APPENDIX F – COMPLIANCE WITH APPLICABLE SAGE-GROUSE POLICIES, PLANS, AND PROCEDURES AND APPLICANT-PROPOSED MITIGATION

F.1 Introduction

The Bureau of Land Management (BLM) and several cooperating agencies participating in the preparation of the Environmental Impact Statement (EIS) for the Energy Gateway South Transmission Project (Project) have recently updated or are in the process of revising policies and plans addressing management and conservation of greater sage-grouse (*Centrocercus urophasianus*) in the Project area. These revisions are largely in response to declining greater sage-grouse populations in the western United States, agency responsibilities for sage-grouse conservation, and the U.S. Fish and Wildlife Service's (FWS) *12 Month Findings for Petitions to List the Greater Sage-grouse as Threatened or Endangered*, published in March 2010, which found that listing the species under the Endangered Species Act was warranted but precluded by higher priority listing actions. Several of these policy and sage-grouse management plan revisions have been initiated or completed since the Applicant (PacifiCorp, doing business as Rocky Mountain Power) submitted an *Application for Transportation and Utility Systems and Facilities on Federal Lands* (Standard Form 299) on November 28, 2007, initiating the BLM and cooperating agencies' review of the Project.

The BLM and cooperating agencies have collaborated to prepare the EIS in accordance with current relevant law, regulation, policies, and plans; including those guiding agency decisions that may have an impact on sage-grouse and sage-grouse habitat. This appendix addresses actions and planning undertaken by the BLM, cooperating agencies, and the Applicant to prepare the EIS and potentially develop the Project in compliance with applicable law, regulation, policies, and plans related to sage-grouse.

The BLM and cooperating agencies collaborated to prepare a *Framework for Sage-grouse Impacts Analysis for the Energy Gateway South Transmission Project* (April 2013; Exhibit F1) as an early step to addressing potential impacts on sage-grouse during preparation of the EIS. The framework outlines the analysis and potential mitigation required for agencies whose decisions pertaining to the Project are evaluated in the EIS to adequately analyze the potential effects of the Project on sage-grouse and sage-grouse habitat and potentially select an action alternative that would be consistent with agency missions and goals pertaining to sage-grouse conservation. The framework also was developed to facilitate relevant cooperating agency decisions and evaluation of compliance with applicable plans and policies that are not subject to National Environmental Policy Act review and not addressed in the EIS.

F.2 Applicable Sage-grouse Policies and Plans

F.2.1 Federal

F.2.1.1 Bureau of Land Management Washington Office Instruction Memorandum 2012-043 Greater Sage-Grouse Interim Management Policies and Procedures

On December 22, 2011, BLM issued Washington Office (WO) Instruction Memorandum (IM) 2012-043, which provides interim conservation policies and procedures for greater sage-grouse that are to be applied by BLM field offices to ongoing and proposed authorizations and activities. The purpose of the WO-IM 2012-043 is to promote sustainable greater sage-grouse populations and conserve greater sage-grouse habitat while BLM develops and decides how to best incorporate long-term conservation measures for greater sage-grouse into applicable land-use plans. The IM policies and procedures apply to BLM actions in preliminary priority habitat (PPH) and preliminary general habitat (PGH) for greater sage-grouse, which will be identified by the state wildlife agencies. (Note: The conservation policies and procedures described in the IM do not apply in areas where a state and/or local regulatory mechanism has been developed for the conservation of the greater sage-grouse in coordination and concurrence with the FWS, and the state sage-grouse plan has subsequently been adopted by the BLM through the issuance of a state-level BLM Instruction Memorandum). The WO-IM 2012-043 prescribes specific procedures for pending and future right-of-way applications in preliminary priority and preliminary general habitat. The Notice of Intent to prepare an EIS for the Project was published in the *Federal Register* on April 1, 2011, and therefore these procedures are applicable to the Project.

WO IM 2012-043 procedures for pending and future right-of-way applications in preliminary priority habitat include:

- Conduct pre-application meetings for all new right-of-way proposals consistent with the right-of-way regulations (43 Code of Federal Regulations [CFR] 2804.10) and consistent with current renewable energy right-of-way policy guidance (WO-IM-2011-061, issued February 7, 2011).
- For pending applications, assess the impact of the proposed right-of-way on greater sage-grouse and its habitat, and implement the following:
  - Ensure that reasonable alternatives for siting the right-of-way outside of the PPH or within a BLM-designated utility corridor are considered and analyzed in compliance with the National Environmental Policy Act
  - Identify technically feasible best management practices, conditions, etc. (e.g., siting, burying powerlines) that may be implemented in order to eliminate or minimize impacts
- For right-of-ways where the total project disturbance from the right-of-way and any connected action is less than 1 linear mile, or 2 acres of disturbance, develop mitigation measures related to construction, maintenance, operation, and reclamation activities that, as determined in cooperation with the respective state wildlife agency, would cumulatively maintain or enhance greater sage-grouse habitat.
- For right-of-way applications where the total project disturbance from the right-of-way and any connected action is greater than 1 linear mile or 2 acres of disturbance, it is BLM policy that where a field office determines that it is appropriate to authorize a right-of-way, the following process must be followed:
  - The BLM will document the reasons for its determination and require the right-of-way holder to implement measures to minimize impacts on sage-grouse habitat.
  - In addition to considering opportunities for onsite mitigation, the BLM will, to the extent possible, cooperate with project proponents to develop and consider implementing appropriate offsite mitigation that the BLM, coordinating with the respective state wildlife agency, determines would avoid or minimize habitat and population-level effects (refer to WO-IM-2008-204, Off-site Mitigation). When developing such mitigation, the BLM should consider compensating for the short-term and long-term direct and indirect loss of greater sage-grouse and its habitat.
  - Unless the BLM determines, in coordination with the respective state wildlife agency, that the proposed right-of-way and mitigation measures would cumulatively maintain or enhance greater sage-grouse habitat, the proposed right-of-way decision must be forwarded to the appropriate BLM State Director, State Wildlife Agency Director, and FWS representative for

their review. If this group is unable to agree on the appropriate mitigation for the proposed right-of-way, then the proposed decision must be forwarded to the Greater Sage-Grouse National Policy Team with the addition of the State Wildlife Agency Director, when appropriate, for its review. If the National Policy Team and the State Wildlife Agency Director are unable to agree on the appropriate mitigation for the proposed right-of-way, the National Policy Team will coordinate with and brief the BLM Director for a final decision in absence of consensus.

The three states crossed by the Project (Wyoming, Colorado, and Utah) all have statewide sage-grouse management plans and are participating with BLM and U.S. Forest Service (USFS) in the ongoing amendments of resource management plans (RMPs) and land and resource management plans (LRMPs), respectively, and interim management of sage-grouse differently as follows:

- Wyoming has established a state regulatory mechanism for the conservation of the sage-grouse and the BLM has adopted this state strategy through the issuance of BLM IM WY 2012-019; therefore, PPH and PGH will not be designated in Wyoming. The Wyoming Core Areas have been adopted by the BLM.

- Colorado has developed PPH and PGH that focus conservation efforts on the most important habitat for the species and provides a biological basis for land use recommendations under BLM WO IM 2012-043 and is participating with the BLM in the ongoing amendments of RMPs in Colorado.

- Utah has developed a state regulatory mechanism for the conservation of sage-grouse that could be adopted by the FWS and BLM in place of the conservation measures identified in the IM and has not designated PPH and PGH. However, BLM has not adopted the state regulatory mechanism at this time. For the purposes of identifying PPH and PGH, BLM considers the Utah Division of Wildlife Resources (UDWR) occupied sage-grouse habitat layer to be synonymous with PPH in the Utah; no PGH has been identified.

F.2.1.2 U.S. Forest Service Interim Recommendations for Greater Sage-grouse and Greater Sage-grouse Habitat

On October 12, 2012 the USFS issued Interim Recommendations for Greater Sage-Grouse and Greater Sage-Grouse Habitat. Similar to BLM WO IM 2012-043, the USFS Interim Recommendations provide conservation policies and procedures for greater sage-grouse that are to be applied on National Forest system land until USFS LRMPs are incorporated to include sage-grouse conservations measures. Additionally, USFS seeks to promote consistency with BLM management of sage-grouse on BLM-administered lands under BLM WO IM 2012-043.

The USFS Interim Recommendations for Greater Sage-Grouse and Greater Sage-Grouse Habitat recommendations for nonrecreational special use proposals including power lines direct USFS to:

- Within 3 kilometers of sage-grouse habitat, avoid authorizing placement of overhead power lines or other tall structures that provide perch sites for raptors.
- Determine, in coordination with the respective state wildlife agency, whether a proposal that may affect sage-grouse or sage-grouse habitats would likely have more than minor adverse effects on sage-grouse or sage-grouse habitat.
- If the proposed use likely would have more than minor adverse effects on sage-grouse habitat:
    - Consider feasible alternatives for siting the use outside of sage-grouse habitat; and

  - Identify technically feasible best management practices in terms of siting placement of overhead power lines or other tall structures (e.g., burying power lines) that may be implemented, to avoid or minimize impacts on sage-grouse or sage-grouse habitats.
- In consultation with the state wildlife agency, develop mitigation measures for construction, maintenance, operation, and reclamation of the proposed use that minimize impacts on sage-grouse habitat.

F.2.1.3 BLM Resource Management Plans and USFS Forest Plans

Many BLM RMPs and USFS LRMPs contain land-use restrictions to promote sage-grouse conservation (e.g., limitations on development activities near sage-grouse leks). Restrictions identified in applicable plans are detailed in EIS Appendix E, Table E-11 and have been considered in the analysis presented in Chapter 3. BLM and USFS are currently preparing amendments and EISs for applicable RMPs and LRMPs in Wyoming, Colorado, and Utah to include additional sage-grouse conservation measures. The BLM and USFS amendments of applicable land-use plans are anticipated to be complete prior to the Record of Decision for the Project. If an action alternative is selected, the Project would be developed in compliance with the conservation measures in applicable BLM RMPs and USFS LRMPs.

F.2.2 State

F.2.2.1 Wyoming

The Governor of Wyoming issued Executive Order 2011-5 in June 2011. Executive Order 2011-5 replaced previous executive orders pertaining to sage-grouse in Wyoming and established a state regulatory mechanism to protect sage-grouse and sage-grouse habitat. The Executive Order established Core Population Areas and focuses conservation efforts in these areas including limits on the density of surface disturbance and restrictions on surface occupancy and seasonal use (EIS Appendix E, Table E-11). Additionally, the Executive Order established new transmission line corridors through the Core Population Areas and implemented restrictions on development of new transmission lines within core areas outside of the established corridors.

In addition to Executive Order 2011-5, the Wyoming Game and Fish Commission adopted the Wyoming Greater Sage-grouse Conservation Plan in 2003. The plan was developed to maintain and improve sage-grouse habitats in Wyoming, provide for coordinated management across jurisdictional or ownership boundaries, and develop the statewide support necessary to assure the survival of Wyoming's sage-grouse populations. The plan is intended to be used as guidance regarding sage-grouse management by state and federal agencies in Wyoming and the Wyoming Game and Fish Commission has sought agreements with federal agencies to implement the plan.

F.2.2.2 Colorado

The Colorado Greater Sage-grouse Steering Committee published the Colorado Greater Sage-grouse Conservation Plan in 2008. The purpose of the plan is to facilitate the conservation of sage-grouse and their habitats in Colorado by supporting goals that, if achieved, would facilitate the recovery of the species and result in its removal from the state's species of concern list. Guidelines for sage-grouse protection from populations and habitat disturbance were developed as a part of the plan (EIS Appendix E, Table E-11). Colorado Parks and Wildlife works collaboratively with federal, state, and local agencies as well as local working groups to implement the recommendations included in the plan.

The Colorado Department of Natural Resources is working collaboratively with BLM during the ongoing amendment of BLM RMPs to include sage-grouse conservation measures and is providing information to

FWS for consideration in its development of a listing decision for the species. This work includes the identification of sage-grouse PPH and PGH in the state as well as preparation of "The Colorado Package," a compilation of accomplishments and ongoing actions to promote sage-grouse conservation based on the strategies identified in the 2008 Colorado Greater Sage-grouse Conservation Plan.

F.2.2.3 Utah

The Governor of Utah approved the Conservation Plan for Greater Sage-grouse in Utah in April 2013. The plan is designed to eliminate the threats facing sage-grouse while balancing the economic and social needs of the residents of Utah by establishing incentive-based conservation programs for private, local government, and School and Institutional Trust Lands Administration lands and regulatory programs on other state- and federally managed lands. To achieve this goal, the plan establishes sage-grouse management areas and implements management protocols in these areas. Management provisions in sage-grouse management areas include seasonal and spatial restrictions on development activities, limits on extent of new cumulative permanent disturbance, and special provisions for electric transmission lines.

Additionally, the UDWR published the Utah Greater Sage-grouse Management Plan in 2009. The plan identifies threats and issues affecting sage-grouse management in Utah as well as goals, objectives, and strategies intended to guide UDWR, local working groups, and land managers efforts to protect, maintain, and improve sage-grouse populations and habitats and balance their management with other resource uses.

F.2.3 Local

F.2.3.1 Local Area Working Groups

The Project could cross sage-grouse habitats in the boundaries of eight sage-grouse local working groups; three in Utah (Uinta Basin, Strawberry Valley, and Castle Country), three in Colorado (Northwest Colorado, Piceance/Parachute/Roan Creek, and Pinon Mesa), and 2 in Wyoming (Bates Hole/Shirley Basin and South-central Wyoming). Each local working group has prepared a conservation plan to assess the status of local populations, to provide guidance and recommendations to meet objectives for maintaining sage-grouse populations and improving habitat, and to promote incorporation of local knowledge and local participation in larger efforts to promote conservation of sage-grouse.

F.3 Coordination and Actions Taken to Comply With Applicable Plans and Policies

Sage-grouse and sage-grouse habitats are widespread in landscapes crossed by the alternative routes in Wyoming, Colorado, and Utah. BLM and the cooperating agencies acknowledged that alternative routes that avoid sage-grouse and sage-grouse habitat would not be feasible early during the preparation of the EIS. The agencies collaborated with the Applicant to identify feasible strategies to avoid, minimize, and compensate for the potential effects of the Project on sage-grouse pursuant to the plans and policies described in Section F.2.

F.3.1 Project Siting

The BLM worked with the cooperating agencies and the Applicant to avoid and minimize potential effects on sage-grouse by identifying and eliminating or modifying alternative routes that would have substantially greater effects on sage-grouse or sage-grouse habitat compared to other alternative routes considered.

F.3.3.1 Routes Eliminated from Further Consideration

Transmission line alternative routes and segments included in the Applicant's Application for Transportation and Utility Systems and Facilities on Federal Lands were systematically screened and analyzed using the methods described in EIS Sections 2.5.1.1 and 2.5.1.3. Alternative routes that would have substantially higher impacts on sage-grouse and sage-grouse habitat compared to other alternative routes studied were eliminated from further consideration in the EIS. Alternative routes and segments that were eliminated from further consideration at least in part due to their impacts on sage-grouse and sage-grouse habitats include (refer to *Energy Gateway South Transmission Project Siting Study Report*, BLM 2012; EIS Section 2.5.1.1; and EIS Maps 2-3a and 2-3b):

Wyoming

- Links W17 and W18 were eliminated from consideration because they cross the Hannah sage-grouse core area outside of the utility corridor identified in the Wyoming Governor's Executive Order 2011-5 and are not parallel to an existing transmission line. Therefore, these links do not comply with the Executive Order regarding greater sage-grouse core area protection.
- Links W19 and W20 were eliminated from consideration because they cross the Hannah and South Rawlins sage-grouse core areas outside of the utility corridor identified in the Wyoming Governor's Executive Order 2011-5 and do not parallel to an existing transmission line. Therefore, these links do not comply with the Executive Order regarding greater sage-grouse core area protection.
- Links W453, W454, W490, W491, W492, W493, and W520 were eliminated from consideration because any route using these links would be required to cross the Salt Wells sage-grouse core area outside of the utility corridor identified in the Wyoming Governor's Executive Order 2011-5 and would not be parallel to an existing transmission line. Therefore, alternative routes using these links do not comply with the Executive Order regarding greater sage-grouse core area protection. Additionally, alternative routes using these links may have substantial impacts on sage-grouse in Utah (refer to description of Links U20, U30, and U90).

Colorado

- Links C50, C45, C51, and C80 were eliminated from consideration because they cross important habitats that support some of the highest densities of breeding sage-grouse in the Northwest Colorado sage-grouse population, which is the largest sage-grouse population in Colorado.

Utah

- Links U20, U30, and U90 were eliminated from consideration because they cross important habitats occupied by the Diamond Mountain sage-grouse population, which is one of the largest and most robust sage-grouse populations of sage-grouse in Utah. Additionally, alternative routes using these links may have substantial impacts on sage-grouse in Wyoming (refer to description of Links W453, W454, W490, W491, W492, W493, and W520).
- Link U322 was eliminated from consideration because it crosses important habitats occupied by the Halfway Hollow sage-grouse population that have not been affected by previous transmission line development. Additionally, alternative routes using this link may have substantial impacts on other important sage-grouse habitats in Wyoming and Utah (refer to description of Links W453, W454, W490, W491, W492, W493, W520, U20, U30, and U90).
- Links U422 and U423 were eliminated from consideration because they are not located adjacent to an existing high-voltage transmission line and therefore would have greater impacts on sage-

grouse compared to Links U425, U426, and U427, which were retained for analysis, where they cross important habitats occupied by the Strawberry/Fruitland sage-grouse population.

F.3.3.2 Revision to Alignments and Incorporation of Local Route Variations

The BLM, cooperating agencies, and the Applicant worked collaboratively to refine the alternative routes analyzed in the EIS, as practicable, to avoid or minimize effects on sage-grouse and important sage-grouse habitats. These refinements included local adjustments to the alternative routes to locate them outside of designated sage-grouse habitat or in habitats of lower value to sage-grouse and development of local route variations that would avoid important sage-grouse habitats. Segments that were refined and local route variations that were developed at least in part to reduce potential effects on sage-grouse and sage-grouse habitats include:

Wyoming

- The alignment of Link W21 was refined to reduce impacts on sage-grouse by locating the segment closer to other planned infrastructure and closer to the center of the utility corridor identified in Wyoming Governor’s Executive Order 2011-5 in the Hanna sage-grouse core area.

Colorado

- The alignment of Links C61, C71, C72, and C91 were refined to reduce impacts on sage-grouse, to the extent practicable, by locating the segments farther away from known sage-grouse leks and outside of sage-grouse priority habitat used by the Northwest Colorado sage-grouse population.

Utah

- The alignment of Links U401 and U404 were refined to avoid important habitats occupied by the Anthro Mountain sage-grouse population.
- Links U409, U411, U520, U514, U516, U560, U515, U540, and U513 were developed to provide local route variations in Utah that would avoid sage-grouse leks and other important habitats occupied by the Emma Park sage-grouse population, which is one of most robust sage-grouse populations in Utah (refer to EIS Section 3.2.8.5).

F.3.2 Development of Additional Onsite Mitigation

The BLM, cooperating agencies, and the Applicant are working collaboratively to develop onsite mitigation measures that could be used to reduce impacts on sage-grouse and sage-grouse habitat in addition to the mitigation measures in applicable BLM, USFS, and state agency plans. Development of additional onsite mitigation measures to reduce potential effects on sage-grouse is ongoing and the final measures will be outlined in the Applicant’s voluntary sage-grouse conservation and mitigation plan for the selected alternative route. Mitigation measures that have been agreed-on include:

- Modification of the proposed tower design to use H-frame tubular steel structures (Selective Mitigation Measure 6 [EIS Table 2-13]) and the installation of perch deterrents on these structures (Selective Mitigation Measure 14) within 4 miles of sage-grouse leks in designated sage-grouse core areas and priority habitats to reduce potential sage-grouse predation by raptors (refer to EIS Section 3.2.8.4).

Other mitigation measures that are being considered include:

- Reduced speed limits during construction and maintenance activities to reduce risk of sage-grouse collision with moving vehicles and reduce disturbance to sage-grouse resulting from vehicle noise;
- Additional restrictions on use of herbicides in areas where sage-grouse are known to congregate;
- Special reclamation standards focused on restoring functionality and quality of sage-grouse habitat beyond the minimum standards required by agency policy;
- Expanded seasonal and spatial restrictions in important sage-grouse habitats beyond the minimum restrictions required by applicable agency policies and plans; and
- Reducing the separation between the Project and other linear infrastructure (including other transmission lines) for short distances in important sage-grouse habitats where high levels of impact on sage-grouse are anticipated.

F.3.3 Development of Offsite Mitigation

Despite removing and modifying alternative routes and segments that would have comparatively higher impacts on sage-grouse and implementing additional onsite mitigation, BLM and the cooperating agencies anticipate that implementation of any of the alternative routes analyzed in the EIS would result in high residual impacts on sage-grouse and sage-grouse habitat (refer to EIS Section 3.2.8.5). The residual impacts would not be consistent with the objectives for sage-grouse and sage-grouse habitat management identified in applicable agency plans and policies (Section F.2). In accordance with BLM WO IM 2013-142 and other cooperating agency policies pertaining to offsite mitigation, BLM, the cooperating agencies, and the Applicant are working collaboratively to develop appropriate offsite mitigation that could be implemented to facilitate reasonable development of the Project consistent with applicable agency plans and policies pertaining to sage-grouse. To facilitate this collaboration, the Applicant has convened a group of sage-grouse biologists from the BLM and cooperating agencies (the Habitat Equivalency Analysis [HEA] Technical Working Group) to provide input and guidance for developing the Applicant's Sage-grouse Mitigation Plan, including the HEA (refer to EIS Section 6.2.2.1). The methods used in development of the Applicant's Sage-grouse Mitigation Plan, including the HEA and the types of offsite mitigation being considered are described in Exhibit B (Energy Gateway South Transmission Project Greater Sage-grouse Habitat Equivalency Analysis Plan).

F.4 Applicant Provided Commitments for Mitigation

The following statement was prepared by the Applicant to outline the company's intention to prepare a voluntary sage-grouse conservation and mitigation plan for the selected alternative route:

> The Draft EIS analysis describes potential Project-related impacts on sage-grouse and their habitat. These impacts have been minimized or avoided to the extent feasible by the BLM and cooperating agencies using avoidance and minimization measures (e.g., seasonal restrictions) from applicable BLM, USFS, and other applicable land-use and conservation plans. After application of these avoidance and mitigation measures, the BLM analysis indicates that impacts on sage-grouse and their habitat are likely to occur as a result of implementation of the Project. To meet requirements of BLM IM 2012-043, October, 2012 USFS Manual updates, and other applicable agency policies, Rocky Mountain Power will take voluntary actions to avoid, minimize, and compensate for the Project's effects on sage-grouse and their habitat.
>
> The agencies have developed a framework for Sage-grouse Impacts Analysis for the Energy Gateway South Transmission Project. The framework is used by the Applicant

and the agencies to identify and analyze Project-related impacts and develop adequate mitigation. The framework identifies the use of a Habitat Equivalency Analysis (HEA), conducted by the project Applicant, as a replicable method for determining mitigation that is scaled to Project-related permanent and interim losses of sage-grouse habitat services.

In coordination with the agencies, Rocky Mountain Power will develop a voluntary sage-grouse conservation and mitigation plan for the preferred alternative route. The final plan will document Rocky Mountain Power's offer of scaled mitigation and other voluntary Applicant-committed mitigation measures for sage-grouse. The mitigation plan will offer measures to avoid, minimize, or compensate for all Project effects characterized by the framework and identified in the EIS that could not be mitigated or avoided using measures in BLM or other agency plans, including losses of habitat services quantified using the HEA.

F.4.1 Energy Gateway South Transmission Project Greater Sage-grouse Habitat Equivalency Analysis Plan

The *Energy Gateway South Transmission Project Greater Sage-grouse Habitat Equivalency Analysis Plan*, developed by the Applicant in coordination with the HEA Technical Working Group (refer to EIS Section 6.2.2.1) is included as Exhibit F2.

Exhibit F1 –
Framework for
Sage-grouse Impacts Analysis

Framework for Sage-grouse Impacts Analysis for the Energy Gateway South Transmission Project

December 3, 2013

(1) Evaluation of Direct and Indirect Impacts - This portion of the overall Greater Sage-Grouse (hereafter sage-grouse) Impacts Assessment Framework addresses Project-related habitat impacts that bear directly on listing factors considered by the U.S. Fish and Wildlife Service (FWS) when evaluating the need to provide full listing protection under the Endangered Species Act (ESA).

A starting point for this analysis is a thorough review of the threats assessment/five factor analysis that FWS conducted as part of the March 23, 2010 (75 FR 13910), listing of the sage-grouse as a Candidate under ESA. An evaluation of all potential threats to sage-grouse and sage-grouse habitat from the transmission line should be conducted incorporating the latest available scientific information—most of which is referenced in the *Federal Register* notice itself.

Of particular importance is the synthesis evaluation of all potential threats of the Project that operate cumulatively to impact sage-grouse populations and habitat in a way that is not adequately evaluated by examining threats independently. The direct, indirect and cumulative impacts analysis for the Project should consider the *Federal Register* notice cumulative threats assessment summary as an example of how to fully analyze impacts associated with the proposed project. Reference to additional scientific information published since the issuance of the *Federal Register* notice is available on the FWS website and should be incorporated into the analysis: Best available scientific information should be used in the direct, indirect and cumulative impacts analysis.

A project environmental affects analysis of sage-grouse populations that attend leks within 18 kilometers of the Project is a critical component of an indirect impacts analysis for the species. Sage-grouse that attend leks up to 18 kilometers from the Project may be indirectly affected by the loss of habitat functionality during other seasons of the year (Connelly et.al. 2000). The construction of a transmission project or other linear facility may pose additional hindrance of seasonal migration patterns or avoidance of important seasonal habitats once used extensively by local sage-grouse populations. Qualitative and quantitative measures of habitat change must be considered in describing the potential impacts of the Project. In the context of managing a species that requires such a large landscape of habitats to meet their life-cycle needs, and the nature of the proposed disturbance, it is reasonable to make some assumptive predictions about the relative impacts within 18 kilometers.

(2) Addressing Direct Loss of Birds - This piece of the overall Greater Sage-Grouse Impacts Assessment Framework is an important contribution to the range wide jeopardy analysis conducted as part of the informal conferencing process for this Candidate species. Additionally, addressing impacts on populations provides key information needed for completing any potential future formal Section 7 consultation that would be required if the sage-grouse is ultimately listed under ESA during project development, thereby significantly streamlining this process.

FWS is actively working on this issue as it relates to range wide sage-grouse conservation. There are two ways that the Applicant is expected to help resolve this concern:

(a) Work closely with FWS and state agency biologists to develop an approach to address loss of birds from Project-related impacts and their replacement. This will include development of a monitoring plan utilizing best and most current scientific methods for estimating loss of birds during both construction and operational periods after the Project is constructed. Monitoring would be conducted using a Bakke design (preconstruction, postconstruction, and control site monitoring) to compare changes in local populations and habitat use that could occur in the analysis area.

(b) Contribute financially to research projects that have been designed specifically to address this issue.

(3) Mitigation - An impacts analysis that has been conducted in coordination with agency biologists—leading to an adequate understanding of impacts on sage-grouse populations and habitat—is necessary to identify mitigation needs and to develop mitigation plans that focus on the amount and locations of impacts and commensurate mitigation measures and actions. Discussion and evaluation of mitigation should be relevant to local identified impacts and with the understanding that mitigation ratios will remain the same across state lines. That is, a bird in Wyoming is equivalent to one in Colorado or Utah; an acre of nesting habitat in Colorado is worth as much in Wyoming and Utah; etc. Mitigation actions should also focus on localized replacement of ecological values for GSG impacted by the Project with replacement, recovery, or compensation of habitat values planned to be located as closely as possible to where the impacts occurred. However, biological factors may provide a valid basis for adjusting the minimal mitigation ratio beyond one-to-one replacement of values. Three such factors include: (a) the best available scientific information regarding the relative value of sage-grouse populations contributing to long-term species viability across the species' range points to the relative importance of central and southwestern Idaho, central and northwestern Nevada, eastern Oregon, and the state of Wyoming; (b) regarding individual birds, hens have a much higher biological value, in terms of contribution to populations, than males; and (c) localized habitats of high ecological value including (but not limited to) those serving key functions in demographic, genetic, or seasonal connectivity, important wintering areas, or leks.

There will be two primary components of mitigation, a Project-wide mitigation plan and the Habitat Equivalency Analysis (HEA) described in this section. The mitigation plan will include the HEA as articulated below, as well as any other impacts as identified in the EIS (i.e., indirect impacts) and associated mitigation not included in the HEA.

(a) An overarching Project-wide sage-grouse mitigation plan will be developed that includes a description of all Project-related impacts and mitigation measures that will be used to offset/compensate for them.

(b) The HEA provides a standardized basis to determine a one-to-one ratio for habitat services lost/ habitat services mitigated. For this Project, functionality of habitat to support sage grouse is the habitat service of interest. Habitat services lost can be quantified and where possible replacement habitat services of equal kind and value would be provided as mitigation. However, replacement of in-kind habitat services may not be possible in all locations, so habitat services ratio of services lost to services replaced may be greater than 1:1 in some areas

HEA is a method of quantifying the permanent or interim loss of habitat services from Project-related impacts. HEA provides a scientific-based, peer-reviewed method of scaling mitigation requirements, and has been used by federal regulatory agencies including the FWS and National Oceanic and Atmospheric Administration. The HEA is not meant to be an impacts analysis in and of itself; rather, it is a way to objectively determine quantity of Project-related habitat impacts and provides the quantity and type of mitigation necessary to offset loss of habitat services as a form of output.

The HEA process for Gateway South is an Applicant-lead effort that requires close collaboration with state agencies in states sustaining most of the impacts on populations and habitat (Wyoming, Colorado, and Utah) as well as FWS and BLM biologists and local working groups to ensure adequacy of analysis and a corresponding final product. Building models associated with the HEA process must be done in close coordination with agency biologists and local working groups in order to address concerns, questions, assumptions, and issues as they arise.

Agency biologists recognize the need for the incorporation of data and information in the HEA models that the Applicant may not currently have. Agency biologists will work with the Applicant to obtain such information to the extent they can (e.g., habitat maps; adequate vegetation data) again, reiterating the need for an interactive approach between the Applicant and agency biologists in order to ensure adequate completion of the HEA.

The initial starting point for evaluating direct and indirect impacts on sage-grouse habitat will be 18 kilometers either side of the proposed transmission line, addressing impacts on roughly 98 percent of nesting hens according the best available scientific information. Any deviation from this starting point must be supported by scientific literature and collaboratively determined to be appropriate if habitats do not extend to those distances: agency biologists can direct the Applicant to recently published literature on this topic which the Applicant is encouraged to use.

Calculating Density of Disturbance within Key Habitat (Applied in Wyoming only)

Once the analysis is complete and an alternative has been selected, an additional site-specific evaluation of density of disturbance within Key Habitats/Core Areas may be conducted. The purpose of this evaluation is to evaluate opportunities to (1) minimize density of disturbance within Key Habitats/Core Areas that are outside the designated disturbance corridor identified in the Wyoming Governor's Executive Order 2011-5 and (2) restore and/or enhance important sage-grouse habitat as a part of Project-related mitigation. These site-specific habitat evaluations also will enable BLM to: (a) demonstrate compliance with the *Greater Sage-Grouse Habitat Management Policy on Wyoming BLM Administered Public Lands including Federal Mineral Estate* (IM WY-2010-012); and (b) demonstrate consistency with the *Greater Sage-Grouse Core Area Protection*, Wyoming Governor's Executive Order 2011-5. In Colorado and Utah, if density disturbance calculations are completed, they will be closely coordinated with the appropriate state and federal agencies to ensure that each state's Key Habitat areas are appropriately identified and considered in the Density disturbance calculation (DDC).

The overall goal of a Sage-Grouse Key Habitat/Core Area Strategy is to limit the density and duration of disturbances and restrict activities within Key Habitats/Core Areas sufficient to ensure the long-term conservation and management of sage-grouse within each state. To this end, the DDC is a tool designed to measure habitat loss within the Key Habitat/Core Area. In particular, in Wyoming, it is used to determine—in terms of management actions— how the Project-related disturbance can be limited to no more than 5 percent loss of habitat and result in no more than an average of one disturbance per 640 acres.

Step 1: Determination of leks that will be used in the site-specific evaluation:
Place a four-mile boundary around the outer Project boundary (as defined by the proposed area of disturbance related to the Project, i.e., right-of-way width, or similar). All occupied and undetermined sage-grouse leks located within four miles of the outer boundary of the Project, and within Key Habitat/Core Areas, the will be considered in the DDC.

Step 2: Determine the DDC area size and configuration:
A four-mile boundary placed around the perimeter of each lek identified in Step 1 and the area within the boundary of the leks, plus the four-mile Project boundary, creates the DDC area for the Project.

Step 3: Density of disturbance habitat evaluation:
Disturbance will be evaluated for the DDC area as a whole, as well as for individual leks within the DDC area. Any portion of the DDC that falls outside Key Habitat/Core Area will be removed from this portion of the evaluation for Wyoming to maintain consistency with the provisions in Wyoming Executive Order 2011-5.

<u>Disturbance Calculation</u>: Total acres of "disturbance" within the DDC area will be determined through an evaluation of:

a. Existing and proposed disturbance—sage-grouse habitat that is disturbed by existing anthropogenic features or activities (e.g., transmission lines, distribution lines, wind development, oil/gas wells/facilities, active mine areas, geothermal, communication towers, pipelines, paved and improved roads, and others) and wildfire, including the full right-of-way width of the Proposed Action;

b. Approved permits (i.e., any state or federal permits providing approval for on the ground actions) for projects not yet implemented or constructed.

Habitat Disturbance Evaluation: In Wyoming, for projects that will result in disturbance of more than 5 percent of the DDC area, it may be advantageous for the Applicant to map the full extent of sage-grouse habitat within the DDC area in order to reduce this percentage. If this is done, it will be conducted to identify:

a. "Suitable Habitat" and "Marginal Habitat" using BLM's Habitat Assessment Framework and unsuitable habitats within the DDC area
b. Sage-grouse evidence of use of suitable habitats (seasonal use, densities based on best available information)
c. Priority restoration areas (which could reduce the existing disturbances to below the 5 percent threshold), for example:
    i) Areas where plug and abandon activities on retired oil and gas wells will eliminate disturbance
    ii) Areas where past reclamation has not produced suitable habitat
d. Areas of invasive species
e. Lands where other conservation assurances are in place (e.g., candidate conservation agreement with assurances, easements, habitat contract, etc.)

Step 4: Determination of existing and allowable suitable habitat disturbance:
Acres of disturbance within suitable habitat divided by the total suitable habitat within the DDC area, multiplied by 100, represents the percent of disturbed suitable habitat within the DDC area. In Wyoming, subtracting the percentage of existing disturbed suitable habitat from 5 percent equals new allowable suitable habitat disturbance until plant regeneration or reclamation reduces acres of disturbed habitat within the DDC area.

Exhibit F2 –
Greater Sage-grouse
Habitat Equivalency Analysis Plan

PACIFICORP
A MIDAMERICAN ENERGY HOLDINGS COMPANY

Rocky Mountain Power | Pacific Power
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Salt Lake City, Utah 84116

Energy Gateway South Transmission Project Greater Sage-grouse Habitat Equivalency Analysis Plan

Prepared by

Rocky Mountain Power – PacifiCorp

May 2013

Energy Gateway South Transmission Project
Greater Sage-grouse Habitat Equivalency Analysis Plan

Prepared by

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May 2, 2013

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

The Gateway South Transmission Line Project (Gateway South or Project) is part of PacifiCorp's transmission expansion program, called Energy Gateway, which is intended to connect new and existing energy generation resources to customers throughout PacifiCorp's service territory. Energy Gateway is composed of several large-scale projects that will support increasing electric energy use and improve system reliability.

The Project is designed to provide 1,500 megawatts (MW) of new capacity needed to meet the current and forecasted needs of PacifiCorp's customers. These forecasts are based on PacifiCorp's Integrated Resource Plan (IRP) as required to fulfill the regulatory requirements and guidelines established by the public utility commissions of the states served by PacifiCorp. The IRP addresses the obligations of each company, pursuant to the Open Access Transmission Tariff, to plan for and to expand its transmission system in a non-discriminatory manner based on the needs of its native load and network customers.

Gateway South is independent of, and would be proposed regardless of, any particular new generation project. The transmission grid can be thought of in terms of hubs, spokes, and a backbone connecting the hubs. Each substation is a hub that receives or sends electricity along the spokes. For this system to work, a backbone of high-capacity transmission lines (including Gateway South) is needed to connect the hubs and transport the electricity from the source to the customer.

Gateway South will:

- Provide long-term transmission capacity to move resources to growing load centers;
- Connect Gateway West and Gateway Central, which will provide operational flexibility for the bulk electric network, increase reliability of the network, and support path ratings for each segment;
- Improve capacity and reliability of other interconnected transmission lines associated with Energy Gateway;
- Reduce transmission limitations on the existing system; and
- Provide incremental transmission capacity planned at approximately 1,500 MW.

As proposed, the Project would be comprised of an extra high-voltage alternating current (AC) transmission line that would run between existing, planned, and proposed substations. The proposed single-circuit 500-kilovolt (kV) transmission line would be approximately 400 miles in length; the line would begin at the planned Aeolus Substation near Medicine Bow, Wyoming, connect to two separate proposed series compensation substations, and terminate at the existing Clover Substation near Mona, Utah. Two proposed series compensation substations are planned at approximately the one-third and two-third points along the line between the Aeolus and Clover Substations. Modifications at the existing Mona Substation are required to re-terminate existing lines to accommodate the nearby 500-kV termination at Clover Substation.

Gateway South will cross federal, state, and private lands along its route from Wyoming to Utah. The federal lands are primarily administered by the Bureau of Land Management (BLM). As such, PacifiCorp filed an application with BLM for a right-of-way (ROW) grant across public lands. The BLM, in compliance with the National Environmental Policy Act of 1969 (NEPA), is preparing an environmental impact statement (EIS) for Gateway South to inform its decision making on PacifiCorp's ROW grant application.

In December 2011, BLM released an instruction memorandum to help guide conservation actions aimed at conserving greater sage-grouse (*Centrocercus uropahsianus*) (sage-grouse) and its sagebrush habitat. Instruction Memorandum No. 2012-043 (IM 2012-43) helps to balance conservation actions benefiting sage-grouse while maintaining a robust economy in the West by outlining processes for BLM field officials to follow when analyzing impacts to sage-grouse and developing appropriate mitigation. It also establishes the BLM's principles to protect unfragmented habitat; minimize new habitat loss and fragmentation; and manage habitats to maintain, enhance, or restore conditions for sage-grouse. In addition to considering opportunities for onsite mitigation, IM 2012-043 encourages BLM to cooperate with project proponents to develop appropriate off-site mitigation. Through on-site and off-site mitigation, the project proponent should avoid or minimize population-level project effects, as determined by the BLM and respective state wildlife agencies. The IM states when developing such mitigation, the BLM should consider compensating for the short-term and long-term direct and indirect loss of sage-grouse and its habitat.

The BLM, working in concert with the U.S. Fish and Wildlife Service (Service), developed a Framework for Sage-grouse Impacts Analysis (Framework; January 2011), which was applied to the Energy Gateway West Project. The BLM and Rocky Mountain Power decided that the Framework will be revised for application to Energy Gateway South (meeting April 4, 2013). The Framework addresses project-related impacts to sage-grouse habitat that bear directly on listing factors considered by the Service when evaluating the need to provide full listing protection under the Endangered Species Act (ESA). According to the Framework, mitigation is addressed after the NEPA-mandated impacts analysis has been conducted, resulting in an adequate understanding of impacts to sage-grouse populations and habitat, which is described in the EIS. The Framework specifies the use of Habitat Equivalency Analysis (HEA), conducted by the project proponent, as a replicable method for determining mitigation that is scaled to project-related permanent and interim habitat losses.

PacifiCorp will provide a final conservation and mitigation plan documenting the scaled compensatory mitigation to the BLM as a voluntary applicant-committed mitigation measure for sage-grouse. The mitigation plan will offer compensation for all project effects characterized by the Framework that could not be mitigated using other voluntary efforts (e.g., seasonal restrictions, speed limits, etc.). To comply with IM 2012-43 and to maintain consistency with the analysis for the Energy Gateway West Project, PacifiCorp will complete an HEA to determine the amount of compensatory mitigation necessary to offset some of the anticipated disturbance to sage-grouse habitat resulting from the construction, operation, and maintenance of Gateway South. The HEA will quantify mitigation due for a subset of the Project effects characterized by the Framework; the HEA can only be used to quantify mitigation for project effects that are known and quantifiable. Refer to the mitigation plan for specifics on mitigation projects and to review PacifiCorp's approach to mitigating project effects characterized by the Framework analysis that could not be modeled in the HEA.

The HEA will be completed for areas of known sage-grouse habitat in Wyoming, Colorado, and Utah that are intersected by the agency preferred alternative selected by the BLM through the NEPA process. This process requires close coordination with the BLM and other stakeholders to ensure the compensatory mitigation identified in the HEA offsets the impacts modeled from the Gateway South project to the extent required by BLM, U.S. Forest Service, and other applicable agency policy. PacifiCorp initiated meetings regarding the HEA with the BLM and other stakeholders prior to the identification of an agency preferred alternative due to the level of effort required to perform the HEA modeling and schedule constraints. The product of these early meetings is this HEA Plan; all HEA analyses will be conducted after the agency preferred alternative is identified in the Draft EIS per the Framework.

The HEA is not an impacts analysis for the Project. The impacts analysis for the Project is separate and is documented in the EIS. Rather, the HEA will be used as a decision-support tool by PacifiCorp to develop a mitigation plan for the agency preferred alternative. The HEA will quantify the mitigation due for the Project effects modeled and the value of conservation project types for offsetting that loss; the mitigation plan will disclose PacifiCorp's proposed mixture of project types and project specifications. It is anticipated that the HEA will model loss of habitat services associated with vegetation loss (direct effect), noise (indirect effect), and human presence (indirect effect). Additional Project effects (such as introduction and spread of invasive species; decreased lek attendance; habitat loss caused by behavioral avoidance of transmission corridors; increased public access and associated impacts [e.g., noise, trash]; and increased predation and nesting by raptors and corvids due to the presence of transmission structures) may not be included in the HEA because of lack of information necessary to establish a quantified relationship between the construction and operation of the transmission line and response by sage-grouse. PacifiCorp may still provide voluntary mitigation to reduce effects that are identified in the EIS analysis, but not quantified in the HEA, in the event that these effects are determined by the agencies to require mitigation.

The following sections describe the HEA process and identify the potential types of mitigation projects that could be used to compensate for the short-term and long-term direct and indirect loss of sage-grouse and its habitat.

OVERVIEW OF HABITAT EQUIVALENCY ANALYSIS

HEA is a science-based, peer-reviewed method of quantifying interim and permanent habitat injuries, measured as a loss of habitat services from pre-disturbance conditions, and scaling compensatory habitat requirements to those injuries (King 1997; Dunford et al. 2004; Allen et al. 2005; Kohler and Dodge 2006; National Oceanic and Atmospheric Administration [NOAA] 2006, 2009). Habitat services include those ecosystem features (physical site-specific characteristics of an ecosystem) and ecosystem functions (biophysical processes that occur within an ecosystem) that support wildlife and human populations (King 1997).

Habitat services are generally quantified using a metric that represents the functionality or quality of habitat (i.e., the ability of that habitat to provide wildlife "services" such as nest sites, forage, cover from predators, etc.). When wildlife habitat is the primary service of interest, areas with the highest habitat service levels are those areas with highest habitat quality. Interim (or short-term) habitat injuries are those services that are absent during certain phases of the project that would have been available if that disturbance had not occurred. Examples of interim habitat injuries include temporary vegetation losses, temporary soil partitioning, and temporary displacement of wildlife populations. Permanent habitat injuries are those habitat injuries remaining after project completion and interim reclamation and recovery are complete. Examples of permanent habitat injuries include permanent vegetation loss, permanent loss of wildlife or fisheries populations, irrecoverable impacts to soils or water as a result of contamination.

HEA uses a service-to-service approach to scaling. HEA does not assume a one-to-one trade-off in resources (in number of acres, for example); rather, HEA balances the number of services lost with those that are gained as a result of conservation activities (NOAA 2006). For example, 1 acre of land with a diverse vegetative structure and abundant tree canopy can support higher numbers of nesting songbirds (the habitat service of interest) than 1 acre of land with few trees and little vegetative diversity. The two land parcels, although equal in size, provide unequal habitat services.

What Does Habitat Equivalency Analysis Do?

HEA is an economics model that:

- Quantifies current habitat services provided in a project area or landscape (commonly referred to as the baseline habitat service level);
- Quantifies the interim and permanent injuries to the baseline habitat service level; and
- Determines appropriately scaled restoration and conservation activities to offset habitat services lost as a result of project impacts.

Benefits of Habitat Equivalency Analysis

The benefits of HEA include the following.

- High credibility – the approach has been evaluated and documented in scientific peer-reviewed literature and has held up in numerous court cases.
- Analysis is quantitative rather than qualitative in nature.
- Equations are straightforward, but have enough input variables to allow flexibility in project design.
- Provides a replicable method for negotiation of mitigation ratios, acceptable compensatory restoration, and/or fines.
- Valuable planning tool; can be used to evaluate the cost of multiple compensatory mitigation projects.

- Applicable to any ecosystem type where an appropriate habitat services metric can be defined.
- Currently the most commonly used method by natural resource trustees to assess damages to ecosystems.
- Used by federal regulatory agencies, such as the U.S. Fish and Wildlife Service, NOAA, BLM, Environmental Protection Agency, Department of Interior, U.S. Army Corps of Engineers.

When Habitat Equivalency Analysis Should be Used (Chapman 2004)

HEA is an appropriate tool for scaling mitigation when:

- Habitat services can be defined or modeled;
- Quantification of project impacts is possible;
- Replacement of services lost is feasible; and
- Conservation methods are sufficiently known.

COMPONENTS OF COMPENSATION

Compensation for habitat services (that is, the impact to sage-grouse habitat modeled by the HEA) includes two components: 1) recovery of the injured area (primary restoration; Figure 1), and 2) compensation for the interim loss of habitat services occurring prior to full recovery (compensatory restoration; Figure 2).

HEA quantifies the habitat services lost during the lifetime of a project compared to baseline (Area X in Figure 1) and scales the compensatory project so that it provides services that are equal to that loss (Area Y in Figure 2). Baseline refers to the quantity of habitat services that would have existed had the disturbance not occurred. The quantity of services lost (Area X) depends on the extent of the injury and the time required for restoration; actions taken to accelerate the rate of primary restoration would decrease the interim loss of habitat services, requiring less compensatory restoration. In some cases, full restoration of the lost services may not be feasible, in which case the area required for compensation (Area Y) would be larger. Compensatory restoration may occur off-site (such as by the purchase of additional habitat), or on-site through habitat improvements that increase habitat services above baseline (such as non-native vegetation removal, shrub thinning, or understory planting).

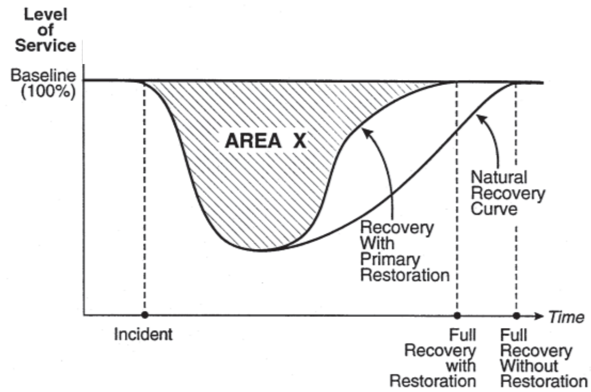

Figure 1. Changes in habitat service level compared to the baseline service level during construction and restoration (copied from King 1997). Area X represents the services lost at an injury site with Primary Restoration expressed as percent of baseline.

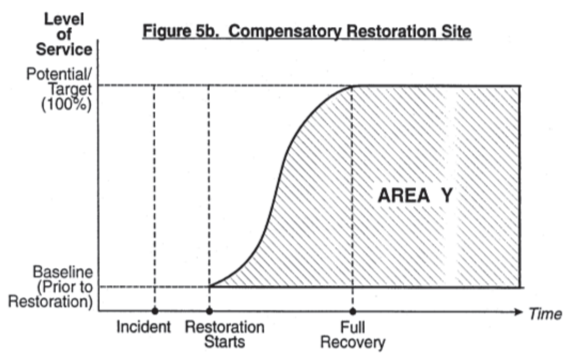

Figure 2. Changes in habitat service level with compensatory restoration (copied from King 1997). Area Y represents the services gained at the compensatory restoration site expressed as percent of potential/target level less baseline (pre-restoration) percent.

MEASURING HABITAT SERVICES (ECOLOGICAL ECONOMICS)

Quantifying the services provided by an ecosystem is a complex task. This complexity can be reduced through the use of an attribute, or metric, that provides a measure of the services of interest. The metric must be able to capture the relative differences in the quality and quantity of services being provided before and after restoration and between primary and compensatory sites (NOAA 2009).

Measurements of habitat services over the lifetime and area of a project are used in the HEA. These measurements have three components: land area, service level (or habitat quality level), and time. The relative service level can be quantified using a metric that measures or scores one or more key habitat elements for a species or wildlife community of interest. Examples of key habitat elements are vegetation stem density, vegetation type, nest density, percentage of canopy cover, and proximity to critical habitat. Habitat services are commonly expressed in service-acres or service-acre-years.

DATA NEEDED FOR HABITAT EQUIVALENCY ANALYSIS

Developing appropriate baseline metrics, quantifying project impacts, and identifying appropriate compensatory mitigation requires substantial and consistent datasets. Data for the following are needed to conduct an HEA.

- Evaluation of baseline services at the primary project site.
- Extent of the disturbance at the primary project site.
- Project timeline.
- Percentage of services predicted to be lost during initial (short-term) disturbance and expected rate of recovery with restoration at the primary project site.
- Timeline for compensatory restoration.
- Services associated with compensatory projects.
- Timeline of compensatory projects.
- Discount rate for each time period (3% is commonly used in HEAs).

HABITAT EQUIVALENCY ANALYSIS PROCESS FOR GATEWAY SOUTH

Completion of the HEA process for the Project Agency Preferred Alternative will require close coordination with the BLM and other appropriate agencies and stakeholders. Such coordination will ensure that the best available scientific data are being used, the habitat service metric is appropriate for the species-specific habitat affected in the Project area, the results of the HEA are understood, and the compensation offsets the interim and permanent loss of habitat services modeled. The following steps will be completed as part of the development of the HEA for the Gateway South.

1. **Establishing baseline habitat services prior to disturbance.**

   PacifiCorp will work closely with the appropriate agencies and stakeholders to finalize a habitat services metric that will quantify sage-grouse habitat services. Appendix A provides a description of the habitat services metric that will serve as the basis for quantifying baseline habitat services, Project-related habitat service losses, and the benefits of habitat restoration and mitigation projects. This habitat services metric has considered the best available scientific information regarding sage-grouse habitat and response to disturbance. This information was used to define variables in the metric when there was a consistent trend in the literature (i.e., the studies measured a consistent response of sage-grouse to its environment), and when existing data were available to inform their use. Appendix B describes how this metric will be applied to establish a baseline measure of habitat services for the Project area.

2. **Quantifying the permanent and interim losses to the baseline service level that result from the Project disturbance.**

   Permanent and interim losses of habitat services caused by the construction and operation of Gateway South will be subtracted from the baseline habitat services. Direct and indirect losses of habitat services over the life of the Project will provide the basis for identifying the amount and type of mitigation necessary to offset the losses that can be quantified in the HEA. Appendix C describes the approaches that will be used to quantify the direct and indirect losses that will occur as a result of Project construction and operations.

3. **Identifying appropriate mitigation projects that may be used to compensate for lost services.**

   PacifiCorp will work with the agencies and stakeholders to identify mitigation projects that may be used to compensate for the permanent and interim losses of habitat services. All mitigation projects would be subject to appropriate land management agency or landowner approval, permits, and planning. Appendix D describes the methods that will be used to quantify habitat service gains resulting from mitigation projects. Mitigation projects likely to be considered and quantified in the HEA include, but are not limited to the following.

   - Fence marking, modification, or removal – Fences that pose a high collision risk for sage-grouse (Stevens et al., in press) would be marked, modified, or removed to reduce or remove threats to sage-grouse. Appropriate land management agency or landowner coordination would be important to ensure fence-related conservation activities support current and future land use objectives.
   - Sagebrush restoration or enhancement projects – Sagebrush restoration or enhancement projects might include seeding sagebrush and associated understory vegetation into previously disturbed or burned areas or transplanting already established sagebrush stems and seedlings into areas where sagebrush has been removed or thinned. Appropriate land management agency or landowner coordination would be important to ensure sagebrush enhancement activities support ongoing and future land use objectives.
   - Conifer removal – In areas where conifers are encroaching into suitable sage-grouse habitat, conifer removal (specifically removal of piñon pine and juniper) could be used to reduce habitat fragmentation and to restore previously unsuitable habitat. Priorities for conifer removal would include lop-and-scatter removal of Phase I[1] conifer encroachment and cut-pile-dispose or mastication of Phase II (mid conifer encroachment). Phase III conifer treatment would also be evaluated but unlikely to

[1]Miller et al. (2005) characterized the three stages of woodland succession:
Phase I - early-succession, trees are present but shrubs and herbs are the dominant vegetation that influence ecological processes (hydrologic, nutrient, and energy cycles) on the site;
Phase II - mid-succession, trees are co-dominant with shrubs and herbs and all three vegetation layers influence ecological processes on the site;
Phase III - late-succession, trees are the dominant vegetation and the primary plant layer influencing ecological processes on the site.

be selected as an appropriate compensatory tool. Appropriate land management agency or landowner coordination would be important to ensure activities support ongoing and future land use objectives.

- Conservation easements – Where possible, conservation easements could be used to provide long-term contractual protection of high-quality sage-grouse habitat, conservation efforts, and improvement projects. PacifiCorp's ability to acquire conservation easements would be dependent upon the willingness of private landowners to participate in a conservation program. Landowner coordination would be important to ensure activities support ongoing and future land use objectives.

In the HEA, the benefits of mitigation projects must be quantifiable using the habitat services metric. The above list consists of those mitigation projects with benefits that could be quantified in the HEA. As the Gateway South HEA is completed for the Agency Preferred Alternative, other mitigation projects are likely to be identified. Additional mitigation projects with benefits that cannot be quantified in the HEA will be considered separately and their compensatory value determined in coordination with the lead agencies and other stakeholders. PacifiCorp's mitigation plan will describe the mixture of mitigation projects proposed to offset the effects of Gateway South, and will consider agency preferences for project types by project segment.

4. Quantifying the amount of mitigation necessary to compensate for the losses to baseline services that remain after project implementation.

Once final mitigation projects have been identified and approved by PacifiCorp, the lead agencies, and involved stakeholders, the average habitat service gain and cost per service returned[2] will be quantified for each project type. The resulting values will be balanced with the services lost to determine the compensatory mitigation appropriate to offset the permanent and interim loss of sage-grouse habitat services resulting from development of Gateway South. Appendix C describes the approach that will be used to identify appropriate levels of compensatory mitigation for direct and indirect losses of habitat services modeled that will occur as a result of project construction and operations. A final conservation and mitigation plan/report documenting the scaled compensatory mitigation would be provided to BLM as a voluntary applicant-committed mitigation measure for sage-grouse.

[2] Habitat service gains are averaged among several hypothetical mitigation projects that are modeled. Mitigation project costs are obtained for previously-conducted projects, standardized per acre or mile of application, and averaged among projects.

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APPENDIX A

Proposed Habitat Service Metric for the Gateway South Transmission Line

DEVELOPMENT OF HABITAT SERVICE METRIC FOR HABITAT EQUIVALENCY ANALYSIS

PacifiCorp has convened a group comprised of agency and stakeholder representatives to work with consultants on the Habitat Equivalency Analysis (HEA) (the HEA Technical Working Group [HTWG]). From Colorado, the HTWG includes a representative from the U.S. Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service, Colorado Parks and Wildlife, and Moffat County. Utah representatives are from the BLM, U.S. Fish and Wildlife Service, Utah Division of Wildlife Resources, and Uintah County. Wyoming representatives are from the BLM, the U.S. Fish and Wildlife Service, Wyoming Game and Fish, the Saratoga-Encampment-Rawlins Conservation District, and the Little Snake River Conservation District. Consultants participating in the HTWG include SWCA Environmental Consultants, EPG, and EnviroIssues.

The HTWG developed a habitat service metric for the greater sage-grouse (*Centrocercus urophasianus*) (sage-grouse) using variables identified in the peer-reviewed literature as representative of sage-grouse habitat. Habitat service levels are intended to reflect both the quality of the habitat and the ability of the birds to use the habitat. For each of the metric variables, a habitat service score ranging from 0 to 3 (no services [contributing no value to habitat] to high services [optimal habitat]) was assigned, similar to the sage-grouse habitat assessment framework developed by Stiver et al. (2010) and the sage-grouse habitat suitability index developed by LaGory et al. (2012). Scoring habitat services is a critical step in the HEA process, because it provides a way to measure the relative quality of specific habitat functions in a specific area.

The scores for this HEA are primarily based on information contained in the literature regarding sage-grouse habitat use and selection. When literature did not allow for direct assignment of value ranges for HEA scores, professional judgments, which were based on peer-reviewed literature, were used. Professional judgments are associated with specific literature references when possible and/or confirmed with academic and agency biologists.

When a basic life requisite of sage-grouse is absent (vegetation is absent, the area is forested, or high levels of disturbance are present), the cell being scored is assigned a total service value of 0. When a measurements for particular variable within the metric (e.g., % sagebrush cover) matches literature-based descriptions of sub-optimal conditions, that variable is given a service score of 0 (contributing no value to habitat), 1 (poor habitat), or 2 (moderate habitat). For example, sagebrush cover <1% would score a 0, cover of 1%–5% would score a 1, and cover of 5%–15% or >35% would score a 2 for that variable. When measurements for a particular variable match literature-based recommended conditions, that variable is given a service score of 3 (optimal habitat). For example, sagebrush cover of 15%–35% would score a 3 for that variable.

Scoring of the variables is categorical and each variable is given the same weight in the model. This approach is based on the best available data and is consistent with the general approach of LaGory et al. (2012). LaGory et al. (2012) describe their approach as follows:

> In general, there was insufficient information in existing studies to determine relationships among variables and habitat suitability or relative contributions between variables/components. Therefore, for simplicity, we developed piecewise linear functions of suitability based on the assumption that all variables are of equal weight and applied these functions to geospatial layers to generate indices ranging from 0 (poor) to 100 (optimal). This approach is similar to that used for many of the U.S. Fish and Wildlife Service (USFWS) Habitat Suitability Index models in their Habitat Evaluation Procedure, (available at http://www.fws.gov/policy/ESMindex.html).

While the individual variables are not weighted, the number of variables relating to a habitat attribute (e.g., six for vegetation vs. one for slope) and the size of the buffers (e.g., 6.4 kilometers [km] for leks vs. 2 km for fences with high collision risk) give some attribute categories more influence than others. In the metric, there are three variables that score sagebrush characteristics (sagebrush abundance index, sagebrush % cover, and sagebrush canopy height), so areas that are not dominated by sagebrush will score low for these three variables, resulting in a lower overall score.

Sage-grouse habitat suitability publications vary in their baseline environmental conditions affecting a particular study site. Even studies within the same state may describe different suitable habitat conditions depending on elevation, precipitation zone, and other geographic or climatic factors affecting each study site.

No specific habitat studies have been conducted on the Project's transmission line corridor alternatives, therefore the habitat metrics described below mostly rely on information presented in BLM et al. (2000), Cagney et al. (2009), Connelly et al. (2000), Connelly et al. (2011), and other summary publications. Specific citations are given to support the habitat model framework when applicable.

A single habitat service metric is applied to the whole Project corridor in order to standardize results. This approach assumes that optimal habitat or poor habitat for sage-grouse looks the same (that is, measures the same for the variables in the metric) regardless of its location, despite regional differences in habitat features and availability.

As a result, the best available habitat at the edge of the species' range may not score as high as the best available habitat in the center of the species' range, unless they have the same measurements for the variables in the metric. The following sections describe the development of the habitat service model variables.

METRIC OF SAGE-GROUSE HABITAT SERVICES

The metric is only applied to areas that contain sage-grouse habitat. To more accurately model sage-grouse utilization areas, land cover types typically avoided by sage-grouse are masked from the analysis area before the metric is applied. Disturbances of these lands require no mitigation in the HEA. These land cover types include all forest types, urban areas, open water, roadways, well pads, mine footprints, areas <100 meters (m) from roadways with >6,000 annual average daily traffic (AADT), and <25 m of paved roads and heavily traveled gravel roads (multiple sources per U.S. Fish and Wildlife listing decision in Federal Register; Johnson et al. 2011).

The metric for sage-grouse habitat services used in this HEA is a simple additive model (Table A1). Each cell in the analysis area is scored separately by summing the scores of Variables 01 through 09. Each variable is described in detail below.

DESCRIPTIONS OF METRIC VARIABLES

Anthropogenic Variables

Habitat within and surrounding the Project transmission line corridor is currently influenced by fences used for livestock management (e.g., to control livestock movements and vegetation use within grazing allotments and pastures, to delineate or protect private property and agricultural croplands, and to restrict livestock from improved and unimproved roadways); and by roads, mines, wells, and existing transmission substations that fragment the vegetative landscape and alter wildlife use patterns. Two anthropogenic-influenced variables were used to address these effects on sage-grouse habitat suitability.

<u>VAR01 and VAR02 Distance to Roads and Highways</u>

Research into the effects of roads on sage-grouse is varied. For instance in Colorado, Rogers (1964) mapped 120 leks with regard to distance from roads and found that 42% of leks were over 1.6 km (1 mile) from the nearest improved road, but that 26% of leks were within about 90 m (about 100 yards) of a county or state highway, and two leks were on a road. Connelly et al. (2004) also note the use of roads for lek sites. In contrast, Craighead Beringia South (2008) reported results from a 2007 to 2009 study of sage-grouse seasonal habitat use in Jackson Hole, Wyoming. Results indicate that sage-grouse avoid areas within approximately 100 m of paved roads. Similarly, Pruett et al. (2009) found that lesser prairie-chickens avoided one of the two highways in the study by 100 m; however, some prairie-chickens crossed roads and had home ranges that overlapped the highways, thus roads did not completely exclude them from neighboring habitat. Johnson et al. (2011) examined the correlation between trends in lek attendance and the environmental and anthropogenic features within 5- and 18-km buffers around leks. They found that lek attendance declined over time with length of interstate highway within 5 km, although the authors note that this trend was based on relatively few data points and no pre-highway data were available for comparison. Interstate highways >5 km away and smaller state and federal highways had little or no effect on trends in lek attendance. Thresholds less than 5 km were not examined.

In the habitat services metric, those habitats located within 100 m of a high-traffic paved road (interstate highway or high-traffic federal or state highway with >6,000 AADT, for example), or within 25 m of a low-traffic paved road (low-traffic federal or state highway, or other paved roads, for example) were considered to provide no services to sage-grouse due to traffic and associated noise/human disturbance and were given a score of 0 (no services). Unpaved roads with high traffic loads (for example, oil and gas service roads, mine service roads, etc.) provide similar disturbance levels as paved roads with similar traffic loads (e.g., low-traffic state highway).

Table A1. Anthropogenic and Habitat Variables Used as a Metric of Sage-grouse Habitat Services

Variable Number	Variables	3	2	1	0	Primary Citations
VAR01	Distance to interstate highway or high-traffic (>6,000 AADT) federal or state highway (meters)	>1,000	650–1,000	100–650	NA	Craighead Beringia South (2008); Johnson et al. (2011); Pruett et al. (2009)
VAR02	Distance (meters) to low-traffic (<6,000 AADT) federal or state highways, other paved roads, heavily travelled gravel roads, well pads, mine footprints, and transmission substations	>200	50–200	25–50	NA	Connelly et al. (2004); Craighead Beringia South (2008); Johnson et al. (2011); Pruett et al. (2009)
VAR03	Distance to fence segments that pose a high collision risk for sage-grouse (kilometers)*	>2.0	0.4–2.0	<0.4	N/A	Christiansen (2009); Stevens et al. (2012); Stevens et al. (in press)
VAR04	Percent slope	<10	10–30	30–40	>40	Beck (1977); Lincoln County Sage Grouse Technical Review Team (2004)
VAR05	Distance to occupied lek[†] (kilometers)	0–6.4	6.4–8.5	>8.5	N/A	Cagney et al. (2009); Connelly et al. (2000); Connelly et al. (2011); Holloran and Anderson (2005)
VAR06	Sagebrush abundance index (% of vegetation that is sagebrush within a 1 km^2 moving window)	50–95	30–50 or >95	10–30	0–10	Carpenter et al. (2010); Walker et al. (2007); Aldridge and Boyce (2007); Aldridge et al. 2008; Wisdom et al. (2011)
VAR07	Percent sagebrush canopy cover	15–35	5–15 or >35	1–5	<1	Cagney et al. (2009); Connelly et al. (2000); Stiver et al. (2010)

Table A1. Anthropogenic and Habitat Variables Used as a Metric of Sage-grouse Habitat Services

Variable Number	Variables	3	2	1	0	Primary Citations
VAR08	Sagebrush canopy height (centimeters)	30–80	20 to <30 or >80	5–20	<5	Crawford et al. (2004); Connelly et al. (2000); Stiver et al. (2010)
VAR09	Distance of habitat to sage or shrub dominant (meters)	<90	90–275	275–1,000	>1,000	BLM et al. (2000); Connelly et al. (2000); Lincoln County Sage Grouse Technical Review Team (2004)

* Allotment boundaries were used as a surrogate for fence lines. The model by Stevens et al. (in press) was used to identify fence segments that posed a high risk for sage-grouse collision.

† Leks were classified as active if their 10-year attendance average was greater than 0.

To characterize this disturbance in the model, mine footprints and well pad footprints were classified and scored as if they were low-traffic roads, so that there are no habitat services within 25 m of these disturbances. Transmission substations (the existing Aeolus and Clover substations at either end of the Project) and series compensation stations were also classified and scored as if they are low-traffic roads in the model to account for the noise and human presence associated with these facilities.

Those habitats located farther than 200 m and 1,000 m, respectively, of a low-traffic road or high-traffic road were considered the most serviceable to sage-grouse (that is, exhibited no decrease in lek attendance) and given a score of 3. A logarithmic curve was fit between the highest and lowest categories so that score increased with distance from the road to estimate the distance breaks associated with scores 1 and 2. A logarithmic rate of change simulates sound attenuation rates better than a linear rate of change (Crocker 2007). Conflicting research results regarding sage-grouse use near and on unpaved resource/collector roads (e.g., two-track roads) did not allow for quantification of the disturbance caused by these roads in the model.

While the application of distances to all scores (0–3) is not perfectly supported in the peer-reviewed literature, our approach places a penalty upon habitats that are bisected by all types of large roadways. Penalties are higher for roads that typically have higher traffic levels and risk to sage-grouse (e.g., mortality from collision, noise disturbance) than less-utilized secondary roads that generally have less traffic and implied risk.

<u>VAR03 Distance to Fences that Pose a High Risk for Collision</u>

Fence collisions have been reported as a cause of significant injury and mortality to grouse species (sage-grouse [Braun 2006; Call and Maser 1985; Connelly et al. 2004; Christiansen 2009; Danvir 2002; Stevens et al. 2012]; lesser prairie-chicken [Wolfe et al. 2007]; ptarmigan [Bevanger and Broseth 2000]; and red grouse, black grouse, and capercaillie [Baines and Summers 1997; Catt et al. 1994; Petty 1995]). In addition to direct mortality, fences provide corridors for mammalian predators increasing the opportunity for predation of hens and broods (Braun 1998). Unlike the other variables in the metric, which are primarily meant to characterize use and avoidance of habitat by sage-grouse, the distance to high risk fences was added to account for the potential direct loss of sage-grouse (not sage-grouse avoidance of fences).

In Wyoming, Christiansen (2009) reported preliminary results of a multiple-year study (2005–ongoing) near Farson on sage-grouse fence strikes and mortalities and the utility of fence markers on reducing collisions. After installation of fence markers on portions of high-risk fences, grouse mortality decreased by 70%. Although the study did not compare the number of strikes with regard to distance to lek, the author recommends that fences should not be located within 0.25 mile (0.4 km) of leks.

In Idaho, Stevens (2011) and Stevens et al. (2012) evaluated the environmental features associated with sage-grouse fence collision risk, and tested the efficacy of reflective vinyl fence markers to reduce collision rates at eight study sites. Modeling predicted marking reduced collision rates by 74% at the mean lek size and fence distance from the lek. Collision probability varied by region, topography, fence type, fence density, and lek proximity. Areas with high slope or terrain ruggedness generally showed lower collision risk than flat areas. Collisions were more common on fence segments bound by steel t-posts with spans between posts exceeding 4 m. Collision probability increased with fence length per km^2 and proximity to nearest active lek. Stevens et al. (2012) recommended 2-km mitigation buffers around leks in high-risk areas, which is consistent with the recommendation by Braun (2006).

For this variable, fences segments having a high risk for collision were identified using the model by Stevens et al. (in press), which is largely informed by fence proximity to leks and terrain roughness. All habitats within 0.25 mile (0.4 km) of fences with high collision risk were scored as a 1 (few services) for this variable due to the increased risk that sage-grouse in those areas might collide with that fence (Christiansen 2009). As the distance to fence increases, there is decreased likelihood of a sage-grouse striking a fence and potentially less risk of depredation by mammalian and avian predators. Consistent with recommendations by Stevens et al. (2012) and Braun (2006), habitats >2 km from high-risk fence segments were given the highest score of 3. A linear relationship was then used to determine the remaining metric scores (i.e., score of 2 between 0.4 and 2.0 km, and score of 1 <0.4 km of a fence). Risk for collision was determined without regard for fence type or configuration, because data available were not sufficient to differentiate among them in the model.

<u>VAR04 Slope</u>

Slope was used to refine sage-grouse habitat potential. Sage-grouse generally use flat or gently sloping terrain (Connelly et al. 2011; Eng and Schladweiler 1972; Nisbet et al. 1983; Rogers 1964). Beck (1977) plotted the distribution of 199 sage-grouse flocks in Colorado and found that 66% of flocks were on slopes less than 5% and only 13% of flocks were on slopes greater than 10%. Areas with slopes greater than 40% are unsuitable for nesting habitat (Lincoln County Sage Grouse Technical Review Team 2004), but still have some value to sage-grouse and should be retained in the model (professional judgment of the Gateway South HTWG). Therefore, areas with less than 5% slope were assigned a habitat service score of 3, and those exceeding 10% subjectively received incrementally lower habitat service scores. Slopes >40% did not add value to the habitat and received a score of 0 for this variable, but these areas may provide habitat services depending on the scores for the other variables.

A terrain roughness index (TRI) was evaluated for use in place of the slope variable, as some studies have shown that it is a better indicator of sage-grouse use (Carpenter et al. 2010; Doherty et al. 2008; Doherty et al. 2010; Dzialak et al. 2011). However, there was substantial variation in the methods used to calculate TRI (e.g., measure of roughness used and analysis window size) and region evaluated (e.g., Alberta, Canada, vs. Powder River Basin, Wyoming) by these studies. Given this variation, it was not possible to identify literature-supported cutoffs between scores for use in the model.

<u>VAR05 Distance to Lek (10-year Average Count >0 Males)</u>

Current sage-grouse habitat management guidance uses occupied leks as focal points for nesting habitat management (Connelly et al. 2000; Connelly et al. 2011); therefore, distance to lek was used as a variable in the habitat services metric. These guidelines recommend protecting sagebrush communities within 3.2 km of a lek in uniformly distributed habitats and 5.0 km in non-uniformly distributed habitats. Holloran and Anderson (2005) studied nesting sage-grouse at 30 leks in central and western Wyoming and determined that 45% and 64% of female sage-grouse nested within 3.2 km and 5.0 km, respectively, of the lek where the hen was radio-collared. Moreover, statistical analyses suggested that the area of interest for nesting sage-grouse should be truncated at 8.5 km from a lek. Similar frequencies are reported in Cagney et al. (2009)—66% within 5.0 km and 75% within 6.4 km of a lek where the female bred.

Female sage-grouse do nest at distances greater than 8.5 km (farthest distance reported in Holloran and Anderson [2005] was 27.4 km), so all distances >8.5 km from occupied leks were given a service score of 1 to reflect some potential use by nesting sage-grouse. Areas within 6.4 km of a lek provide the highest service level, because they provide female grouse with forage, roost sites, and cover from predators or inclement weather during the lekking season, in addition to containing lekking habitat and nesting habitat (Cagney et al. 2009). Therefore, areas within 6.4 km of an occupied lek were assigned a service score of 3 for this variable. Between these distances (6.4–8.5 km), areas were assigned a score of 2 for this variable.

VAR06 Sagebrush Abundance Index

Walker et al. (2007) found that the proportion of habitat that was sagebrush within a 6.4-km moving window was a strong predictor of lek persistence in the Powder River Basin of Wyoming. The moving window is an analysis area that is larger than and centered on the cell being scored; in this case, the window is a 6.4-km buffer that moves as the cell being scored is changed. Areas with less than 30% of sagebrush within 6.4 km of the lek center had a lower probability of lek persistence. Aldridge and Boyce (2007) also used a moving window (1 km^2) to measure sagebrush cover and abundance. Their resource selection function found that sage-grouse selected nesting habitat that contained large patches (1 km^2) of sagebrush with moderate canopy cover and moderate sagebrush abundance (i.e., heterogeneous distribution of sagebrush). Carpenter et al. (2010) found similar results in Alberta, Canada. Their top resource selection functions included a quadratic function for sagebrush abundance, which indicates that areas of moderate sagebrush abundance were selected more frequently than areas of homogenous sagebrush.

Aldridge et al. (2008) [per Wisdom et al. (2011)] found that at least 25% of the landscape in a 30.77-km analysis area needed to be dominated by sagebrush for sage-grouse persistence, with 65% being preferred. Wisdom et al. (2011) found that landscapes with less than 27% sagebrush were not different from landscapes from which sage-grouse have been extirpated. Similar to Aldridge et al. (2008), Wisdom et al. (2011) found that 50% sagebrush across a landscape was a good indicator of sage-grouse persistence.

The Gateway South HTWG indicated that sage-grouse prefer higher sagebrush abundance in the southern part of their range (i.e., the Project Area) than is indicated by these studies. For example, the Colorado Parks and Wildlife Avian Research Center has generally found a positive linear relationship between sagebrush abundance and measures of habitat selection (Brian Holmes, Colorado Parks and Wildlife, personal communication with Jon Kehmeier, SWCA, on February 13, 2013). Colorado Parks and Wildlife has not observed an upper inflection point in the proportion of the landscape covered in sagebrush where use or selection begins to drop, and suggest that the difference may be due to the structure and composition of the sagebrush community (that is, silver sagebrush mixed grassland rangelands of Alberta [Aldridge and Boyce 2007; Carpenter et al. 2010] vs. big sagebrush steppe [Project Area]).

Sagebrush covering 50% to 95% of the landscape scored a 3 for this variable (Aldridge et al. 2008; Wisdom et al. 2011; professional judgment of the HTWG). Sagebrush covering 30% to 50% or >95% scored a 2 for this variable (Aldridge et al. 2008). Sagebrush covering 10% to 30% scored a 1 (Walker et al. 2007; Wisdom et al. 2011) and sagebrush covering less than 10% scored a 0 for this variable.

VAR07 Sagebrush Canopy Cover

Recommended sagebrush canopy cover for sage-grouse habitat varies seasonally. Seasonal habitats were not modeled, but seasonal differences in the selection for sagebrush cover was considered when developing habitat services metrics. The seasonal habitat needs of sage-grouse are described below, followed by scoring of percent sagebrush cover in the habitat services metric.

Seasonal Habitat Use

Nesting

Connelly et al. (2000) cite 13 references to sagebrush coverage that range from 15% to 38% mean canopy cover surrounding the nest. Citations contained within Crawford et al. (2004) reported 12% to 20% cover and 41% cover in nesting habitat. In their species assessment, Connelly et al. (2000) conclude that 15% to 25% canopy cover is the recommended range for productive sage-grouse nesting habitat. This is also the range identified in the sage-grouse habitat assessment framework (Stiver et al. 2010) as providing the highest service level for sage-grouse based on a review of the available literature. Wallestad and Pyrah (1974) reported that successful nests were in stands where sagebrush cover approximated 27%. This cover range is used as a goal in some sage-grouse management guidelines (Bohne et al. 2007; BLM et al. 2000). Cagney et al. (2009) guidelines for grazing in grouse habitat, which use information synthesized from over 300 sources, state that hens tend to select an average 23% live sagebrush canopy cover when selecting nesting sites.

Sage-grouse in Utah use habitats with higher sagebrush canopy cover than is observed in the northern and eastern portions of the species range, possibly due to the relative scarcity of understory grasses in Utah (Renee Chi, BLM, personal communication with Ann Widmer, SWCA, on March 22, 2013). Nest sites in Wildcat Knoll (part of the Emery-Sanpete population of Utah) were located in areas with an average of 33% shrub canopy cover for successful nests and 22% for unsuccessful nests (Perkins 2010). Nests (n = 50) in Parker Mountain were located at sites with an average canopy cover of 35.5% for big sagebrush and 32% for big sagebrush mixed with black sagebrush (Chi 2004; Renee Chi, BLM, personal communication with Ann Widmer, SWCA, on March 22, 2013). In the Sheeprock sage-grouse population, nest site shrub canopy cover measured an average of 62% in 2005 and 83.5% in 2006 (Robinson 2007).

Brood Rearing

Connelly et al. (2000) found that productive brood-rearing habitat should include 10% to 25% cover of sagebrush. This is the range used as a goal in sage-grouse management guidelines (Bohne et al. 2007; BLM et al. 2000). While sagebrush is a vital component of sage-grouse habitat, very thick shrub cover may inhibit understory vegetation growth and reduce the birds' ability to detect predators (Wiebe and Martin 1998).

Again, sage-grouse in Utah may use areas with higher canopy cover than is typical throughout the northern and eastern parts of their range. Grouse in the Sheeprock population were documented using areas with an average shrub canopy cover of 73% during brood rearing in 2005 and 2006 (Robinson 2007).

Winter

Connelly et al. (2000) cite 10 references to sagebrush coverage in winter-use areas that range from 15% to 43% mean canopy cover (Crawford et al. [2004] also cite two of these references in their assessment); however, they considered a canopy of 10% to 30% cover (above the snow) as a characteristic of sagebrush needed for productive sage-grouse winter habitat. This is the cover range used as a goal in sage-grouse management guidelines (Bohne et al. 2007; BLM et al. 2000). Sage-grouse in Utah may prefer higher cover in winter. In Emma Park, areas of high sagebrush cover were used disproportionally to their availability on the landscape, with an average of 38.3% sagebrush canopy cover in winter-use areas (Crompton and Mitchell 2005).

Scoring in Habitat Services Metric

In general, the recommended sagebrush cover for nesting habitats was intermediate to, and overlapped that of, brood-rearing and winter habitats. Thus, favorable conditions for nesting were given the highest scores for percent sagebrush cover in the sage-grouse habitat services metric.

This variable used the scores assigned by Stiver et al. (2010) for sagebrush cover categories in sage-grouse nesting habitat, with a slight adjustment to account for use of higher canopy cover in Utah. This adjustment is also consistent with the Colorado Greater Sage-Grouse Conservation Plan (Colorado Division of Wildlife et al. 2008). Sagebrush percent canopy cover of 15% to 35% was assumed to provide the highest level of services (score of 3) to nesting sage-grouse. This includes canopy covers that are 10% higher than the average ranges provided in Connelly et al. (2000) and Cagney et al. (2009). Areas with slightly less or more cover than this (55–15 or >35) were given a habitat services score of 2. Habitats with <5% cover received a score of 1.

VAR08 Sagebrush Canopy Height

Sagebrush canopy height is an important aspect of all sage-grouse seasonal habitats. As described above, seasonal habitat models will not be developed for the Project. However, seasonal habitat requirements were considered when developing habitat metric values. The seasonal habitat needs of sage-grouse are described below, followed by scoring of percent sagebrush cover in the habitat services metric.

Seasonal Habitat Use

Nesting

Gregg et al. (1994, cited in Crawford et al. 2004) found that the area surrounding successful nests in Oregon consisted of medium-height (40 to 80 centimeters [cm]) sagebrush. Connelly et al. (2000) cite 11 references to sagebrush height that range from 29 to 79 cm mean height.

In their assessment, Connelly et al. (2000) conclude that sagebrush with a height of 30 to 80 cm is needed for productive sage-grouse nesting habitat in arid sites and 40 to 80 cm in mesic sites. These ranges are supported by Stiver et al. (2010), who recommend a range of 30 to 80 cm, and BLM et al. (2000), which state that optimum sage-grouse nesting habitat consists of sagebrush stands containing plants 40 to 80 cm tall.

Winter

Important structural components in winter habitat include medium to tall (25–80 cm) sagebrush stands (Crawford et al. 2004). Connelly et al. (2000) cite 10 references to sagebrush height in winter habitat that range from 20 to 46 cm above the snow. Two studies measured the entire plant height and provided a range from 41 to 56 cm. In their assessment, Connelly et al. (2000) conclude that characteristics of productive winter habitat include sagebrush that is 25 to 35 cm in height above the snow. This is the height range used as a goal in sage-grouse management guidelines (Bohne et al. 2007; BLM et al. 2000).

Scoring in Habitat Services Metric

Sagebrush canopy heights that provided high-quality nesting habitat generally also provided high-quality winter habitat for sage-grouse. Thus, favorable conditions for nesting were given the highest scores for sagebrush canopy height in the sage-grouse habitat services metric.

The sagebrush cover scores assigned for nesting habitat in the sage-grouse habitat assessment framework by Stiver et al. (2010) to different sagebrush cover categories were assigned to this variable. Areas of sagebrush with a height of 30 to 80 cm were assigned a habitat services score of 3. As sagebrush canopy height decreases, the value of a sagebrush plant to provide cover for nesting females and their nests is diminished. Additionally, low-lying sagebrush is less available to sage-grouse during the winter due to snow cover. Areas with canopy heights greater than 80 cm provided intermediate levels of services because they may provide relatively poor cover for nesting sage-grouse and have foliage that is difficult for sage-grouse to access during mild and moderate winters. Sites with lower and higher sagebrush canopy heights were scored lower (sagebrush 12 to <30 cm or >80 cm in height received a score of 2). Areas with minimal sagebrush canopy heights were considered to have the lowest habitat service value (sagebrush <20 cm received a score of 1).

<u>VAR09 Distance to Vegetation Dominated by Sagebrush or Shrub</u>

Sage-grouse use shrubby habitats including sagebrush during the brood-rearing season (Connelly et al. 2000) and for grouse movement and dispersal (Stiver et al. 2010). Close proximity to shrubby vegetation increases the service value of all vegetation types modeled because shrubby vegetation provides cover from predators, facilitates grouse movement, and supports population connectivity.

The Lincoln County Sage Grouse Technical Review Team (2004) identified proximity to sagebrush cover as an important component in habitat suitability of non-sagebrush, brood-rearing habitats (e.g., mesic lowland habitats, hay meadows). The Team considered brood-rearing areas within <100 yards, 100 to 300 yards, and >300 yards of sagebrush cover as suitable, marginal, and unsuitable habitat, respectively. Similarly, Stiver et al. (2010) considered mesic habitats <90 m, 90 to 275 m, and >275 m of sagebrush to be suitable, marginal, and unsuitable late brood-rearing/summer habitat, respectively. These categorizations support the concept of increasing service level with proximity to shrubs, particularly sagebrush.

The distance to vegetation dominated by sagebrush or shrub variable (VAR09) measured the distance of the cell being scored (regardless of its vegetation type) to the next nearest cell that was dominated by sagebrush or a shrub species, including willows. For this variable, cells <90 m, 20 to 275 m, and >275 m to a cell dominated by a shrub species were assigned scores of 3, 2, and 1, respectively. The scoring was applied to all vegetation types, because this variable is relevant to bird movement and dispersal from all habitat types.

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APPENDIX B

Quantification of Baseline Habitat Service Level

QUANTIFICATION OF BASELINE HABITAT SERVICE LEVEL

The pre-construction baseline of the habitat services will be based on existing datasets to the extent possible. It is not anticipated that additional data collection will be necessary to complete the Habitat Equivalency Analysis (HEA). The baseline service level will be determined by applying the habitat service metrics described in Appendix A to the Assessment Area that is identified for the Project. For other similar projects, the Assessment Area included the footprint of the project and a buffer around the footprint, because greater sage-grouse (*Centrocercus urophasianus*) (sage-grouse) habitat service losses were expected to extend beyond the area of direct disturbance.

ESRI ArcGIS ArcInfo 10.X, Spatial Analyst, and ModelBuilder software and tools will be used to conduct analyses. To facilitate calculations across the entire assessment area, it is anticipated that all data will be converted to a raster/grid format. Raster or grid algebra processing is significantly faster for a project of this size.

PREPARATION OF GIS MODEL INPUT LAYERS

Habitats within and surrounding the corridor for the preferred alternative will be summarized in a series of representative raster layers for the 9 metric variables (see Appendix A). These nine variables consist of data representations within the project area for human disturbance, landscape characteristics, proximity to sage-grouse lek locations, and vegetation characteristics that may influence the use of habitat by sage-grouse. A spatial resolution of 30 meters (m) is anticipated to be sufficient to capture a 'landscape level' perspective of habitat across the Assessment Area.

Representative raster data will be created for each variable in the HEA metric (Appendix A). Scores for each cell in each raster will be assigned per the variable scores listed in Table A1 of Appendix A. The following sections describe the datasets anticipated to be necessary to describe each of the variables described in Appendix A.

Lands Excluded From Analysis

As described in Appendix A, land cover types and terrain features that do not provide suitable habitat for sage-grouse will be removed from the HEA model. All vegetation types and landforms that potentially provide habitat for sage-grouse will remain in the model.

VAR01 and VAR02 Distance to Roads and Highways or Other Infrastructure

Road layers used in developing the baseline HEA model are available from the Bureau of Land Management, U.S. Forest Service, state agencies, or from readily available standard road and infrastructure layers. Road layers will be compared between states to ensure consistency in classification prior to using them in the HEA model development. HEA model scores will be applied to 30-m raster cells according to the process described in Table A1, Appendix A. For example, all cells that are more than 1,000 m from interstate highways or high traffic volume state and federal highways will be given a score of 3, those between 650 and 1,000 m will be given a score of 2, those between 100 and 650 m will be given a score of

1, and those cells within 100 m will be removed from consideration in the model per the description provided for Variable 4 in Table A1 and the supporting text.

VAR03 Distance to Fences that Pose a High Risk for Collision

Grazing allotment boundaries will be used as surrogates for fence locations in the HEA baseline model development, because fence data of equal quality is not available across the entire assessment area. Modeling of fences will only occur where data are available, which may exclude private lands and federal lands that do not have allotments defined. The model of Stevens et al. (in press) will be used to identify fences that pose a high collision risk for sage-grouse. Scores for distance to high-risk fence will be applied to the 30-m grid cells in the model in the same manner as described for roads and highways with cells closest to fences receiving the lowest scores and those farthest from fences receiving the highest scores.

VAR04 Slope

Slope will be calculated using 30-m digital elevation models and scored according to the process described in Appendix A.

VAR05 Distance to Lek (10-year Average Count >0 Males)

Lek data will be obtained from the wildlife management agencies in each state. Lek status will be determined for all leks. Leks that have been active in the past 10 years or that have an unknown status will be included in the HEA model. Those that are labeled as unoccupied or inactive will not be included. Cells surrounding leks will be scored according to the methods described in Appendix A with cells closest to leks receiving the highest scores.

VAR06 Sagebrush Abundance Index

A sagebrush abundance index will be determined from available vegetation layers by calculating the proportion of sagebrush in a 1-square-kilometer area surrounding each 30-m cell in the assessment area. Scores will be applied using the methods described in Appendix A. Areas with a high proportion of sagebrush in the landscape and some habitat heterogeneity will be scored higher than areas with little habitat heterogeneity or areas with little or no sagebrush.

Sagebrush Cover, Sagebrush Canopy Height

When possible, percent cover and height will be determined directly from the vegetation attribute data included in the GAP and Landfire vegetation datasets. Where data are not available, attributes for percent cover and height will be determined using other data sources. Sampling data from GAP/Landfire datasets as well as datasets obtained from BLM and the state agencies will be used to attribute vegetation percent cover and height for segments of the landscape with the most similar characteristics. Once vegetation values have been applied to the 30-m grid, HEA scores will be applied using the methods described in Appendix A.

Distance to Vegetation Dominated by Sagebrush or Shrub

The distance from each cell to the nearest sagebrush- or shrub-dominated cell will be calculated. Cells within or closest to sagebrush or shrub landscapes will be scored higher than those that are distant from shrub-dominated cells.

SUMMATION OF BASELINE SERVICES IN THE HEA MODEL

Spatial grids representing the above HEA variables will be combined through additive raster calculations to create a final raster layer. The value of each cell will be the sum of variables 1 through 9. The final numeric value for each cell is the habitat services provided to sage-grouse by that cell.

The resulting habitat service values and the number of acres associated with each of the habitat service values will be multiplied together and summed across the Assessment Area to calculate the total habitat services (expressed in service acres) (Equation 1). The total habitat services provided by the Assessment Area will be calculated and will serve as the pre-construction baseline for the Project.

Equation 1. $$VJ = \sum_1^i (V_i * J_{V_i})$$

where:

VJ is the habitat services (service-acres) provided by the Assessment Area,

V is the habitat service score (i.e., the sum of the variable scores in the habitat service metric),

i is the number of possible unique values for V, and

J_{V_i} is the number of acres for each value of V_i, where $\sum_1^i J_{V_i}$ would equal the total acreage of the Assessment Area (J).

APPENDIX C

Quantification of Habitat Service Losses

QUANTIFICATION OF HABITAT SERVICE LOSSES

Habitat service losses caused by the Project will be modeled using geographic information system (GIS) technology for important Project milestones by decreasing the variable scores below the Baseline level for the Project effects identified for that milestone using habitat services metric in the footprint of the Project (direct disturbances) and in buffers around the footprint (indirect disturbances). The habitat service scores for each milestone will be summed across the Assessment Area to calculate the estimated interim and permanent habitat service losses associated with the Project.

DESCRIPTION OF DISTURBANCES BY PROJECT MILESTONE

The habitat services provided by the Assessment Area will be measured at several different Project milestones that reflect varying levels of disturbance.

The Project milestones modeled for the HEA will be:

1. **Baseline**—the baseline milestone quantifies habitat services available to greater sage-grouse (*Centrocercus urophasianus*) (sage-grouse) before disturbance. The calculation of the habitat services available to sage-grouse at Baseline is described in Appendix B.
2. **Construction—**the transmission line construction milestone quantifies habitat services available to sage-grouse during the construction of the Project.
3. **Restoration**—the restoration milestone quantifies habitat services available to sage-grouse after Project construction is complete and some services return with the reduction in noise and human presence.
4. **Recovery**—the recovery milestone quantifies habitat services available to sage-grouse after a vegetation type has recovered to the greatest extent expected after Project restoration is complete. Habitat services return to baseline conditions in restored areas with the time to recovery being dependent on the vegetation type. It is anticipated that there will be multiple vegetation-based recovery endpoints. Vegetation recovery endpoints will be determined upon identification of the vegetation communities impacted by the Project.

QUANTIFYING LOSS OF HABITAT SERVICES DUE TO SURFACE DISTURBANCE DURING CONSTRUCTION

For the Construction milestone, direct disturbances will be defined as the loss of habitat services associated with vegetation removal and ground-disturbing activities within the construction footprint (Table C1). The habitat service scores for all 30-square-meter raster cells in the Project footprint where vegetation removal or ground disturbance occur will be changed from the Baseline service scores to 0 in the GIS model for this milestone. Recovery from the disturbed state will be applied per the vegetation-specific recovery curves for the Project.

Table C1. Direct Disturbance Levels Modeled by Project Milestone and Disturbance Type

Project Milestones	Percent Baseline Services Present by Direct Disturbance Type		
	Series Compensation Stations	**Transmission Towers**	**Access Roads, Transmission Lines, and Temporary Infrastructure**
Baseline	100%	100%	100%
Construction	0%	0%	0%
Restoration	0%	0%	0%
Progressive Vegetation Recovery	0%	0% within permanent tower footprint. Elsewhere baseline services will be retuned per the vegetation-specific recovery curves developed for the Project.*	Baseline services will be retuned per the vegetation-specific recovery curves developed for the Project.

* Baseline habitat services will return in the model in areas where two-track roads will be maintained for occasional access by PacifiCorp personnel. Two-track roads were not identified in metric as changing the habitat services available for sage-grouse, and so these roads have no effect in the model once construction is complete.

QUANTIFYING LOSS OF HABITAT SERVICES DUE TO INDIRECT DISTURBANCES DURING CONSTRUCTION

Indirect disturbances will be simulated by applying buffers to the construction footprint and decreasing the habitat service scores below the Baseline habitat service scores within the buffers. Because of uncertainties in the indirect impacts of transmission structures on sage-grouse, at this time, noise and human presence will be the only indirect disturbances modeled in the HEA.

Use of construction equipment such as backhoes, cranes, front-end loaders, bulldozers, graders, excavators, compressors, generators, and various trucks would be needed for mobilizing crew, transportation and use of materials, line work, site clearing, and preparation during the construction phase of the Project. Construction of and improvements to access roads would require use of earthmoving equipment such as bulldozers and graders. Table C2 provides the typical noise levels for the construction equipment that could potentially be used during the construction phase of the Project (ranging 80 to 90 A-weighted decibels [dBA] at 50 feet [15 meters (m)] from any work site).[1]

[1] Construction noise values taken from Energy Gateway West HEA report.

Table C2. Typical Noise Levels from Construction Equipment

Equipment Type	Noise Level at 50 feet (dBA)
Crane	88
Backhoe	85
Pan loader	87
Bulldozer	89
Fuel truck	88
Water truck	88
Grader	85
Roller	80
Mechanic truck	88
Flat bed truck	88
Dump truck	88
Tractor	80
Concrete truck	86
Concrete pump	82
Front end loader	83
Scraper	87
Air compressor	82
Average construction site	85

Noise during the construction phase of the Project would be similar in magnitude to noise produced by vehicles using secondary roads (county highways, state highways, and heavily travelled gravel roads such as access roads for oil and gas development, mining, etc.). Passenger vehicles, medium trucks, and heavy trucks travelling 55 miles per hour (mph) produce typical noise levels of 72 to 74 dBA, 80 to 82 dBA, and 84 to 86 dBA, respectively, from a distance of 50 feet. Therefore, the noise disturbance associated with construction will be modeled as if the construction area was a secondary road (Table C3).

In the model, buffers will be placed around active construction areas in a manner that is identical to the methods used for secondary roads. The cells that fall within these buffers will be scored in a manner identical to a secondary road (that is, the score for VAR02 decreased).

Table C3. Indirect Disturbance Levels Modeled by Project Year and Disturbance Type

Project Milestones	Indirect Disturbance Buffers Applied by Disturbance Type		
	Series Compensation Stations	Transmission Towers	Access Roads, Transmission Lines, and Temporary Infrastructure
Baseline	None	None	None
Construction	Secondary road	Secondary road	Secondary road
Restoration	Secondary road	None	None
Progressive Vegetation Recovery	Secondary road	None	None
	Secondary road	None	None
	Secondary road	None	None
	Secondary road	None	None

QUANTIFYING HABITAT SERVICES LOSSES DURING RESTORATION AND RECOVERY

Project-related habitat service losses are anticipated to decrease once construction is complete. Although still below baseline levels, the habitat service scores rise during restoration and recovery with vegetation regrowth (direct disturbances) and decreased levels of noise and human presence (indirect disturbances).

Restoration Milestone

For the Restoration milestone, direct disturbances will be defined as the loss of all habitat services in the construction footprint where vegetation clearing and ground disturbance occurs because the vegetation has not regrown sufficiently to provide habitat (see Table C1).

The indirect disturbance buffers that are applied to the series compensation stations during construction will remain during the restoration milestone and for the life of the Project because of the noise and human activity associated with operation of these facilities. No indirect disturbances will be modeled for the rest of the Project because little vehicle traffic or human presence is anticipated in these areas after construction of the line is complete.

Progressive Recovery Milestone

For the Recovery milestone, direct disturbances will be defined as the loss of all habitat services in the footprint of the transmission structure pads and the partial loss of services in areas of vegetation regrowth (see Table C1). Indirect disturbances will be applied in a manner identical to the Construction milestone (see Table C3).

Habitat services in areas where the vegetation is reclaimed (i.e., outside the footprint of permanent facilities) will gradually return to baseline conditions at a rate dependent on the vegetation type. Services will return more rapidly for vegetation having rapid recovery rates (e.g., agriculture, grassland, wetland, or riparian) than for those with slower recovery times (e.g., shrub-dominated including sagebrush). Vegetation recovery curves will be developed for the vegetation communities that are impacted by Project activities.

To calculate the progressive return of services, the percentage of the baseline service value for a cell will be calculated based on the appropriate vegetation recovery curve. For example, in those vegetation types with rapid restoration potential (agricultural areas, some grasslands, etc.), habitat services could be returned to 100% of Baseline in the first year following construction. Those with longer recovery times may only achieve partial service returns per year until achieving their maximum value. For example, a vegetation community with a 50-year recovery period might achieve 10% value in year 5 after restoration, 20% in year 10, 30% in year 15, etc., until all services are returned in year 50.

HEA TO QUANTIFY INTERIM AND PERMANENT HABITAT INJURIES

The approach described above will produce a measure of habitat services (in service-acres) for each of the Project milestones for each of the modeled Project segments. The HEA is a stepwise model which quantifies the habitat injury separately in each year (Figure C1) and each of the milestones will be assigned to a calendar year per the schedule provided by the Project proponents after the preferred alternative is identified. It is likely that a linear change in habitat services will be used to estimate annual service-acre increases between restoration and recovery and between the vegetation-specific recovery times. The total number of service-acres lost per year will be summed across the analysis period and expressed as service-acre-years. This value is the estimated sum of the interim and permanent losses to sage-grouse habitat that would occur as a result of project construction and operation.

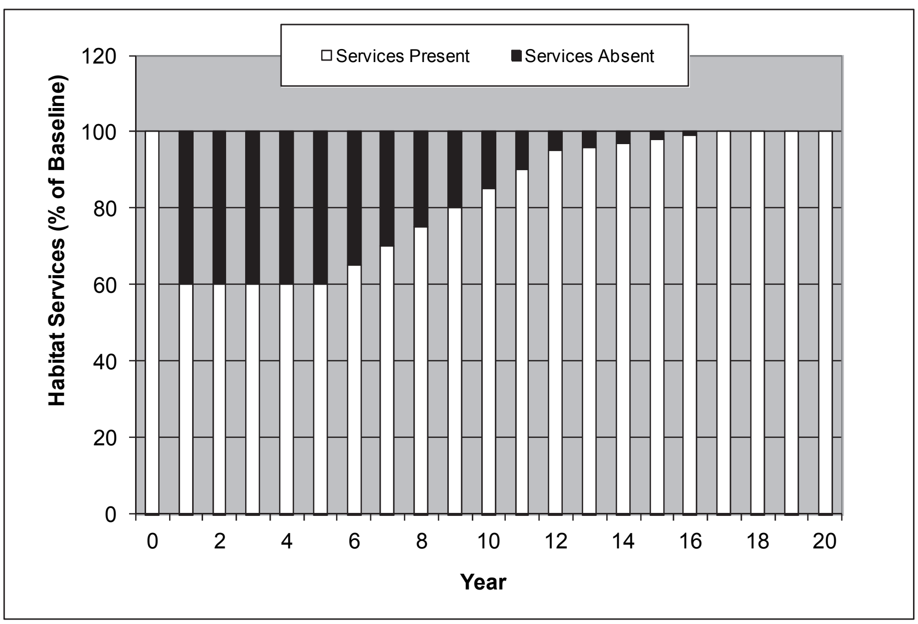

Figure C1. Hypothetical example of how the HEA model considers habitat services absent and habitat services present in each year to calculate the total services lost over the Project period (i.e., sum of the black bars).

The HEA model balances the cumulative injury (*I*, service-acre-years) over the lifetime of the Project with the cumulative benefit of habitat restoration and mitigation (*R*, service-acre-years), so that the services returned by habitat restoration and mitigation are greater than or equal to the cumulative injury ($R \geq I$). The habitat injury (*I*, service-acre-years) will be quantified for the life of the Project using Equation 2. Equation 2 was adapted from Equation 8.1 in Allen et al. (2005)[2]. The discount rate (*r*) is anticipated to be set to 3%, which is standard for this type of analysis. The discount rate converts services being provided in different time periods into current time period equivalents (Allen et al. 2005). The discount rate effectively weighs the habitat service losses so that losses occurring early in the project result in a greater overall injury than losses occurring later in the project. Likewise, habitat restoration and mitigation occurring early in the Project would result in a greater benefit than habitat restoration and mitigation occurring late in the Project.

Equation 2.

$$I = \sum_{t=0}^{y} JV^{j} * \rho_{t} * \left[(b^{j} - x_{t}^{j}) / b^{j}\right]$$

where:

I is the present value of the service-acre-years lost over *y* due to interim and permanent injury,

$t = 0$ is the year the project begins,

y is the analysis period (107 years),

JV^j is the value of the habitat services provided by the injured habitat (service-acres) before injury (i.e., at the Baseline milestone),

b^j is the mean service score provided by the Assessment Area (JV^j/J, where J is the injury Assessment Area in acres) at the Baseline milestone (time [*t*] = 0),

ρ_t is the discount factor, where $\rho_t = 1/(1+r)^{t-C}$, where *r* is the discount rate for the time period and *C* is the time the claim is presented (*C* = Project Year 1), and

x_t^j is the mean service score provided by the Assessment Area at the end of year *t* if Project disturbances are applied.

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2 Allen, P.D. II, D.J. Chapman, and D. Lane. 2005. Scaling environmental restoration to offset injury using habitat equivalency analysis. In *Economics and Ecological Risk Assessment: Applications to Watershed Management*, edited by R.F. Bruins and M.T. Heberling, pp. 165–184. Boca Raton, Florida: CRC Press.

APPENDIX D

Quantification of Habitat Service Gains Produced by Habitat Restoration and Mitigation projects

MODELING MITIGATION PROJECT HABITAT SERVICE GAINS

Habitat restoration and mitigation projects are intended to create new, or protect existing, greater sage-grouse (*Centrocercus urophasianus*) (sage-grouse) habitat services (Table D1). These measures serve as a "toolbox" from which mitigation options may be selected by PacifiCorp for inclusion in a mitigation package once the Bureau of Land Management has identified the preferred alternative for Gateway South and final Habitat Equivalency Analysis (HEA) results are available for that alternative. The purpose of implementing the habitat restoration and mitigation projects is to offset the cumulative sage-grouse habitat service losses in the Assessment Area over the Project lifetime (see *I* in Equation 2 from Appendix C). The HEA will be used to evaluate the benefit of a sample of conservation projects in the Assessment Area.

Table D1. Potential Habitat Restoration and Mitigation projects for Inclusion in the HEA

Measure	Brief Project Description	Anticipated Benefits
Fence removal and marking with flight diverters	Fence segments that pose a high collision risk for sage-grouse (Stevens et al., in press*) would be marked, modified, or removed to reduce or remove threats to sage-grouse.	• Reduce mortality due to sage-grouse collisions • Increase visibility of fences • Increase contiguous patches of shrub-steppe habitat • Remove localized grazing pressure and increase habitat
Sagebrush restoration and improvement projects	Seeding, planting seedlings, or transplanting containerized sagebrush plants (one plant per 5 square meters) and seeding a bunchgrass understory.	• Create contiguous patches of shrub-steppe habitat with optimal sagebrush cover and height and a bunchgrass understory • Increase availability of high-quality nesting, brood rearing, and winter habitats
Juniper/conifer removal	Mechanical removal (lop and scatter, cut-pile-cover, or mastication) of juniper/confer adjacent to areas with optimal sagebrush cover and height.	• Reverse juniper/conifer encroachment on shrub-steppe habitat to increase contiguous patches of sage-grouse habitat • Increase light penetration to support a forb and grass understory
Conservation easements	Removes threat of specific land uses to sensitive wildlife populations.	• Prevent sage-grouse habitat destruction or degradation near urban areas and oil and gas development • Reduce future fragmentation of shrub-steppe habitat

* Stevens, B.S., D.E. Naugle, B. Dennis, J.W. Connelly, T. Griffiths, and K.P. Reese. In press. Mapping sage-grouse fence-collision risk: Spatially-explicit models to target conservation implementation. Wildlife Society Bulletin.

GIS MODELING OF CONSERVATION BENEFITS

The analysis of habitat service benefits produced by each habitat restoration or mitigation measure in Table D1 will be completed using an approach similar to that described for quantifying habitat losses. It is necessary that both analyses—quantification of habitat service losses and habitat service gains—use the same habitat services metric (see Appendix A), the same unit of measure (service-acres and service-acre-years), the same analysis period, and the same discount rate. Figure D1 illustrates a hypothetical example of how mitigation would be added to the baseline service metric over time to derive an estimate of the service-acre-years provided by the mitigation projects that will be modeled for the Project.

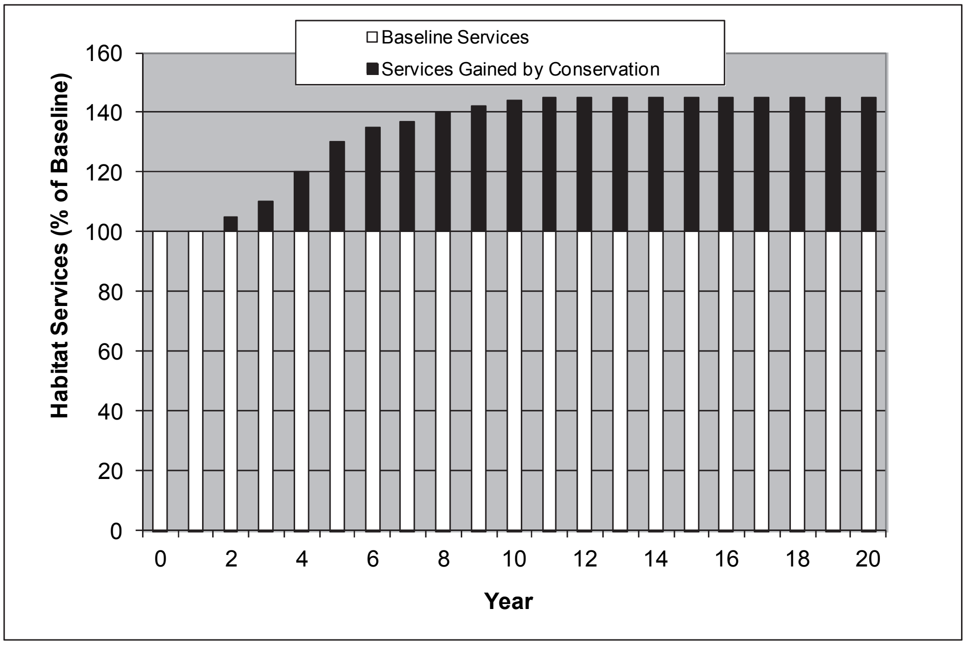

Figure D1. Hypothetical example of how the HEA model considers habitat services gained by habitat restoration and mitigation to calculate the total services gained over the project period (i.e., sum of the black bars).

Modeling Habitat Restoration and Mitigation projects

Ideally, locations of possible habitat restoration and mitigation projects will be identified prior to finalization of the HEA process. In the event that these locations are not known, hypothetical habitat restoration and mitigation project areas will be used to estimate average habitat service gain.

Once actual or hypothetical habitat restoration and mitigation project locations are identified, variable scores in the HEA model will be changed to approximate the change in habitat services expected with implementation of the measure. The new habitat service score will be calculated for each cell in the Assessment Area using the same habitat services metric used to quantify baseline and impacts (see Appendix A). The habitat service benefit of a modeled project will be calculated by determining the difference in the habitat services provided at baseline and after implementation of the habitat restoration or mitigation measure.

For each habitat restoration/mitigation project, the time to full benefit and project initiation timing will be determined and accounted for in the HEA model to estimate of the present value habitat service gain that would be created. The present value habitat service gain (*R*, service-acre-years) will be quantified for the life of the Project using Equation 3 (adapted from Equation 8.1 in Allen et al. 2005[1]).

Equation 3.

$$R = \sum_{t=0}^{y} PV^p * \rho_t * \left[(x_t^p - b^p)/b^p\right]$$

where:

R is the present value of the service-acre-years gained by the habitat restoration or mitigation measure,

$t = 0$ is the year the transmission line Project begins,

y is the analysis period (107 years),

PV^p is the value of the habitat services provided by the improved habitat (service-acres) before habitat restoration or mitigation measure (i.e., at the Baseline milestone),

b^p is the mean service score provided by the Assessment Area (PV^p/P, where P is the injury Assessment Area in acres) at the Baseline milestone (time [t] = 0),

ρ_t is the discount factor, where $\rho_t = 1/(1+r)^{t-C}$, where r is the discount rate for the time period and C is the time the claim is presented (C = Project Year 1), and

x_t^p is the mean service score provided by the Assessment Area at the end of year t if habitat restoration or mitigation measure benefits are applied.

The present value habitat service gain (R) will be standardized among projects by dividing by size of project (units in acres or linear miles depending on the conservation measure modeled) and averaged among hypothetical projects applying the same conservation measure to produce the service-years gained per unit of treatment ($\overline{R}^m$). This value will be used in mitigation calculations.

ESTIMATING COST TO IMPLEMENT MODELED HABITAT RESTORATION AND MITIGATION PROJECTS

The cost of the modeled habitat restoration and mitigation projects will be estimated by averaging the known cost of similar projects previously implemented (in current year U.S. dollars). The cost per unit treated will be divided by the average service-acre-years per unit area treated (calculated in the previous section), to estimate the price per service-acre-year gained for each of the habitat restoration and mitigation projects. This is the currency that will be used to offset the permanent and interim habitat service losses associated with Project construction and operation for the duration of the analysis.

[1] Allen, P.D. II, D.J. Chapman, and D. Lane. 2005. Scaling environmental restoration to offset injury using habitat equivalency analysis. In *Economics and Ecological Risk Assessment: Applications to Watershed Management*, edited by R.F. Bruins and M.T. Heberling, pp. 165–184. Boca Raton, Florida: CRC Press.

APPROACH TO OFFSET HABITAT SERVICE LOSSES WITH HABITAT SERVICE GAINS

An HEA scales the mitigation package (i.e., funding to create habitat services) to offset the loss of habitat services over the lifetime of the project. The injury is offset by planned habitat restoration and mitigation projects in Equation 4, where the project size (P^m) can be solved for each habitat restoration or mitigation measure type (m).

Equation 4 $$I = \sum_{m1}^{i} P^m * \overline{R}^m$$

where:

- I is the present value of the service-acre-years lost over y due to interim and permanent injury,
- y is the analysis period (107 years)
- i is the number of habitat restoration and mitigation projects modeled,
- P^m is the size of the habitat restoration or mitigation project of type m (in units of acres or miles), and
- $\overline{R}^m$ is mean service-years gained per unit (acres or miles) of treatment.

Once the P^m is defined for each habitat improvement and mitigation measure, the costs per unit can be applied. Mitigation due is the sum of the costs to implement each of the habitat improvement and mitigation projects needed to offset the Project.