Attachment E

Chokecherry and Sierra Madre
Phase I Wind Energy Project
Local Area Population Analysis for Golden and Bald Eagles

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U.S. Fish and Wildlife Service, Region 6, Migratory Bird Management Office,

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Chokecherry and Sierra Madre (CCSM) Phase I Wind Energy Project Local Area Population (LAP) Analysis for Golden and Bald Eagles

To assess cumulative impacts to the local-area population we followed methods outlined in Appendix F of the Eagle Conservation Plan Guidance (USFWS 2013) and we utilized a USFWS cumulative effects tool developed to complete local-area population analysis. Further for this analysis we used eagle mortality records available to us in a proprietary USFWS eagle mortality database, and an additional set of eagle mortality records available from the Wyoming Game and Fish Department (WGFD). A major caveat with the our eagle mortality records is that they were obtained based on opportunistic or incidental reporting of eagle mortalities and they were not obtained from regular or systematic survey efforts to detect eagle mortalities using a statistically valid protocol or sampling methodology. Except for some of the wind energy industry mortality records, there were no searcher efficiency or carcass persistence trials associated with any of these records so that a bias correction factor could be applied to them as would be the case for studies conducted using statistically valid sample designs. Also, some industries that impact eagles have self-reported eagle mortalities at a higher rate than other industries, and some types of eagle mortalities lend themselves better to discovery and reporting. Hence there are many types of bias associated with these records given this caveat. Still we elected to use the eagle mortality records in the USFWS database and WYGF database because this was the best scientific information available to us regarding eagle mortalities within the local-area populations for both bald and golden eagles.

We employed key decision criteria while working with the records in the USFWS eagle mortality database according to guidance developed by USFWS, Region 6. Based on the Region 6 guidance memo we used eagle mortality records from the USFWS database for only the most recent 10 full years (2005 – 2014). We used this approach because work on the EA for the new 2009 BGEPA regulations for non-purposeful take of eagles started about eight to nine years ago. And the EA for the 2009 BGEPA regulations included estimates of the existing baseline in terms of eagle populations and current mortality levels. Also, the 2009 BGEPA regulations themselves were issued about 7 years ago and there has likely been an increase in reporting of eagle mortalities to USFWS since these went into effect which provides us with a more accurate estimate of eagle mortalities compared to the preceding 20 or 30 years. Lastly most wind energy facilities operating in Wyoming became functional within the last 10 years and this is also when some of these facilities have voluntarily reported eagle fatalities to USFWS.

Using our USFWS eagle fatality prediction model (USFWS ECPG 2013), and information provided to us by the CCSM Phase I Project proponent on turbine blade sizes and eagle use, we developed predictions for take of golden and bald eagles for the CCSM Phase I Project. Estimates of golden eagle fatalities and bald eagle fatalities were calculated for CCSM Phase I Project using g two different turbine sizes. Using the largest on-shore wind turbine anticipated (120-meter diameter blade), the 80 percent upper credible interval (80% UCI) from the USFWS peer-reviewed model predicts 14 golden eagle fatalities and 2 bald eagle fatalities annually for CCSM Phase I Project. Using a smaller turbine (103-meter blade), the

model predicts the 80% UCI for CCSM Phase 1 Project will result in 10 golden eagle and 1 bald eagle fatalities annually. Below we present our analysis of how take of 10 or 14 golden eagles per year affects golden eagles at the LAP level, and how take of 1 or 2 bald eagles per year affects bald eagles at the LAP level. Both take levels for both eagle species are presented in our analysis. But on a comparative basis the take of eagles at the higher predicted level would be of greater concern from a conservation perspective for both species than that predicted for the lower predicted level.

Golden Eagle LAP Analysis

Using the above approach the local-area population for golden eagles is delimited by a circle with a radius of 140 miles around the project footprint, with 140 miles representing the mean natal dispersal distance for golden eagles. The eagle management units currently used by USFWS to manage golden eagle populations are the Bird Conservation Regions (BCR) (USFWS 2013). For the CCSM Phase I Project the local-area population of golden eagles is comprised of eagles in four BCR's. These include the Badlands and Prairies, Northern Rockies, Southern Rockies/Colorado Plateau, and Shortgrass Prairie BCR's (Table 1). The local area population of golden eagles for the Chokecherry and Sierra Madre project is approximately 1932 eagles (Table 1) and the 1% and 5% benchmarks for this local-area population are about 19 and 97 golden eagles respectively. USFWS has identified that take rates of between 1% and 5% of the estimated total eagle population size at this scale as significant, with 5% being at the upper end of what might be appropriate under the BGEPA preservation standard, whether offset by compensatory mitigation or not (USFWS 2013).

Based on the combined records in the USFWS eagle mortality database and WGFD database there were 430 golden eagle mortalities within the local-area population between 2005 and 2014 (Table 2). About 92% of these reported mortalities were due to anthropogenic causes with only 4 (about 1%) reported cases of mortality due to natural causes, and for another 7% (32 total eagle mortalities) of the total mortalities there no ability to determine whether they were due to anthropogenic vs. natural causes (Table 2). Given that there were undoubtedly other eagle mortalities due to natural causes within this ten year span this further illustrates a bias with these mortality records since there is not a systematic mortality survey effort, nor a standardized method of data collection on found deceased eagles. Of the anthropogenic causes most (50%) were power line related with 217 cases of electrocutions and 4 cases of collisions with power lines (Table 2). Most of the remaining eagle mortalities due to anthropogenic causes were either due to collisions with wind turbines (97 records; 23% of all records; Table 2) or collisions with vehicles along highways/roads (60 records; 14%; Table2). There also were 7 records of eagles being shot, 3 records of collisions with trains along railroad lines, 2 records of mortality due to collision with a fence, 2 records of non-target snaring, 1 due to collision but where the type of structure collided with was unknown, and 1 where an eagle was killed due to management/research trapping (Table 2). All types of collision mortalities combined together comprised 37% of these mortalities. Although most of the available golden eagle mortality records combined from the USFWS database and WGFD database are related to power lines (mostly electrocutions) or collisions with wind turbines or motor vehicles, we cannot say that these sources of eagle mortality are more important as factors in eagle mortality within the local-area population than shooting, poisoning, or any other anthropogenic

sources of eagle mortality. Facility maintenance practices for electric utility and wind energy companies ensure that these facilities are on a regular inspection schedule which may explain the higher rates of reporting of eagle mortalities for these industries. Similarly, dead eagles are more visible along highways than areas away from roadways. It is certainly possible that the eagle mortality factors such as shooting are actually more important in terms of total eagle take within this area, we simply lack the data to really assess this.

For golden eagle mortalities due to collisions with wind turbines at wind energy facilities we used the USFWS cumulative effects tool to calculate that about 17 eagles per year are taken by existing online wind facilities at the local-area population level. A further caveat on this estimate is that it is only based on golden eagle mortality records self-reported to USFWS by online operating wind facilities. There are other online wind energy facilities within the local-area population that are not reporting golden eagle mortalities to USFWS, but for which eagle mortalities are likely occurring at some level. However, in this analysis we elected not to assign a value for golden eagle mortalities to these wind facilities because this approach is too speculative. Still the above estimate of 17 golden eagles taken per year within this local-area population by online wind facilities should be viewed as a minimum estimate of mortalities due to this mortality type. Subtracting the estimate of 17 eagles taken by wind facilities per year from the above 1% and 5% benchmarks leaves approximately 2 eagles at the 1% level and 80 eagles at the 5% level for the local area population.

For golden eagle mortalities due to power line impacts (combination of both electrocutions and collisions with power lines) the total number from 2005 through 2014 was 221 (Table 2) for an average of about 22 per year. Since not all eagles that are taken by electrocutions or collisions with power lines are discovered and reported to USFWS this average of 22 golden eagles per year killed by power line impacts should again be viewed as a minimum estimate of this type of take. Subtracting the estimate of 22 eagles per year taken by power lines from the above numbers for wind turbine impacts leaves -20 eagles at the 1% level and 58 eagles at the 5% level for the local area population. And the combined golden eagle take due to wind turbines and power lines is about 39 eagles per year.

For golden eagle mortalities due to collisions with vehicles on highways the total number from 2005 through 2014 was 60 (Table 2) for an average of about 6 eagles per year. Since not all eagles killed along highways in collisions with motor vehicles are discovered and reported this average of 6 eagles taken per year should again be viewed as a minimum estimate for this type of take. Subtracting the estimate of 6 eagles per year taken by vehicle collisions along highways from the above combined numbers for take due to wind turbine and power line impacts leaves -26 eagles at the 1% level and 52 eagles at the 5% level for the local area population. And the combined take of eagles due to wind turbine, power line, and vehicle collision impacts is about 45 eagles per year.

Analysis for wind turbines with 103 meter blades:

Using the USFWS eagle fatality prediction model (USFWS 2013), we predicted the number of golden eagles the CCSM Phase I Project would take per year for two different size wind turbine blades. At the upper 80th credible interval level we estimate, with the data provided, this wind project would take 10

golden eagles per year if wind turbines with 103 meter blades. Using this estimate, and the above reductions against the 1 % and 5% benchmarks due to wind energy, power lines, and vehicle collisions, if 10 golden eagles were taken by the CCSM Phase I Project per year then the combined cumulative take would be -36 eagles at the 1% level and 42 eagles at the 5% level for the local area population. So the combined take of eagles due to collisions with turbines, power line impacts, collisions with vehicles, and predicted take from the CCSM Phase I Project is about 55 eagles per year or about 2.9% of the local area population. Hence, USFWS would have some concern about this combined take level for golden eagles for this local area population since at 2.9% total it exceeds the 1% benchmark, but this concern would be offset by the fact that combined take would still be below the 5% benchmark level.

Analysis for wind turbines with 120 meter blades:

At the upper 80th credible interval level we predict, with the data provided, this wind project would take 14 golden eagles per year if the CCSM Phase I Project were built with wind turbines that had 120 meter blades. Using this estimate, and the above reductions against the 1 % and 5% benchmarks due to wind energy, power lines, and vehicle collisions, if 14 golden eagles were taken by the CCSM Phase I Project per year then the combined cumulative take would be -40 eagles at the 1% level and 38 eagles at the 5% level for the local area population. So the combined take of eagles due to collisions with turbines, power line impacts, collisions with vehicles, and predicted take from the CCSM Phase I Project is about 59 eagles per year or about 3.1% of the local area population. Hence, USFWS would have some concern about this combined take level for golden eagles for this local area population since at 3.1% total it exceeds the 1% benchmark, but this concern would be offset by the fact that combined take would still be below the 5% benchmark level.

Table 1: Estimated Golden Eagle Local Area Population (LAP) for the Proposed CCSM Phase I Project Wind Energy Facility in Carbon County, Wyoming.

BCR	Estimated No. of Golden Eagles
Badlands and Prairies	356.85
Northern Rockies	1125.90
Southern Rockies/Colorado Plateau	422.14
Shortgrass Prairie	27.31
Total Local Area Population	1932.20
1% LAP Benchmark	19.32
5% LAP Benchmark	96.61

Table 2: Known Golden Eagle Mortalities within 140 Miles of the Proposed CCSM Phase I Project Wind Energy Facility, 2005 through 2014.

Natural Causes	Number of Mortalities	Percent of Total Mortalities
Killed by another animal	1	<1
Emaciation/Starvation	2	<1
Physiological Stress	1	<1
Anthropogenic Causes		
Electrocution	217	50
Collision with Power Line	4	1
Collision	1	<1
Collision with Wind Turbine	97	23
Collision with Vehicle	60	14
Collision with Fence	2	<1
Railroad Collision	3	<1
Shot	7	2
Non-target Snaring	2	<1
Management/Research Trapping	1	<1
Unknown	19	4
Other	13	3
Total Mortalities	430	100

Bald Eagle LAP Analysis

Using the above approach the local-area population for bald eagles is delimited by a circle with a radius of 43 miles around the project footprint, with 43 miles representing the mean natal dispersal distance for bald eagles. The eagle management units currently used by USFWS to manage bald eagle populations are the Eagle Management Units (EMU) (USFWS 2013). For the Chokecherry and Sierra Madre project the local-area population is comprised of bald eagles in the Northern Rocky Mountains and the Rocky Mountains and Plains EMU's. The local area population of bald eagles for the Chokecherry and Sierra Madre project is approximately 117 eagles (Table 3) and the 1% and 5% benchmarks for this local-area population are about 1 and 6 bald eagles respectively. USFWS has identified that take rates of between 1% and 5% of the estimated total eagle population size at this scale as significant, with 5% being at the upper end of what might be appropriate under the BGEPA preservation standard, whether offset by compensatory mitigation or not (USFWS 2013).

Based on the USFWS eagle mortality database, and an additional set of eagle mortality records available from the WGFD, there were 11 reported bald eagle mortalities within the local-area population for the CCSM Phase I Project between 2005 and 2014 (Table 4). All of these reported mortalities where the cause of the mortality was identified were due to anthropogenic causes; with 3 records of collisions with wind turbines, 3 records of highway accidents (assumed to be cases where vehicles collided with eagles), 2 records of electrocution on power lines, and 1 record of a collision with a power line (Table 4). There were 2 other bald eagle mortalities where the cause was unknown which means they could have been due to either natural or anthropogenic causes. With these data again a major caveat is that these records are biased due to the manner they were obtained and reported. Although most of the available bald eagle mortality records in the USFWS database and WGFD database are related to power lines, wind turbines, and collisions with vehicles we cannot say that these sources of eagle mortality are more important as factors in eagle mortality within the local-area population than other potential mortality sources such as shooting, poisoning, or any other anthropogenic sources of eagle mortality. Facility maintenance practices for electric utility and wind energy companies ensure that these facilities are on a regular inspection schedule which may explain the higher rates of reporting of eagle mortalities for these industries. It is certainly possible that the eagle mortality factors such as shooting or poisoning are actually much more important in terms of total eagle take within this area, we simply lack the data to really assess this.

For bald eagle mortalities due to collisions with wind turbines at wind energy facilities we used a USFWS cumulative effects tool to calculate that about 0.8 bald eagles per year are taken by existing online wind facilities at the local-area population level. A further caveat on this estimate is that it is only based on bald eagle mortality records self-reported to USFWS by online operating wind facilities. There are other online wind energy facilities within the local-area population that are not reporting bald eagle mortalities to USFWS, but for which eagle mortalities are likely occurring at some level. However, in this analysis we elected not to assign a value for bald eagle mortalities to these wind facilities because this approach is too speculative. Still the above estimate of 0.8 bald eagles taken per year within this

local-area population by online wind facilities should be viewed as a minimum estimate for this type of take. Subtracting the estimate of 0.8 bald eagles taken by wind facilities per year from the above 1% and 5% benchmarks leaves approximately 0.2 eagles at the 1% level and 5.2 eagles at the 5% level.

For bald eagle mortalities due to power line impacts the total number reported from 2005 through 2014 was 3 (Table 4) for an average of about 0.3 per year. Since not all eagles that are taken by electrocutions or collisions with power lines are discovered and reported to USFWS this average of 0.3 bald eagles killed by power line impacts should again be viewed as a minimum estimate for this type of take. Subtracting the estimate of 0.3 eagles per year taken by power lines from the above numbers for wind turbine impacts leaves -0.1 eagles at the 1% level and 4.9 eagles at the 5% level. And the combined bald eagle take due to wind turbines and power lines is about 1.1 bald eagles per year.

For bald eagle mortalities due to collisions with vehicles on highways the total number from 2005 through 2014 was 3 (Table 4) for an average of about 0.3 eagles per year. Since not all eagles killed along highways in collisions with motor vehicles are discovered and reported this average of 0.3 eagles taken per year should again be viewed as a minimum estimate for this type of take. Subtracting the estimate of 0.3 eagles per year taken by vehicle collisions along highways from the above combined numbers for take due to wind turbine and power line impacts leaves -0.4 eagles at the 1% level and 4.6 eagles at the 5% level. . And the combined take of eagles due to wind turbine, power line, and vehicle collision impacts is about 1.4 bald eagles per year.

Analysis for wind turbines with 103 meter blades:

Using the USFWS eagle fatality prediction model (USFWS 2013), we predicted the number of bald eagles the CCSM Phase I Project would take per year for two different size wind turbine blades. At the upper 80^{th} credible interval level we estimate, with the data provided, this wind project would take 1 bald eagle per year if the CCSM Phase I Project were built with wind turbines that had 103 meter blades. Using this estimate, and the above combined reductions against the 1 % and 5% benchmarks due to wind energy, power lines, and vehicle collisions, if 1 bald eagle was taken by the CCSM Phase I Project per year then the combined cumulative take at the 1% level would be -1.4 bald eagles and 3.6 bald eagles at the 5% benchmark level. Total eagle take per year due to the CCSM Phase 1 Project plus other ongoing take due to other unpermitted ongoing types of take would be 2.4 bald eagles per year (1 eagle predicted/year for CCSM Phase I Project + 0.8 eagles/year due to other ongoing take at wind facilities + 0.3 eagles/year ongoing take due to power lines + 0.3 eagles/year ongoing take due to vehicle collisions) or about 2.1% of the local area population Hence, USFWS would have some concerns about this take level for bald eagles since the combined annual take of 2.1% of the local area population would exceed the 1% benchmark level. But this concern would be offset by the fact that this take level is still below the 5% benchmark level for this local area population.

Also, USFWS has established take thresholds for bald eagle populations by EMU in the Final Environmental Assessment (FEA) for the 2009 BGEPA take regulations. For the Northern Rocky Mountains EMU the annual take threshold for the portion within the USFWS Region 6 boundary is 30.73 bald eagles per year, and for the Rocky Mountains and Plains EMU the annual take threshold is 13.02

eagles per year for a combined annual take threshold of 43.75 bald eagles per year (USFWS 2009). Hence, even with an estimated 2.4 bald eagles per year (estimated take due to the CCSM Phase 1 Project plus other ongoing eagle take) taken out of this combined threshold level for the Northern Rocky Mountains and Rocky Mountains and Plains EMU's from the FEA, this would still leave 41.35 bald eagles per year that could be taken from these combined EMU's in Region 6. Most of the bald eagles for the local area population associated with the Chokecherry and Sierra Madre project are from the Northern Rocky Mountains EMU (Table 3). So considering only the Northern Rocky Mountain EMU threshold of 30.73 eagles per year, and subtracting out the estimated take above of 2.4 bald eagles per year, this still leaves 28.33 bald eagles per year that still could be taken; a reduction for the Northern Rocky Mountain EMU of only about 8%. However the reduction in the USFWS thresholds for the bald eagle EMU's in Region 6 are considered the net impact is that this reduction would be relatively minimal.

Analysis for wind turbines with 120 meter blades:

Using the USFWS eagle fatality prediction model (USFWS 2013) we utilized eagle data from pre-construction eagle surveys to predict the number of bald eagles the CCSM Phase I Project would take per year. At the upper 80th credible interval level we predict, with the data provided, that this wind project would take 2 bald eagles per year if the CCSM Phase 1 Project were built with wind turbines that had blades that were 120 meters. Using this estimate, and the above combined reductions against the 1 % and 5% benchmarks due to wind energy, power lines, and vehicle collisions, if 2 bald eagles were taken by the CCSM Phase I Project per year then the combined cumulative take at the 1% level would be -2.4 bald eagles and 2.6 bald eagles at the 5% benchmark level. Total eagle take per year due to the CCSM Phase I Project plus other ongoing take due to other unpermitted ongoing types of take would be 3.4 bald eagles per year (2 eagles predicted/year for CCSM Phase I Project + 0.8 eagles/year due to other ongoing take at wind facilities + 0.3 eagles/year ongoing take due to power lines + 0.3 eagles/year ongoing take due to vehicle collisions) or about 2.9% of the local area population Hence, USFWS would have some concerns about this take level for bald eagles since the combined annual take of 2.9% of the local area population would exceed the 1% benchmark level. But this concern would be offset by the fact that this take level is still below the 5% benchmark level for this local area population.

Also, USFWS has established take thresholds for bald eagle populations by EMU in the Final Environmental Assessment (FEA) for the 2009 BGEPA take regulations. For the Northern Rocky Mountains EMU the annual take threshold for the portion within the USFWS Region 6 boundary is 30.73 bald eagles per year, and for the Rocky Mountains and Plains EMU the annual take threshold is 13.02 eagles per year for a combined annual take threshold of 43.75 bald eagles per year (USFWS 2009). Hence, even with an estimated 3.4 bald eagles per year (estimated take due to the CCSM Phase I Project plus other ongoing eagle take) taken out of this combined threshold level for the Northern Rocky Mountains and Rocky Mountains and Plains EMU's from the FEA, this would still leave 40.35 bald eagles per year that could be taken from these combined EMU's in Region 6. Most of the bald eagles for the local area population associated with the Chokecherry and Sierra Madre project are from the Northern Rocky Mountains EMU (Table 3). So considering only the Northern Rocky Mountain EMU threshold of 30.73 eagles per year, and subtracting out the estimated take above of 3.4 bald eagles per year, this still leaves 27.33 bald eagles per year that could still be taken, a reduction for the Northern Rocky Mountain

EMU of only about 11%. However the reduction in the USFWS thresholds for the bald eagle EMU's in Region 6 are considered the net impact is that this reduction would be relatively minimal.

Table 3: Estimated Bald Eagle Local Area Population (LAP) for the Proposed CCSM Phase I Project Wind Energy Facility in Carbon County, Wyoming.

EMU	Estimated No. of Bald Eagles
Northern Rocky Mountains	114.05
Rocky Mountains and Plains	2.81
Total Local Area Population	116.86
1% LAP Benchmark	1.17
5% LAP Benchmark	5.84

Table 4: Known Bald Eagle Mortalities within 43 Miles of the Proposed CCSM Phase I Project Wind Energy Facility, 2005 through 2014.

	Number of Mortalities	Percent of Total Mortalities
Anthropogenic Causes		
Electrocution	2	18.1
Collision with Power Line	1	9.2
Collision with Wind Turbine	3	27.3
Highway Accident	3	27.3
Unknown	2	18.1
Total Mortalities	11	100