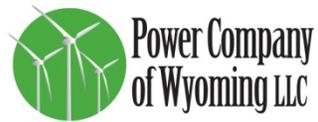


Appendix D
Reclamation Plan

Chokecherry and Sierra Madre Wind Energy Project

Master Reclamation Plan

Prepared for



**555 Seventeenth Street
Suite 2400
Denver, CO 80202**

Prepared by

**SWCA Environmental Consultants
295 Interlocken Blvd., Suite 300
Broomfield, CO 80021
(303) 487-1183 / Fax (303) 487-1245
www.swca.com**

May 2011

TABLE OF CONTENTS

| | <u>Page</u> |
|--|-------------|
| 1.0 Introduction | 1 |
| 1.1 Definitions and Objectives | 1 |
| 1.1.1 Initial Stabilization | 2 |
| 1.1.2 Long-term Reclamation | 2 |
| 1.2 Reclamation Success Standards | 2 |
| 1.2.1 Surface and Soils Stabilization Standards | 2 |
| 1.2.2 Revegetation Standards | 3 |
| 1.2.3 Landscape Reconstruction Standards | 4 |
| 1.3 BLM Reclamation Requirements | 4 |
| 2.0 Pre-Disturbance Site Characterization | 4 |
| 2.1 Ecological Site Delineation | 5 |
| 2.1.1 Pre-Disturbance Site Assessment | 5 |
| 2.1.2 Soil | 5 |
| 2.2 Reference Sites | 6 |
| 2.3 Photopoints | 6 |
| 2.4 Identify Limited Reclamation Potential Areas | 6 |
| 2.4.1 Abiotic Landscape Features | 7 |
| 2.4.2 Topsoil/Subsoil | 7 |
| 2.4.3 Vegetation | 7 |
| 3.0 Surface-Disturbing Activities | 7 |
| 3.1 Construction Planning | 8 |
| 3.1.1 Facility Layout | 8 |
| 3.1.2 Design Documentation | 8 |
| 3.2 Waste Material Management | 8 |
| 3.2.1 Handling of Contaminated Soil Material | 9 |
| 3.2.2 Disposal of Waste Materials | 9 |
| 3.3 Subsurface Integrity | 9 |
| 3.3.1 Stabilization | 9 |
| 3.3.2 Water Quality | 9 |
| 4.0 Soil Management | 10 |
| 4.1 Soil Handling | 10 |
| 4.1.1 Maintain Biological, Chemical, and Physical Integrity | 10 |
| 4.2 Landscape Reconstruction and Erosion Control | 12 |
| 4.2.1 Landscape Reconstruction | 12 |
| 4.2.2 Soil Stabilization and Erosion Protection | 13 |
| 5.0 Site Preparation and Revegetation | 16 |
| 5.1 Soil Materials | 16 |
| 5.1.1 Re-establish Chemical, Physical, and Biological Properties | 16 |
| 5.1.2 Compaction | 17 |
| 5.1.3 Protect Seeding Surface | 17 |
| 5.2 Establish Desired Plant Community | 17 |
| 5.2.1 Seeding | 18 |
| 6.0 Weed Management | 19 |
| 7.0 Reclamation Monitoring | 20 |

| | | |
|-----|---------------------------------------|----|
| 7.1 | Monitoring Parameters | 21 |
| 7.2 | Compliance..... | 21 |
| 7.3 | Identify Additional Reclamation | 22 |
| 8.0 | References..... | 23 |

1.0 INTRODUCTION

This Master Reclamation Plan for the Chokecherry and Sierra Madre Wind Energy Project (Project) provides an overview of the reclamation goals and standards that will be used to ensure successful reclamation of disturbed areas created by the Project. The reclamation procedures outlined in this document describe the methodologies, monitoring, and reporting requirements for reclaiming disturbances associated with the Project and were developed based on Bureau of Land Management (BLM) Wyoming Reclamation Policy (2009), management directives presented in the Rawlins Field Office (RFO) Resource Management Plan (RMP) (BLM 2008) and RFO Reclamation Guidance (BLM 2011), Wyoming Department of Environmental Quality (WDEQ) Land Quality Division reclamation guidelines (WDEQ 2007), State of Wyoming’s reclamation guidance for wind development, and coordination with BLM staff.

The Project area contains private lands; federal lands administered by the BLM (“public lands”); state lands under the management of the Wyoming State Board of Land Commissioners (the “State Land Board”), and lands under the administration of the Wyoming Game and Fish Commission (“WGFC”) (collectively referred to as “state lands”). The Master Reclamation Plan and the procedures and standards outlined herein will apply to public lands within the Project area. While the preference will be to use the procedures and standards of the Master Reclamation Plan, specific reclamation techniques, standards, and schedules on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate. Reclamation procedures in this document outline measures that will be taken to effectively reclaim areas disturbed by the Project, minimize Project impacts to natural resources, and comply with federal and state regulations. For the purposes of this document, reclamation measures are presented in a general, non-specific manner. Detailed or site-specific reclamation measures and techniques will be developed following final Project design. This Reclamation Plan is intended to be adaptive to changing conditions and technologies, and the BLM Authorized Officer (AO) will have discretion to update, modify, or change the procedures should it be deemed warranted due to site conditions or other factors.

1.1 DEFINITIONS AND OBJECTIVES

Reclamation objectives emphasize eventual ecosystem reconstruction to maintain a safe and stable landscape and meet the desired outcomes of the land use plan, which means returning the land to a condition approximate to or better than pre-disturbance conditions. Reclamation for this plan is defined as the rehabilitation of a disturbed area to make it acceptable for designated use that often requires regrading, replacement of topsoil, revegetation, and other measures. Reclamation objectives include initial stabilization goals and long-term reclamation measures to ensure biophysical conditions are maintained in the short term to achieve long-term goals of revegetation and ecosystem reconstruction.

1.1.1 Initial Stabilization

Initial (or temporary) stabilization is initiated immediately after construction. The goal of initial stabilization is to stabilize soils and control erosion until long-term reclamation techniques are implemented.

1.1.2 Long-term Reclamation

Long-term reclamation refers to measures applied to stabilize disturbed areas, control runoff and erosion, and achieve reclamation goals and objectives concurrently with construction, maintenance and operation, or decommissioning of facilities. There are two phases of long-term reclamation.

- Interim reclamation is initiated following construction on areas that are not required for regular operations and routine maintenance activities, but which may be re-disturbed during non-routine maintenance and Project decommissioning. The objective of interim reclamation is to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual, and forage loss on those portions of the disturbed area not needed for operations for the life of the Project or until final reclamation is initiated.
- Final reclamation is initiated following construction for areas that will not be re-disturbed during operations and maintenance; and after decommissioning of the Project for all other areas. The objective of final reclamation is to return the land to a condition approximating that which existed prior to disturbance with allowances for an improved and/or stable ecological condition, if possible. This includes reconstruction of the landform to its original state along with re-establishment of a stable vegetative community, hydrologic systems, visual resources, agricultural values, and wildlife habitats.

1.2 RECLAMATION SUCCESS STANDARDS

Reclamation success standards will be used to assess whether the reclamation requirements are being met. On disturbed lands that are not needed for future activities, final reclamation will be pursued immediately. These standards apply on public lands. While the preference will be to use these standards on private lands and state lands, specific reclamation success standards on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate.

1.2.1 Surface and Soils Stabilization Standards

Undesirable materials (e.g., contaminated soils, potentially hazardous materials) will be isolated and/or removed to protect the reclaimed landscape from contamination. The land surface will be recontoured and other soil conservation, surface manipulation, and water management techniques will be implemented to establish stable slopes, watercourses, and drainage features to minimize erosion and sedimentation (also protecting surface water and groundwater resources). The soil surface must be stable and have adequate surface roughness to reduce run-off and capture rainfall and snow melt. Additional short-term measures, such as

the application of mulch or mechanical surface roughening, could be used to limit surface soil movement.

1.2.2 Revegetation Standards

Vegetation production and relative species diversity will approximate the composition and characteristics of the adjacent undisturbed reference sites. The vegetation will stabilize the site and support the planned post-disturbance land use, provide for natural plant community succession and development, be self-perpetuating, and noxious weeds will be controlled in accordance with the standards set forth herein. While the preference will be to use these standards on private lands and state lands, specific revegetation standards on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate to meet specific land use standards. Revegetation will be deemed successful when the following criteria are met.

- A self-sustaining, and locally native plant community is established on the site. Seed mixtures will be developed based on site-specific characteristics following BLM guidance. Vegetation will have a density sufficient to control erosion and non-native plant invasion and re-establish wildlife habitat and forage production.
- Sufficient species diversity is established on sites on public lands. No single species will account for more than 30 percent of total vegetative composition on public lands unless it is evident at higher levels in adjacent undisturbed reference sites.
- Vegetative cover on the site meets appropriate standards. Reclamation of permanent vegetative cover will be determined successful when the basal cover of desirable perennial species is at 80 percent and dominant species is at 90 percent of the adjacent undisturbed reference site in accordance with the RFO RMP (BLM 2008) and/or in accordance with the appropriate standard developed in coordination with private landowners, the State Land Board or WGFC as appropriate.
- Resilient vegetation is established on the site. Plants must be resilient as evidenced by well-developed root systems and successful reproduction (vegetative and sexual).
- Shrub communities are established on sites on public lands (only in communities where shrubs were present prior to construction). Shrubs must be well established, at least in a “young” age class (not comprised mainly of seedlings that may not survive until the following year) showing evidence of reproduction.
- Invasive plant and noxious weed species are a minor component of the plant community on the site. Part of successful revegetation includes maintaining native plant communities with minimal weed occurrences. Invasive plant species should account for less than 5 percent total plant cover and reclamation species should be outcompeting weed species within two years of reclamation initiation; however, total percent cover of these species should be commensurate with adjacent reference sites. On public lands, the BLM has zero tolerance for state-listed noxious weed species and all noxious weeds will be controlled.

1.2.3 Landscape Reconstruction Standards

Landscape reconstruction will be deemed successful when the original landform has been restored or approximated for disturbed areas that are not required for regular operations and maintenance activities. For landscape reconstruction to be deemed successful, the reclaimed landscape will have the characteristics that approximate the visual quality of adjacent areas with regard to location, scale, contour, color, and orientation of major landscape features and will support existing and future land uses. Erosional features will be less than or equal to the surrounding area. While the preference will be to use these landscape reconstruction standards on private lands and state lands, specific standards on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate.

1.3 BLM RECLAMATION REQUIREMENTS

Reclamation requirements are designed to ensure adherence to the BLM Wyoming Reclamation Policy (2009) and the BLM Instruction Memorandum No. WYD-03-2011-002 (BLM 2011). BLM reclamation requirements for Wyoming apply to all surface-disturbing activities and must be addressed in the reclamation plan. Where Wyoming BLM reclamation requirements differ from other applicable federal laws, rules, and regulations, those requirements supersede the BLM Wyoming Reclamation Policy (2009). State and/or local statutes or regulations may also apply. The Wyoming BLM reclamation requirements are addressed individually in the following sections of the Reclamation Plan.

2.0 PRE-DISTURBANCE SITE CHARACTERIZATION

Pre-disturbance site characterization is a critical component for reclamation monitoring purposes to describe the surrounding landscape, determine ecological community types, and assess biophysical parameters during planning. Pre-disturbance survey provides data that allow for proper planning and timely implementation of activities, as well as the landscape, soil, and vegetation characteristics to be recreated with reclamation practices. This characterization also provides the baseline information to assess and monitor rangeland conditions and trends to maintain Wyoming Standards and Guidelines for Healthy Rangelands (BLM 1997).

Components of pre-disturbance site characterization include establishing undisturbed adjacent reference sites and identifying limited reclamation potential (LRP) sites. This baseline information will include topographic, hydrologic, vegetation, and soil parameters and will be used to define site-specific reclamation guidelines. Pre-disturbance assessments of drainages will be completed in accordance with the Project Aquatic Monitoring Plan. LRP sites possess unique landscape characteristics that present distinctive challenges and make meeting reclamation requirements more challenging (BLM 2009). Identifying LRP sites during pre-disturbance characterization will provide information for site-specific reclamation requirements and limitations. By establishing baseline conditions of the surrounding landscape, reclamation goals and success standards will be more actively assessed through the reclamation monitoring plan.

2.1 ECOLOGICAL SITE DELINEATION

Biophysical and physiographic parameters will be characterized in each proposed disturbance site to assess pre-disturbance conditions, delineate ecological sites, and identify revegetation techniques (BLM 2011). An ecological site is a specific kind of land defined by its physical characteristic that differs from other communities within a landscape in its ability to produce and support a distinctive type and amount of vegetation, and in its ability to respond similarly to management actions and natural disturbances (Natural Resources Conservation Service [NRCS] 2003). Ecological sites have not been fully mapped by the NRCS for the Project area; however, within the RFO, 10 ecological site descriptions (ESD) are recognized (BLM 2011). NRCS soil surveys along with aerial imagery, climate, land management, and other natural factors will be used to delineate ecological site boundaries. Photo reference points (photopoints) will be established at each proposed disturbance to provide a qualitative standard for pre-existing conditions and for comparison purposes during post-construction monitoring. The combination of protocols described below will be used for identifying topographic features (slope and aspect), variations in plant composition and cover, and soil surface properties.

2.1.1 Pre-Disturbance Site Assessment

A low-intensity inventory will be conducted for disturbance areas to rapidly assess plant community characterizations, soil surface indicators, and general soil types to ensure that each identified ecological site is appropriately classified (Agricultural Research Service [ARS] 2011). During the site assessment, general attributes will be confirmed through a qualitative assessment of topography, vegetation, and soil. Steep slopes (greater than 25 percent), aspect, and unique topographic features (i.e., rock outcrops, unique boulders, natural moss rock piles, etc.) will be identified.

2.1.2 Soil

More detailed observations of the soil properties and processes will assist in delineating each ecological site (Moseley et al. 2010), while providing the baseline information necessary to assess reclamation needs. Soil components are differentiated by parent material, landform, slope component and complexity, temperature regimes, and moisture regimes. Soil types are further classified by diagnostic horizons, physical and chemical properties, fragment inclusions, and root distribution. Soil characteristics will be gleaned partly from the established Order 3 soil survey data; however, additional information (i.e., physical and chemical properties) will be gathered to further describe soil conditions (ARS 2011). Data gaps in the existing soil data will be identified and fulfilled as needed. Standardized sampling protocols will be used to maintain the quality of data and to compare attributes between adjacent undisturbed sites and reclaimed areas.

Soil erodibility will be defined for each disturbance area as described by the correlated soil components and complexes. Soil erosion features will be assessed for each proposed disturbance area using the Erosion Condition Classification System (BLM 1980), which evaluates soil movement, surface litter, surface rock fragments, pedestalling, row patterns, rills, and gullies. The Erosion Condition Classification System will identify the erosion risk for each site as stable, slight, moderate, critical, or severe.

2.2 REFERENCE SITES

An adjacent undisturbed reference site will be assigned to each disturbance area prior to any surface disturbance activity. A single reference site may be used for more than one disturbance area when the disturbance areas have similar characteristics and fall within the same ecological site type (i.e., a string of turbines on the same ridgeline). Conversely, more than one reference site may be necessary for an individual surface disturbance (i.e., larger facilities and linear features may include multiple ecological sites and may require multiple reference sites). The adjacent undisturbed reference site will be used to establish pre-construction site conditions against which site-specific reclamation goals and standards will be assessed. Reference sites on private lands and state lands and reclamation assessment standards will be developed in cooperation with private landowners, State Land Board or WGFC as appropriate.

Vegetation attributes (i.e., species composition, species cover, and invasive plant and noxious weed occurrences) will be quantified to provide a more precise estimate of the existing vegetation conditions (BLM 2011). Standardized sampling protocols will be used to maintain the quality of data and to compare attributes between adjacent undisturbed sites and reclaimed areas. The Step-Point method measures the basal cover percentage for individual species, total basal cover percentage, and species composition by basal cover percentage (BLM 2011). This methodology is both quantitative, reproducible, and it is also possible to collect a fairly large number of samples within a relatively short period of time, providing a comparison of revegetation success in the reclaimed area to the existing native vegetation in an adjacent area. During site assessments, occurrences of invasive plants and noxious weeds will be identified and recorded (i.e., shapefile).

2.3 PHOTOPPOINTS

Digital photographs will be used to document conditions of vegetation, site stability, erosion, and other features or conditions subject to change over time. Each photograph will include the direction of photo (compass), from where it was taken, and what is captured in the photo (e.g. reference site, sampling transect, noxious weeds [or lack of], etc.). Photographs from the photopoints will be taken during the same year/time period.

2.4 IDENTIFY LIMITED RECLAMATION POTENTIAL AREAS

The BLM has defined LRP sites that are particularly difficult to restore due to highly sensitive physical, biological, and/or chemical characteristics (BLM 2009). LRP sites require additional site-specific reclamation standards, which will be developed for areas identified as LRP sites based on the characteristics listed below. Best Management Practices (BMPs) and other strategies will be developed on a site-specific basis to mitigate impacts and/or to increase reclamation success. BMPs will address the site-specific requirements of the Project and local environment. While the preference will be to use these LRP reclamation success standards on private lands and state lands, specific standards on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate.

2.4.1 Abiotic Landscape Features

Abiotic landscape features that determine LRP areas include topography (slope and aspect), unique features, parent materials (geological substrates), and climate. LRP areas include slopes greater than 25% with south- or southwest-facing aspects; cliffs or rock outcrops that will be destroyed during construction and difficult or impossible to re-establish; soils with marine shale, clay/siltstone, or seleniferous (selenium-bearing) geological substrates; and some areas where the annual precipitation is below 9 inches (BLM 2011).

2.4.2 Topsoil/Subsoil

Soils with limited reclamation potential are soils with a depth of less than 3 inches, a soil pH greater than 8.4, soil electrical conductivity (EC) greater than 8 deciSiemens per meter (dS/m) (which helps identify strongly saline soils), or a sodium absorption ratio (SAR) greater than 13 (which helps identify sodic soils). Soils with no visible biological activity, with a surface heavily stabilized by biological crusts, abiotic white crusts, abiotic black crusts, or dominated by coarse material greater than 0.08 inch in diameter are also signs of LRP areas. These usually indicate salty conditions, old surfaces which are stable after years of protection by biological crusts, or soils which are potentially quite gravelly. Some gravel surfaced soils have had wind and water erosion over time such that only gravels and cobbles remain over very thin, if any, topsoil. These sites usually have very sparse vegetation.

2.4.3 Vegetation

Unique vegetation communities with limited reclamation potential include halophytes (e.g., saltbush [*Atriplex* spp.], greasewood [*Sarcobatus* spp.]) and selenium accumulators (e.g., two-grooved milkvetch [*Astragalus bisulcatus*], prince's plume [*Stanleya pinnata*], woodyaster [*Xylorhiza glabriuscula*]). The presence of invasive species alone normally would not indicate an LRP area; however, some invasive species are halophytes and are indicative of unsuitable soil. Cushion plant, mountain shrub, silver sagebrush (*Artemisia cana*), spiny hopsage (*Grayia spinosa*), or alkali sage communities may also be indicative of LRP areas. Many of these plants do not have seed available commercially, and also have narrow site parameters for seedling establishment and growth. Plants growing on very shallow, saline upland, saline lowland, sands, clayey, shallow clayey, impervious clay, shallow igneous, or badland ecological sites also do not have seed available commercially, and have poor soil characteristics for seedling establishment and growth.

3.0 SURFACE-DISTURBING ACTIVITIES

Components of surface-disturbing activities will be described in the Construction, Operations, and Maintenance Plan (COMP). Construction planning will provide a description of the extent of the Project area covered by the reclamation plan. Pre-disturbance assessments will provide the baseline information needed for construction planning. Waste material management will follow measures outlined in the Project Waste Management Plan. Sources of contamination will be controlled and BMPs will be implemented to protect surface water and groundwater quality.

3.1 CONSTRUCTION PLANNING

Upon final Project design, a COMP will be completed to include a facility layout, location and detail of surface-disturbing activities, and design documentation. This information will be used to determine specific reclamation techniques and reclamation timing for different construction elements and locations. Project construction will take place over a three- or four-year period and a phased approach will be implemented. Each surface-disturbing activity will be assigned to a construction phase and total surface disturbance acres will be calculated for each year of construction. Based on the level of disturbance, site-specific reclamation standards and a monitoring schedule will be determined for each surface-disturbing activity. A site-specific reclamation action plan will be developed for each surface-disturbing activity and monitoring will begin immediately following construction with soil stabilization followed by interim reclamation. The COMP will provide detailed descriptions of the Project components described in the following subsections.

3.1.1 Facility Layout

New facilities for the Project include the rail delivery facility and staging area, operation and maintenance (O&M) facility, substations, batch plants (including aggregate stations), water extraction sites, turbines, roads, and above- and below-ground electrical lines. Each facility will have long-term (i.e., life of the Project) and temporary disturbance footprints. Soil stabilization measures and weed control plans will be implemented for temporary disturbances at each facility.

The COMP will include the Project roadway system and design. The roadway system and design will allow active monitoring of interim and final reclamation.

3.1.2 Design Documentation

The project COMP will include design documentation of each surface disturbing activity. The documentation will include shapefiles delineating the total disturbance area (i.e., footprint), permanent disturbance area (i.e., life of the Project), short-term disturbance area, and proposed infrastructure locations. Delineated disturbance areas will include attributes describing the level of disturbance (i.e., permanent versus temporary, vegetation treatment, and topsoil treatment) and an initial soil stabilization plan. Each surface-disturbing activity that is removing and relocating topsoil will identify and delineate a stockpile location within or adjacent to the disturbance footprint.

3.2 WASTE MATERIAL MANAGEMENT

The BLM Wyoming Reclamation Policy (2009) requires that all waste materials are managed through the segregation, treatment, and/or bio-remediation of contaminated soil material; by burying only authorized waste materials on site; and ensuring that all waste materials moved off-site are transported to an authorized disposal facility.

3.2.1 Handling of Contaminated Soil Material

Contaminated soils can be defined as any soils that are subject to a foreign substance that modifies the chemical properties of soils to the extent that vegetation re-establishment is not achievable within a reasonable amount of time following Project implementation. All contaminated soils will be transported, managed, and disposed of according to procedures outlined in the Waste Management Plan and Storm Water Pollution Prevention Plan (SWPPP).

3.2.2 Disposal of Waste Materials

The construction contractor will keep all hazardous, non-hazardous, special, and general trash wastes separate and will not mix waste streams. Hazardous material will be managed and disposed of as predetermined by the COMP and Waste Management Plan.

3.3 SUBSURFACE INTEGRITY

The BLM Wyoming Reclamation Policy (2009) requires that subsurface integrity is maintained and that sources of groundwater and surface water contamination are eliminated by properly plugging subsurface openings; stabilizing and properly backfilling underground workings; and controlling sources of contamination by implementing BMPs to protect groundwater and surface water quality.

Subsurface openings and underground workings associated with the development will be described in the COMP. Any subsurface openings related to water wells will be developed and plugged per industry standards. Underground workings for infrastructure such as collecting lines, cathodic protection, and other infrastructure will be trenched and backfilled with the same excavated material or appropriately engineered backfill materials in a reverse method from which it was excavated. Backfilled material will be compacted to Project design standards with topsoil salvage and redistribution per predetermined depths. Drainages and other water body crossings will be evaluated at the time of Project planning and construction to determine appropriate subsurface BMPs to be implemented at water crossings. Trench breakers made from sand bags or prefabricated concrete bags may be used at the outer extents of wetlands and drainage crossings to minimize the potential for any ‘French drain’ effect or inadvertent subsurface drainage of water bodies. Trench breakers may also be used to prevent ‘piping’ or lateral subsurface water movement along trenched gathering lines in areas where collecting lines parallel water bodies and stream courses.

3.3.1 Stabilization

Subsurface stabilization will include compaction of redistributed subsoils to Project design standards, as applicable.

3.3.2 Water Quality

Water quality will be maintained during surface-disturbing activities using BMPs and reclamation prescriptions predefined in the COMP, SWPPP, and in compliance with the Clean Water Act (CWA).

4.0 SOIL MANAGEMENT

Soil is constantly being weathered through biological processes, which develops the structure and function essential in sustaining vegetation communities and providing wildlife habitat. Thus, maintaining soil structure and function is critical for successful reclamation efforts. During surface-disturbing activities, topsoil will be separated and handled differently than other soil layers, and topsoil will be salvaged during construction to use for site preparation and support future reclamation efforts. Components of soil management will include soil handling, landscape reconstruction, and surface runoff and erosion control. The BLM hydrologist and soil scientist will be consulted to determine if a drainage is large enough or important enough to require additional site-specific soil management procedures. Soils on public lands will be managed with approved measures. While the preference will be to use these management practices on private lands and state lands, specific soil management practices on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate.

4.1 SOIL HANDLING

A critical component of reclamation is to maintain the biological, chemical, and physical integrity of the soil resource by establishing a series of guidelines for the proper handling of topsoil and subsoil. For each surface-disturbing activity, topsoil, and in some instances subsoil, will be salvaged from surface disturbance activities and stockpiled. Proper salvaging techniques involve delineating soil type and determining soil depth. Components of soil handling will include the identification, erosion protection, placement, and incorporation of salvaged soil stockpiles. The BLM Wyoming Reclamation Policy (2009) requires that all topsoil and appropriate subsoil be properly maintained through clearly identifying, delineating, and segregating all salvaged topsoil and subsoil based on a site-specific soil evaluation, including depth, chemical, and physical properties; by protecting all stored material from erosion, degradation, and contamination, and seeding soils to be stored more than one growing season with desirable native vegetation; placing soils in the appropriately identified locations and providing the necessary signage for identifying stockpiles; and incorporating stored soil material back into the disturbed landscape.

4.1.1 Maintain Biological, Chemical, and Physical Integrity

Maintaining and restoring the biological, chemical, and physical characteristics is necessary to meet reclamation success standards and maintain healthy rangelands. During all surface-disturbing activities, topsoil will be identified and salvaged separately from spoil and stockpiled to support future reclamation efforts. Suitable topsoil typically has physical and chemical properties that promote vegetation growth, rather than inhibit vegetation establishment. Suitable topsoil typically is a well-developed, non-shallow soil with neutral soil pH, low salt content, low to moderate SAR, and loamy texture. Sandy or clayey soils with very little biological activity, no topsoil or very shallow topsoil (less than 3 inches), high alkalinity and/or salinity, or elevated SAR (greater than 13) should be avoided. Abiotic crusts, well-developed cryptobiotic crusts, and soils with high coarse fragment content should also be identified as poor topsoil conditions.

4.1.1.1 Salvaging

Prior to all surface-disturbing activities, topsoil potential will be evaluated and salvage depth determined during pre-construction site characterization. Additional soil physical and chemical characteristics will be evaluated during ecological site delineations. If the ecological site and soil salvage depth cannot be identified from the pre-construction site characterization, additional soil pits and rapid soil tests will be necessary to evaluate site-specific topsoil conditions.

Salvage depth diagrams developed from pre-construction site characteristics will be used to determine the appropriate surface soil material salvage depth. When separating soil by horizon, segregation will occur based upon horizon diagnostics and noted changes in physical indicators (e.g., color, texture, structure, etc.) using a soil pit.

4.1.1.2 Stockpiling

Stored soil material (i.e., stockpiles) will be incorporated into the disturbed landscape. During construction planning and salvage evaluation (i.e., topsoil depth and salvage will be predetermined from soil depth map and ecological sites), the amount of salvaged soil will be calculated and stockpile locations identified within the disturbance footprint. Preliminary evaluations during construction planning and surface disturbance geographic information system (GIS) files should include identified stockpile locations (see Construction Planning). Alternatively, stockpile locations within the disturbed area will be determined following site-specific salvage depth evaluations and topsoil volume calculations. Placement of stockpiles will be planned to minimize disturbance during interim and final reclamation. Topsoil stockpiles for linear features (e.g., roads, gathering lines, etc.) will be stored adjacent to the disturbed area on native soil and seeded with the approved seed mixture.

Stored soil material will be protected from erosion, degradation, and contamination. Soil stabilization will be implemented as soon as practicable on all topsoil and spoil stockpiles. Vegetation will be salvaged and stockpiled along with topsoil to provide erosion protection, maintain natural inocula, and incorporate native seeds and organic matter. Additional mulching and natural tackifiers may be used to protect exposed stockpile surfaces. Stockpiles to be stored beyond one growing season will be seeded with a site-specific seed mixture. The seed mixture will be determined from the ecological site. Seeding stockpiles with an approved and appropriately designed seed mixture (i.e., designed with locally adapted plant species unique to the specific ecological site and biophysical conditions) presents a unique opportunity to predetermine the compatibility and establishment success rate of the site-specific seed mixture.

Topsoil and spoil stockpiles will be designed to minimize the surface area occupied and will be constructed to maintain geomorphic stability until they are used for reclamation. Spoil will be salvaged and stockpiled separately from topsoil. All stockpiles will be located so as not to affect existing drainages. In some cases, a disturbed area may cover more than one ecological site and topsoil from each ecological site will be segregated. Topsoil and spoil stockpiles will be clearly marked and noted on site maps. Topsoil attributes and unique identifiers will be included with all shapefiles, and each stockpile will be identified with the necessary signage. Whenever possible, topsoil will be used immediately and not stockpiled for future use.

Stockpiles will be seeded with desired vegetation after one growing season and piles left for more than two years will be no deeper than 2 feet, including the native topsoil underneath.

4.1.1.3 Timing of Construction

The COMP will provide a detailed construction schedule consistent with the record of decision (ROD) and BLM terms and conditions of approval of the project.

4.2 LANDSCAPE RECONSTRUCTION AND EROSION CONTROL

Surface runoff and erosion control in areas exposed to surface-disturbing activities will be accomplished by reconstructing the landscape and maintaining soil stability. The BLM Wyoming Reclamation Policy (2009) requires that a complementary visual composition is re-established; the landscape is reconstructed to the approximate original contour and consistent with the land use plan, such that highwalls, cut slopes, and/or topographic depressions are eliminated; and that sheet and rill erosion on or adjacent to the reclaimed area is minimized. The landscape will be reconstructed to achieve a desired topography, slope stability, and surface stability. Water courses and drainage features will be reconstructed, where applicable, to maintain the drainage pattern, profile, and dimension to approximate the natural features and hydrologic characteristics of pre-disturbance characteristics. The BLM hydrologist and soil scientist will be consulted to determine if a drainage is large enough or important enough to require additional site-specific reclamation procedures. Slope stability will be controlled by implementing erosion control measures and BMPs to minimize sheet and rill erosion. Surface stability will be controlled by maintaining soil physical properties and treating compacted surfaces with accepted technologies. For private and state lands, landscape reconstruction and erosion control activities will be completed in adherence with appropriate regulatory requirements and while the preference will be to use these standards on private lands and state lands, specific standards on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate.

4.2.1 Landscape Reconstruction

Site stability will be re-established following landscape reconstruction to the approximate original contour by maximizing the geomorphic stability and topographic diversity of the reclaimed landscape (BLM 2009). Re-establishing the complementary visual composition of a disturbed area will ensure that the reclaimed area does not result in a long-term change to the scenic quality of the overall landscape. This includes recontouring the disturbed area to be consistent with the land use plan and to provide a natural landscape capable of supporting viable populations and a diversity of native plant and wildlife habitat (BLM 2008).

4.2.1.1 Topography/Recontouring

Landscape reconstruction will restore the disturbed area back to its approximate original landscape by recreating the physical characteristics that approximate the visual quality of adjacent areas with regard to location, scale, contour, color, and orientation of major landscape features.

Recontouring will be accomplished through backfilling, grading, and site stabilization. Areas to be backfilled include wind turbine pads, cut slopes, collector line trenches, roadside borrow ditches, and facility foundations. Gathering line trenches will be backfilled so that the soil berm is less than 3 inches high. In most cases, dozers, loaders, scrapers, and motor graders are typically used for backfilling and grading. Spoil for backfill will be obtained from fill material and spoil stockpiles.

4.2.1.2 Stream Channels/Drainages

Temporary stream and drainage crossings, along with associated riparian areas, will be restored to approximate pre-construction conditions following disturbances. Disturbances will be minimized and restored as quickly as feasible. Linear construction disturbances will be narrowed to the minimum width necessary to develop the Project. Temporary culvert placement will be required for live and flowing streams to maintain down-gradient water quality. All topsoils in drainages will be salvaged to predetermined depths for surface redistribution following development. Topsoil salvage in wetlands will be segregated and redistributed by wetland zone as applicable. Following development, channels and swale slopes will be recontoured to allow for unrestricted surface flows with a gradient that matches adjacent undisturbed areas. Embankment slopes will be recontoured to match adjacent undisturbed slopes on either side of the disturbance. In the event that sheer vertical embankments occur, recontouring and restoration will be addressed on a site-specific basis.

4.2.2 Soil Stabilization and Erosion Protection

Erosion control measures will be implemented to avoid, minimize, or mitigate impacts from surface-disturbing activities and restore the landscape back to a natural state. Erosion control measures will be installed prior to and immediately following surface-disturbing activities. Initial stabilization measures will be used to control surface runoff and erosion and to ensure biophysical conditions are maintained until long-term reclamation can be initiated. Long-term erosion control measures will be established at two stages of reclamation—interim reclamation and final reclamation—with an overriding goal of revegetation and ecosystem reconstruction.

Immediately following surface-disturbing activities, temporary runoff and erosion control measures will be implemented where necessary to ensure soil stabilization. Applications will include mulching and netting of biodegradable blankets stapled firmly to the soil surface, applying sediment control, respreading scalped vegetation, and constructing water bars, diversion ditches, sediment fences, and energy dissipaters. Road right-of-ways and gathering lines will require stabilization on both sides of drainage channels and will be determined on site-specific evaluations. Following construction and soil stabilization, long-term measures will be applied to further stabilize disturbed areas and control surface runoff and erosion to meet reclamation standards. Erosion and sedimentation control measures and structures will be installed across all cut-and-fill slopes. Surface runoff and sedimentation control measures will be established by constructing sediment trapping devices and water bars, as well as by timely mulching and revegetation of exposed disturbed areas. Runoff discharged from water bars will be redirected into undisturbed vegetation and away from all natural drainages. Silt fences or other sediment filtering devices will be installed at the inside edge of proposed surface disturbances. Trench breakers will be used to prevent the flow of water into trenches

that have been backfilled or temporarily left open. Trench breakers will not be constructed from topsoil but rather from spoil. All runoff and erosion control structures will be inspected, maintained, and cleaned-out and inspections will be necessary following large runoff events (i.e., spring snowmelt runoff, large precipitation events, etc.). Substandard or ineffective structures will be cleaned out and maintained until the desired vegetation is established and soil stability is attained at the reclaimed area.

Interim reclamation is necessary to maintain viable, healthy ecosystems until decommissioning and standards include maintaining active topsoil, establishing erosion control measures, and minimizing habitat, visual, and forage loss following surface-disturbing activities. Interim reclamation may be necessary on previously reclaimed areas in the event of redisturbance following unforeseen maintenance needs and requirements. Final reclamation will take place on surfaces that will not be disturbed during operations and maintenance activities and during decommissioning of the Project to reconstruct the landscape, meet objectives of the land use plan, and provide healthy habitat and rangelands. Infrastructure, debris, equipment, and contaminated soils will be removed from all facilities and wind turbine pads and the landscape will be re-established to a self-sustaining state, including hydrologic systems, visual resources, and stable vegetative and wildlife communities. The BLM will determine when long-term (interim or final) reclamation success standards are met on public lands.

4.2.2.1 Slope Stability

Turnouts, water ditches, and water bars may be constructed across side slopes at periodic intervals according to slope gradient along recontoured and disturbed slopes. The spacing will partially depend on soil particle cohesiveness and whether mulching, soil binder, or tackifier is applied in conjunction with placement of water bars during earthwork reclamations. Water bars will be seeded per predetermined prescriptions and repaired as needed throughout the life of the Project or until final reclamation measures are deemed successful.

Minimize Erosion and Mass Wasting

Administrative BMPs and project planning will be used to avoid and minimize surface disturbances in LRP sites as practicable. Structural BMPs implemented during Project development will further reduce the potential for erosion. The Project SWPPP and Project Aquatic Monitoring Plan will further assist in identifying mass wasting and other erosion problems until the Project reaches success criteria outlined in the interim and final reclamation measures and the Project SWPPP.

Drainage Structures

Drainage structures may include both temporary and more permanent features. Temporary drainage structures include check dams, sediment traps, temporary culverts, and rip rap, or structures associated with a surface water discharge point. These structures will be maintained during development and removed during various phases of construction and reclamation. More permanent drainage structures include culverts and rip-rap associated with roads, substations, and other Project infrastructure. Temporary structures will be implemented and managed per the Project SWPPP and Plan of Development (POD). Structures placed in jurisdictional waters of the U.S. will be installed and reclaimed in compliance with Section

404 of the CWA including any regional, general, and special conditions included with applicable authorizations.

4.2.2.2 Surface Stability

Re-establishing the surface stability at disturbed sites is critical in providing a soil profile in which plant roots have the adequate pore space to grow and penetrate subsoil horizons. Compaction eliminates natural pore spaces by removing air and destroying soil aggregates, which does not allow the movement of air, water, microbes, and nutrients throughout the soil. Compacted soils are often impenetrable and increase surface runoff and erosion potential. Soils susceptible to compaction will be identified during pre-disturbance site characterization and associated with ecological sites. Prior to reclamation, susceptible soils will be tested to determine the level of compaction and highly compacted areas will be identified for additional aerating and ripping. Ripping and aerating will be necessary for all roads and facilities; however, this measure will not be necessary for all surface disturbance activities, but will be determined at the site-specific level with compaction testing of susceptible soils.

Compaction Testing

Soil compaction takes place below the surface making it difficult to detect. Compaction readings of greater than 300 pounds per square inch indicate areas of high compaction that will limit root growth and development.

Compaction will be tested for all road and facility disturbances, and in additional disturbed areas where soil is more susceptible to compaction. Soil compaction will be tested at appropriate depths depending on soil type and depth.

Ripping and Aeration

Compacted areas such as roads and wind turbine pads will be ripped to the compacted zone depth to improve soil aeration, water infiltration, and root penetration. Ripped areas will be disced, if necessary, to fill in deep furrows (where topsoil would be lost) and break up large clods (to which topsoil would not adhere). Surface roughening procedures (e.g., pitting and gouging) will be applied, as necessary, to promote soil air flow and concentrate water into pits and gouges.

Motor graders or tractors equipped with ripping shanks are typically used for ripping. Ripper shanks will be set approximately 1 to 2 feet apart. Discing is typically accomplished using a tractor-drawn disc set 2 to 6 inches deep.

Moisture Content

Mulching of ripped and aerated surfaces will promote moisture capture while providing additional protection from erosion. Ripped and aerated surfaces will be mulched with certified weed-free native grass, hay, small grain straw, wood straw, and/or live mulch. Alternatively, cotton, jute, or synthetic netting will be applied. Mulch will be crimped into the soil, tackified, or incorporated into erosion control blankets to prevent it from blowing or washing away and from entering waterways. If the soils are sandy, snow fencing may be necessary to trap additional moisture. On steep slopes where it is unsafe to operate equipment, at sites where soils have greater than 35 percent surface fragment content, or on notably unstable areas,

hydromulch, biodegradable erosion control netting, or matting will be firmly attached to the soil surface.

5.0 SITE PREPARATION AND REVEGETATION

Site preparation restores the disturbed area back to the original landscape by recreating the physical characteristics that approximate the landscape features of adjacent areas and pre-disturbance conditions. Disturbed areas on public lands will be reseeded in adherence with BLM-approved measures and seed mixtures. The BLM hydrologist and soil scientist will be consulted to determine if a drainage is large enough or important enough to require additional site-specific preparation and revegetation procedures. While the preference will be to use these standards on private lands and state lands, specific standards on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate. Components of site preparation and revegetation include landscape reconstruction, preparing site for vegetation, and establishing native plant communities.

5.1 SOIL MATERIALS

The long-term establishment and viability of the desired plant community is dependent upon providing adequate surface and subsurface properties (BLM 2009). Seedbed preparation maximizes seeding efficiency and improves reclamation success and includes topsoil replacement, discing, and surface roughening techniques. Soil conditioning and amendments may be necessary to ameliorate poor topsoil and subsoil quality. While the preference will be to use these standards on private lands and state lands, specific standards (including the need for soil conditioning and amendments) on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board, or WGFC as appropriate.

The BLM Wyoming Reclamation Policy (2009) requires that each reclamation site is adequately prepared for revegetation by using the proper soil handling techniques and re-establishing the original vertical profile; and by implementing the necessary BMPs to ensure seed protection and successful seedling establishment. Appropriate erosion control devices will be installed on reclaimed areas prior to topsoil replacement, as necessary. Compacted areas will be treated with the most appropriate methods and technologies to improve soil aeration, water infiltration, and root penetration (see Surface Stability). Compaction will be reduced to below the root zone (i.e., 18–24 inches below the surface) prior to topsoil redistribution to promote the establishment of desired plant species.

5.1.1 Re-establish Chemical, Physical, and Biological Properties

Soil materials will be redistributed in a manner to preserve the chemical, physical, and biological properties similar to the original soil profile. Topsoil is typically replaced using scrapers, dozers, and/or motorgraders. If multiple topsoils were stockpiled, stockpiles will be marked with stakes and flagging and the correct topsoil will be redistributed to the appropriate depth according to ecological site. If the stockpile for a given location contains insufficient topsoil to for redistribution, topsoil will be mixed with suitable spoil or imported from another

stockpile with similar properties (i.e., same ecological site). Topsoil will not be replaced on contaminated material—all contaminated material will be removed or otherwise handled in accordance with the Waste Management Plan.

5.1.2 Compaction

After topsoil replacement, compacted soils will be disced or harrowed to reduce soil compaction, break up soil clods, improve root and water penetration, and provide a friable but firm seedbed. Discing and harrowing are typically accomplished using a tractor-drawn disc or harrow. The surface will be roughened to reduce wind and water erosion and promote moisture capture. If the surface is roughened during discing, other moisture-capture techniques will not be necessary.

5.1.3 Protect Seeding Surface

Mulching will be necessary in reclaimed areas where surface roughening is not adequately reducing wind and water erosion or promoting moisture capture. Mulch incorporates organic matter and protects the soil surface from wind and water erosion and raindrop impact, while also providing a sufficient seedbed to hold seeds in place and protect seedlings (see Surface Stability). Reclaimed areas will be uniformly mulched with certified weed-free native grass, hay, small grain straw, wood straw, and/or live mulch at a rate sufficient to maintain appropriate cover.

5.2 ESTABLISH DESIRED PLANT COMMUNITY

The primary objective of revegetation is to establish the species composition, diversity, structure, and total ground cover appropriate for the desired plant community (BLM 2009). Proper seeding mixtures will be used to reclaim disturbed areas on public lands with native vegetation. According to established criteria, the seed mixture selection process for public lands will consider BLM pick lists, seed availability and price, growth form, seasonal variety, and prevailing dominant species. While the preference will be to use these seed mixtures on private lands and state lands, specific seed mixtures on private lands and state lands may vary and will be developed in coordination with private landowners, the State Land Board or WGFC as appropriate to meet specific land use objectives. To increase the likelihood of successful reclamation, locally adapted native plant materials based on the site characteristics and ecological setting (i.e., the pre-disturbance site characterization) will be selected when possible. The BLM Wyoming Reclamation Policy (2009) requires that a desired self-perpetuating native plant community is established by providing the species composition, diversity, structure, and total ground cover appropriate for the desired plant community; enhancing critical resource values (e.g., wildlife, range, recreation, etc.) by augmenting plant community characteristics, where appropriate; selecting genetically appropriate native plant materials; and using non-native plants to aid in the re-establishment of native plant communities only as an approved short-term and non-persistent alternative to native plant materials.

5.2.1 Seeding

Seeding will be implemented during all phases of development depending on initial or long-term reclamation objectives. Initial seeding will be used to achieve temporary vegetation coverage or stabilization for soil stockpiles, or until interim or final reclamation measures can be conducted. Longer term reclamation measures will include seeding following the redistribution of soils to the original vertical profiles, compaction evaluations, mulching and amendment additions, soil roughening with other BMPs, and other reclamation measures identified in the POD and Project SWPPP for a particular area.

5.2.1.1 Designing a Seed Mixture

Seed mixtures will be tailored to establish species diversity, composition, and ground cover appropriate for each desired plant community. Only approved, certified weed-free seeds will be used. Based on established criteria, the seed mixture selection process will consider commercial availability and price, growth form, seasonal variety, and prevailing dominant and locally adapted species. The BLM must approve the specific seed mixture for each reclamation prescription on public lands. Seed mixtures for private and state lands will be developed in coordination with private landowners, the State Land Board, or WGFC as appropriate to meet specific land management objectives. The seed mixture will contain the following elements.

- Species composition and diversity for the desired plant community, ecological setting, and current soil properties.
- Native dominant herbaceous species that support or augment the post-disturbance land uses, including species-specific wildlife habitat, rangelands, and other public uses.
- Full shrub and/or sub-shrub species when these species will help achieve reclamation objectives while supporting post-disturbance land uses and/or wildlife habitat needs.
- Native forb species or other BLM, State Land Board, WGFC, or landowner-approved plant species, as appropriate for management objectives.

5.2.1.2 Seed Banking/Seed Collection

Seed banking and onsite seed collection will only be considered if native and locally adapted seed sources are not available.

5.2.1.3 Selecting Seed

Seed selections will be based on ecological sites, reclamation objectives, and post-disturbance land uses. Seed mixtures will then be further refined based on immediate soil management, wildlife, or rangeland needs. Basic seed mixtures per general ecological site have been developed for ecological sites in the RFO and will form the basis for seed mixtures throughout Project development. Final seed mixtures will be developed based on the following criteria: general conditions within the ecological site; species adaptations to site conditions; commercial availability and cost; usefulness of the species for rapid site stabilization; species success in past revegetation efforts; and compliance with Executive Order 13112 and BLM Manual 1745 (i.e., use of native species) (BLM 1992). The use of non-

native species on public lands will only be considered based on the documented failure to revegetate any area with native species.

5.2.1.4 Seeding Rates

Seeding rates will vary by application method, reclamation objective, desired plant community, and more immediate wildlife needs. Typically, broadcast seeding may require two to three times the amount of seed as drill seeding to achieve similar results. Reclamation areas around specific wildlife habitats or environmentally sensitive areas may require quicker establishment of vegetation for erosion control and may necessitate higher seeding rates.

5.2.1.5 Seed Timing

In general, the timing of seeding will follow final earthwork and grading associated with each phase of development and during the reclamation phases. Temporary coverage seeding will take place immediately following initial disturbances to stabilize soils. Permanent seeding measures will take place within the most optimal times of seeding., Seeding timing will consider elevation, annual rainfall, reclamation and storm water management needs, and land use management objectives. All seeding measures will use guidance provided by storm water inspections.

5.2.1.6 Seeding Techniques

There are a variety of techniques and methods for the application of seed depending on specific site conditions and objectives. Drill seeding or other similar planting methods will be primarily used where the terrain is accessible by equipment and cost effective. A drill equipped with depth bands, a seed agitator, and packer wheels will be used to ensure optimum seed placement and soil contact during drill seeding. Planting depths will vary, but will typically be between ¼ to ½ inch below the surface. Rice hulls or other benign material will be added as necessary to ensure even distribution in drill rows. Drill seeding equipment will be calibrated to distribution rates specific to each seed mixture. Shrub seeding will be conducted separately from herbaceous species seeding along separate drill rows to minimize competition from faster growing herbaceous species. In some areas cross drill seeding or overlapping patterns may be used to mimic more natural areas or further protect a particular site from erosion forces.

Broadcast seeding will be used when drill techniques are not feasible due to slopes, substrate, access, and cost effectiveness. Broadcast seeding will occur on a roughened seedbed and then will be lightly harrowed, chained, or raked to cover the seed. The seeding rate for broadcast seeding will be a minimum of double the recommended rate of the mixtures developed for drill seeding. The broadcast seeder will be properly calibrated based on recommended mixture rates. Hand broadcast seeding will occur in smaller areas, on steep slopes, or on substrates that are not capable of supporting seeding equipment causing excessive tire or tread ruts. Slopes in excess of 2:1 will be hand broadcast and hand raked as feasible.

6.0 WEED MANAGEMENT

Noxious, non-native, and invasive weed control will occur for Project activities for the life of the Project. The BLM Wyoming Reclamation Policy (2009) requires that noxious and

invasive plant species are actively managed on public lands by assessing pre-existing weed occurrences before initiating any surface-disturbing activities; developing a weed management plan; controlling noxious and invasive weeds by implementing an integrated pest management approach; and monitoring treatments and weed populations. Weed control measures will be developed in cooperation with private landowners, the State Land Board, or WGFC as appropriate to meet specific land use standards.

Weed management in the Project Area is a cooperative effort between the surface landowner and BLM. Noxious and invasive weeds are controlled annually using herbicides. Several weed species have been identified in or immediately adjacent to the Project area (BLM 2001). Four weed species have been identified as needing management: perennial pepperweed (*Lepidium latifolium*), halogeton (*Halogeton glomeratus*), Russian knapweed (*Centaurea repens*), and tamarisk (*Tamarix pentandra*) (BLM 2001).

The presence, distribution, and density of noxious/invasive weeds in the Project area will be assessed and monitored prior to and during construction activities. A weed control plan will be developed and will accompany the COMP for each phase of the Project. It will include the following elements.

- Coordination with the BLM to determine priorities for weed management.
- Methods for minimizing the spread of invasive plants, such as
 - minimization of surface disturbance when possible to reduce the potential area for noxious and invasive weed establishment;
 - an integrated pest management approach for controlling invasive plants.
- Techniques for monitoring invasive plant occurrences and treatments.

7.0 RECLAMATION MONITORING

The BLM Wyoming Reclamation Policy (2009) requires that a reclamation monitoring and reporting plan be developed and implemented by conducting compliance and effectiveness monitoring in accordance with a BLM-approved monitoring protocol; evaluating monitoring data for compliance with the Reclamation Plan; documenting and reporting monitoring data and recommending revised reclamation strategies; implementing revised reclamation strategies as needed; and repeating the process of monitoring, evaluating, documenting, reporting, and implementing until reclamation goals are achieved. Performance monitoring is required to evaluate reclamation progress for determining the potential for success and if remediation is required. Reclamation success will be based on the objectives specified in Section 1.2.

The Project reclamation monitoring protocol will be developed with four primary objectives: 1) to document the condition of reclaimed areas relative to the adjacent undisturbed reference sites; 2) to provide an expeditious means for monitoring all reclamation sites to document reclamation progress; 3) to standardize monitoring protocols across the Project and incorporate digital data-tracking and database development; and 4) to establish a monitoring plan for managing bond release.

7.1 MONITORING PARAMETERS

Reclamation monitoring will occur annually in accordance with BLM requirements. Vegetation will be evaluated against reclamation success standards (Section 1.2) and the reference sites established during pre-disturbance planning. In addition, erosional assessments and photopoints will be completed to support reclamation monitoring efforts.

7.2 COMPLIANCE

A data dictionary has been developed by the BLM RFO to track monitoring parameters. An annual monitoring report will be submitted to the BLM RFO March 1 of each year and will include the following.

- Geo-referenced database.
- A minimum of three GIS shapefiles:
 - Type 1 "Surface Disturbance" includes all "as-built disturbance," interim/final reclamation, and long-term disturbance data (annual submittals are dependent upon surface disturbance and reclamation occurring during each monitoring year).
 - Type 2 "Ecological Sites" include polygons for ecological site information mapped to the as-built. (This will only be submitted during the first annual report.)
 - Type 3 "Weed Infestations" include polygons for weed infestation associated with disturbance.
- Digital photographs.
- Reference site attributes.
- Interpretation of monitoring data.

The application of GPS, GIS, and digital data-tracking during reclamation and monitoring activities allows for in-depth knowledge of disturbance site conditions and will facilitate more informed and targeted remediation actions. By incorporating standardized monitoring protocols and a universal data dictionary, the information can be used to establish a field-wide, geo-referenced database with immediate access to disturbance acres, reclamation status, and monitoring history. In addition, this information provides the BLM with a reclamation history perspective to evaluate reclamation success and expedite future reclamation activities.

The monitoring approach is designed to allow reclamation inspectors a standardized tool for evaluating reclamation status throughout the Project and be used to make informed decisions on what actions are needed to obtain field-wide reclamation success. These decisions may range from a high-level action such as revising this reclamation plan to a simple remedial action such as installing a silt fence. The record will be essential to tracking reclamation progress and initiating appropriate remedial actions for the life of the Project.

7.3 IDENTIFY ADDITIONAL RECLAMATION

The BLM will provide a determination as to whether or not reclamation assessments are accurate and success standards are being met. Monitoring reclamation success on private lands and state lands will be coordinated with private landowners, the State Land Board, or WGFC as appropriate to meet specific land use standards. If necessary, the BLM will provide input on remedial actions to facilitate reclamation success. Administrative BMPs may include reseeding non-attainment areas, soil stabilization and amendments, weed control, mulching, and irrigation.

8.0 REFERENCES

- Bureau of Land Management (BLM). 1980. Erosion Condition Classification System. U.S. Department of the Interior, Bureau of Land Management. Tech Note #346.
- . 1992. Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants, BLM Manual 1745. U.S. Department of the Interior, Bureau of Land Management. March 1992.
- . 1997. Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the BLM in the State of Wyoming. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming. Available online at http://www.blm.gov/wy/st/en/programs/grazing/standards_and_guidelines.html. Accessed January 2011.
- . 2001. Renewal of Grazing Permit and Allotment Management Plan. EA WY-030-EA1-092. Bolten and Pine Grove Allotments. The Overland Trail Cattle Company.
- . 2008. Proposed Resource Management Plan and Final Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Rawlins Field Office, Rawlins, Wyoming. Available online at http://www.blm.gov/wy/st/en/programs/Planning/rmps/rawlins/feis_prmp.html. Accessed January 2011.
- . 2009. Wyoming Reclamation Policy. Cheyenne, Wyoming: U.S. Department of the Interior, Bureau of Land Management, Wyoming State Office. Instruction Memorandum No. WY-2009-022. Available online at <http://www.blm.gov/pgdata/etc/medialib/blm/wy/resources/efoia/IMs/2009.Par.54664.File.dat/wy2009-22.pdf>. Accessed January 2011.
- . 2011. Rawlins Field Office Reclamation Guidance. Rawlins, Wyoming: U.S. Department of the Interior, Bureau of Land Management, High Desert District, Rawlins Field Office. Instruction Memorandum No. WYD-03-2011-002. Available online at <http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/rawlins/reclamation.Par.0096.File.dat/im-wyd-03-2011-002.pdf>. Accessed March 2011.
- Moseley, K., P.L. Shaver, H. Sanchez, and B.T. Bestelmeyer. 2010. Ecological site development: a gentle introduction. *Rangelands* 32(6):16–22.
- U.S. Department of Agriculture, Agricultural Research Station (ARS). 2011. Ecological Site Description Introduction. U.S. Department of Agriculture, Agricultural Research Station, Jornada Experimental Range. Available online at <http://usda-ars.nmsu.edu/esdIntro.html>. Accessed February 2011.
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS). 2003. Ecological Site Description (ESD) System for Rangeland and Forestland Data. Updated January 26, 2004. U.S. Department of Agriculture, Natural Resources Conservation

Service. Available online at
<http://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD>. Accessed
January 2011.

Wyoming Department of Environmental Quality (WDEQ). 2007. Land Quality Division
Reclamation Guidelines. Available online at <http://deq.state.wy.us/lqd/guidelines.asp>.
Accessed January 2011.