inform the study design for systematic eagle mortality monitoring, which may be modified in future years to meet the objectives of the monitoring plan. Additionally, because post-construction monitoring methods are constantly improving as researchers develop new and more accurate methods of survey and analysis, Goodnight I Wind will consider new techniques and protocols for inclusion in the Project's post-permit monitoring plan as they become available. Goodnight I Wind and USFWS will agree upon the final monitoring plan prior to implementation.

6.2 Wildlife Incidental Reporting Program

As part of the post-permit monitoring, Goodnight I Wind plans to implement a WIRP at the Project immediately following the commencement of operations. Goodnight I Wind will train field personnel annually on the WIRP and its procedures for reporting any incidental eagle fatalities that may be encountered during project operations, as well as effective data gathering, photo documentation, and record keeping procedures. The WIRP will remain in effect during the years of systematic eagle mortality monitoring and throughout the operational life of the Project.

6.3 Reporting

Goodnight I Wind will notify the USFWS immediately if possible, but no later than 48 hours from discovery of a dead or injured eagle. Additionally, Goodnight I Wind will prepare and submit an eagle incident report to the USFWS within seven business days. This report will include a description of the find, photographs, and a data sheet that provides such information as date/time, turbine number and location, physical description of the find (consisting of any obvious injuries and general carcass condition), evidence of scavenging, and estimated time of injury/death.

In addition to specific incident reports, the independent third party will provide USFWS and Goodnight I Wind with a report after each year of systematic eagle mortality monitoring. This report will provide the raw survey data and a summary of the study design and any modifications from the original study design that were used.

7.0 ADAPTIVE MANAGEMENT PROCESS

Goodnight I Wind will communicate with the USFWS regarding the need for or implementation of additional mitigation or conservation measures at the Project if concerns arise about the rate of eagle take relative to the CRM predictions. As indicated in Section 4.2, fatality predictions from the USFWS CRM can be updated with site-specific, post-construction monitoring data, following the completion of those studies. The site-specific mortality data will be incorporated into a posterior, site specific, estimate of collision probability to further refine mortality predictions for the Project and to inform the level of take coverage that may be needed in subsequent review periods. A stepwise process will guide the implementation of additional conservation measures, as needed (Table 6). If the USFWS issues a permit, the two parties will revisit the adaptive management

table (Table 6) and revise it as necessary during each administrative permit review period. Administrative reviews will occur at least every five years as required for all long-term ETPs.

8.0 CONCLUSION

Goodnight I Wind prepared this summary of eagle related studies to provide guidance for all eagle avoidance, minimization, mitigation, and monitoring efforts for the Project. The measures described in this document are intended to help protect and reduce potential impacts to eagles and monitor actual impacts to eagles at the Project. Goodnight I Wind anticipates that this ECP will adaptively manage impacts to eagles from ongoing operations at the Project.

Table 6. Summary of stepwise adaptive management process for bald eagle and golden eagle take at the Goodnight I Wind Project, based on a permitted take rate averaging 5.97 golden eagles/year and 5.28 bald eagles/year and totaling 180 golden eagles and 159 bald eagles over the 30-year permit term.

Step	Trigger	Adaptive Management Measure
Step I	One or more golden or bald eagle remains found	At the beginning of the next year of compliance monitoring, implement all of the following: • Assess eagle fatalities to determine if cause or risk factors can be determined (e.g., season, weather, presence of prey/carrion, fire, or other events) • Provide assessment results and other relevant data to USFWS
Step II	≥ 10 golden eagle or 9 bald eagle remains found in first 5 years OR ≥ 20 golden eagle or 18 bald eagle remains found in first 10 years OR ≥ 31 golden eagle or 27 bald eagle remains found in first 15 years	At the beginning of the next year of compliance monitoring, implement all of the following: • Implement Step I adaptive management response • Complete additional studies (e.g., eagle use surveys) to better understand risk factors • Coordinate with USFWS to determine next steps
Step III	≥ 21 golden eagle or 19 bald eagle remains found in first 10 years OR ≥ 32 golden eagle or 28 bald eagle remains found in first 15 years OR ≥ 42 golden eagle or 37 bald eagle remains found in first 20 years	At the beginning of the next year of compliance monitoring, implement all of the following: • Implement Step I and Step II adaptive management response • Test one or more conservation measures designed to reduce the likelihood of future take (i.e., deterrent designed to reduce the number of eagles exposed to collision risk, curtailment designed to reduce the source of collision risk, or other measures designed to reduce collisions with turbines) agreed upon in consultation with the USFWS. • Effectiveness study design of any conservation measure implemented must be approved by the USFWS.

Table 6. Summary of stepwise adaptive management process for bald eagle and golden eagle take at the Goodnight I Wind Project, based on a permitted take rate averaging 5.97 golden eagles/year and 5.28 bald eagles/year and totaling 180 golden eagles and 159 bald eagles over the 30-year permit term.

Step	Trigger	Adaptive Management Measure
Step IV	≥ 43 golden eagle or 38 bald eagle remains found in first 20 years OR ≥ 53 golden eagle or 47 bald eagle remains found in first 25 years	Immediately upon meeting this trigger, implement the following: • If technology, biological monitors, or other conservation measures have previously been implemented at the Project, alter the programming or implementation of those effort(s) to enhance effectiveness, or implement another conservation measure agreed upon in consultation with the USFWS. The effectiveness of any measure or enhanced measure must be studied with the study design approved by the USFWS.
Eagle Nests	If a new golden eagle nest is discovered within 1 mile of any Project turbine and/or if a new bald eagle nest is discovered within 0.5 miles of any Project turbine.	Immediately upon meeting this trigger, implement the following: • Immediately report the discovery of the new nest to the USFWS and discuss, in consultation with the USFWS, the potential impacts of project-related activities, if any, on the nesting eagles, and whether temporary or permanent nest take may be appropriate. • Effective immediately do not conduct activities that are not in response to a safety emergency or essential turbine maintenance if the activities a) will occur within 1 mile of an in-use golden eagle nest during the nesting season (Dec 1 to Jul 31) and is within line-of-sight of the nest, b) will occur within 0.5 miles of an in-use golden eagle nest during the nesting season (Dec 1 to Jul 31), or c) will occur within 660 feet of an in-use bald eagle nest during the nesting season (Oct 20 to Jul 31). This restriction must remain in place until coordination with the USFWS occurs while minimizing the risk of nest disturbance. This may include implementation of practical measures to avoid nest disturbance, or the issuance of a nest disturbance permit if no practical measures can be implemented.

Table 6. Summary of stepwise adaptive management process for bald eagle and golden eagle take at the Goodnight I Wind Project, based on a permitted take rate averaging 5.97 golden eagles/year and 5.28 bald eagles/year and totaling 180 golden eagles and 159 bald eagles over the 30-year permit term.

Step	Trigger	Adaptive Management Measure
Eagle Nests (c*ontinued*)		• Monitor the nest status twice annually to determine if it is in-use and if it was successful. If in-use, monitor the eagle activity surrounding the nest once every 10 years (in a year when the nest is in-use) to determine if the territory or home-range associated with the nest is likely to overlap with the project footprint. At a minimum, this would entail conducting one point count for one full day (sunrise to sunset) every week for the duration of the breeding season (from the date the nest is determined to be in-use until Jul 31) or as long as the nest remains in-use during that season. The survey would be performed at a strategically placed point to determine if and how frequently one or both adults and/or fledglings (if applicable) are entering the project footprint and how often this may occur. In addition, if the nest produces nestlings, those nestlings must be banded with federal (USGS) aluminum bands if it is safe to do so. Other method(s) could be used to satisfy this requirement but must be approved by the USFWS prior to implementation.

Note: Triggers are based on the number of eagles found assuming a minimum average detection probability (g) of 0.35[1] for each 5-year review period (following the initial 2-year check-in) and using an 80% credible interval for both golden and bald eagles.

[1] If the minimum average site-wide g-value (probability that eagle remains will be detected by monitoring efforts) of 0.35 is not achieved in any 5-year review period or searcher efficiency rates, as determined through on-site bias trials, are not quantifiable for every search method used during the 5-year review period, then more rigorous fatality monitoring to achieve an average g of 0.35, and/or additional searcher efficiency trials will be required. This may be implemented through additional years of third-party monitoring and/or enhanced operations monitoring (e.g., increased search frequency, increased search area coverage) including searcher efficiency trials for each novel search method (e.g., full plot transects searches, scans, road and pad searches, incidental monitoring) employed during the 5-year review period.

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Appendix A. Predicted Take Levels for the Goodnight I Wind Project, Armstrong County, Texas

Goodnight I Wind Project Eagle Risk Analysis Summary

Prepared by the U.S. Fish and Wildlife Service Southwest Region and National Eagle Support Team

Date: 07 July 2023

Facility Information

Facility: Goodnight I Wind Project

Location: Armstrong County, Texas, USA

Latitude & Longitude: 35.0524928, -101.3198295

Date Online: currently under construction

Number of Turbines: 59

Turbine model: Vestas / model V136-4.5 MW

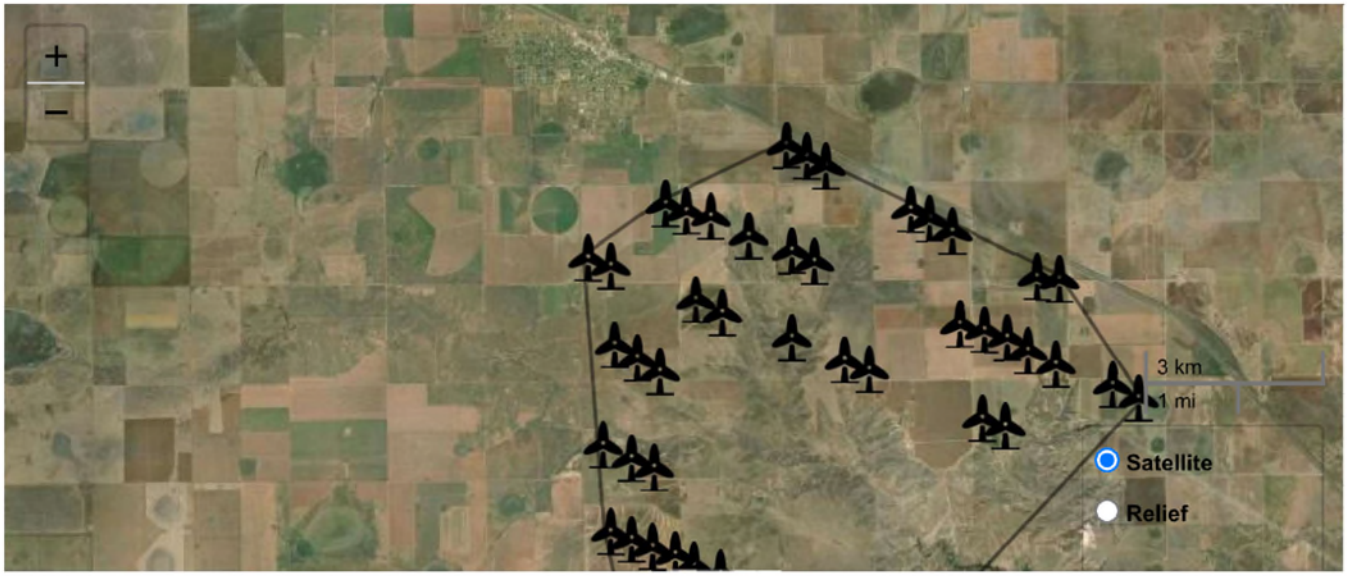
Hub Height: 82 m

Rotor Diameter: 136 m

NOTE: Fatality estimates are specific to the turbine specifications provided.

Facility Overview

The Goodnight I Wind Project is located in northern Texas (Figure 1). The National Eagle Support Team (NEST) reviewed the provided data and produced an annual estimate of incidental take for bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) using the Service's collision risk model (USFWS 2013, 2021; New et al. 2021).



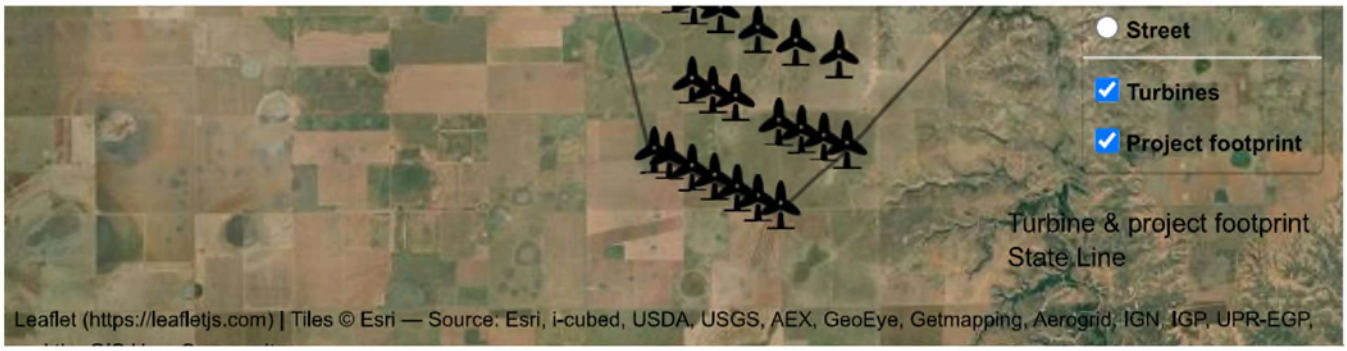


Figure 1. Turbine locations for the Goodnight I Wind Project, Armstrong County, Texas, USA.

Eagle Use Survey Summary

Pre-construction survey data do not meet the requirements of incidental take permit regulations (50 CFR 22.26(d)(3)(ii)) or the assumptions of the collision risk model. Therefore, we used the Service's national prior for exposure to inform the risk analysis.

Mortality Monitoring Summary

As the Goodnight I Wind Project is currently under construction, mortality monitoring has not yet been conducted. Therefore, we used the Service's national prior for collision probability to inform the risk analysis.

Collision Risk Model

The collision risk model (CRM) uses (1) the pre-construction eagle use of a wind facility (eagle exposure), (2) the probability that an eagle collides with a turbine (collision probability), and (3) the hazardous space of a wind facility operating during daylight hours (expansion factor) to estimate the annual number of eagle fatalities at a wind facility. These parameters are then modeled in a Bayesian framework where uncertainty surrounding eagle exposure and collision probability are defined by national prior-probability distributions (priors) for each parameter. Wind facility specific pre-construction eagle-use and post-construction mortality monitoring data can then be used to update these priors, respectively, reducing uncertainty in the parameter estimates and resulting in more precise estimates of annual eagle fatalities at a wind facility (New et al. 2015, 2021; USFWS 2021).

To estimate annual eagle fatalities at the Goodnight I Wind Project, we used the species-specific national priors for eagle exposure and collision probability in combination with the project-specific expansion factor (Table 1 and Table 2). The Service uses the 80th quantile of the fatality distribution from the CRM for golden eagles and, when there are no usable site-specific data to update the prior-probability distribution, also uses the 80th quantile for bald eagles as the annual take limits for eagle incidental take permits.

Table 1: Inputs to the collision risk model (± SD) used to estimate annual bald eagle fatalities for the Goodnight I Wind Project in Armstrong County, Texas, USA .

BAEA Model scenario	Exposure (eagle minutes/hour/km^3)	Collision probability (collisions/eagle-minute)	Expansion factor ((hours*km^3)/year)

BAEA Model scenario	Exposure (eagle minutes/hour/km^3)	Collision probability (collisions/eagle-minute)	Expansion factor ((hours*km^3)/year)
Annual priors only (no survey data)	3.19 ± 11.52	0.007 ± 0.0055	762.53 ± 0.00

Table 2: Inputs to the collision risk model (± SD) used to estimate annual golden eagle fatalities for the Goodnight I Wind Project in Armstrong County, Texas, USA .

GOEA Model scenario	Exposure (eagle minutes/hour/km^3)	Collision probability (collisions/eagle-minute)	Expansion factor ((hours*km^3)/year)
Annual priors only (no survey data)	1.21 ± 2.25	0.0056 ± 0.0049	762.53 ± 0.00

Eagle Collision Risk Estimates

The estimated take using the priors-only model is 5.28 bald eagles (Table 3; Figure 2) and 5.97 golden eagles (Table 4; Figure 2) per year at the 80th quantile.

Table 3: Annual bald eagle (BAEA) fatality estimates for the Goodnight I Wind Project in Armstrong County, Texas, USA .

BAEA model scenario	Mean	Standard deviation	80th quantile
Annual priors only (no survey data)	17.1	81.05	5.28

Table 4: Annual golden eagle (GOEA) fatality estimates for the Goodnight I Wind Project in Armstrong County, Texas, USA .

GOEA model scenario	Mean	Standard deviation	80th quantile
Annual priors only (no survey data)	5.19	13.66	5.97

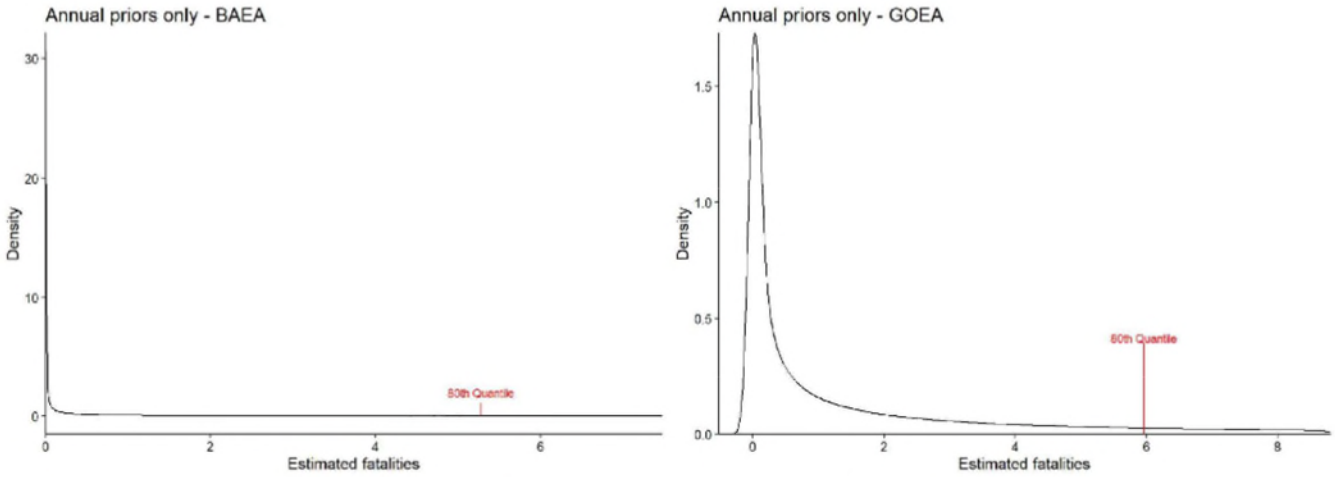


Figure 2: Collision risk estimates from posterior density fatality distributions for collision risk models at the Goodnight I Wind Project, Armstrong County, Texas, USA.

Local Area Population and Cumulative Effect of Take

NOTE: *These numbers will need to be updated when the draft EA is finalized.*

The local area population (LAP) of bald and golden eagles for the Goodnight I Wind Project is approximately 683 and 218 individuals, respectively (USFWS Cumulative Effects Tool, run 5 July 2023). Estimated annual take of 5.28 bald eagles and 5.97 golden eagles represents 0.77% and 2.74% of the LAP, respectively. As of July 2023, there are 0 and 2 projects that overlap with this LAP that are permitted to take bald and golden eagles, respectively. The estimated take for the Goodnight I Wind Project combined with the authorized take from overlapping projects could result in a total annual take of 5.28 bald eagles and 6.25 golden eagles, representing 0.77% and 2.86% of the LAP, respectively.

Based on the Service's eagle mortality database, there was 1 reported bald eagle anthropogenic mortality (Table 5) and 26 reported golden eagle anthropogenic mortalities (Table 6) within the LAP in the last 10 years (2014–2023). All of these mortalities are considered to be unpermitted take.

Table 5: Records of unpermitted Bald Eagle mortalities in the Goodnight I Wind Project LAP from the Service's eagle mortality database for the most recent 10 year period (2014-2023).

Unpermitted Take Summary **Bald Eagle**	**Discovery Period** **2014-2023**
Collision with wind turbine	1

Table 6: Records of unpermitted Golden Eagle mortalities in the Goodnight I Wind Project LAP from the Service's eagle mortality database for the most recent 10 year period (2014-2023).

Unpermitted Take Summary **Golden Eagle**	**Discovery Period** **2014-2023**

Unpermitted Take Summary Golden Eagle	Discovery Period 2014-2023
Electrocution	7
Shot	1
Collision with wind turbine	9
Unknown	7
Disease	1
Emaciation	1

Literature Cited

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