Appendix G. Example Detailed, Multi-phased, Reclamation Plan

Continental Divide-Creston Natural Gas Project EIS Reclamation Goal Statement

Encourage informed decisions to minimize initial disturbance and return disturbance as quickly and effectively as possible to pre-disturbance conditions. Identify important characteristics of revegetation for evaluation of interim reclamation that serve as criteria for rollover and that are indicative that revegetation is moving toward successful reclamation.

A. Development of a comprehensive reclamation plan

I. Conduct a pre-disturbance inventory of proposed disturbance and reference areas

Pre-disturbance inventories are used for two main purposes. The first is to use site-specific information to develop a reclamation plan, including treatment of soils and identification of appropriate species to include in the seed mix and the site's ability to serve as a source of seed prior to disturbance. The second purpose is to identify any issues, such as saline soils, steep topography, or invasive species that will impact successful interim and/or final reclamation.

II. Describe landscape features and climate

1. Climate and physical characteristics of the site are important factors to consider in development of a reclamation plan, particularly in identifying possible problems. For example, a site on a south-facing slope may suggest that more drought tolerant plants should be selected than if the site is on a north-facing slope. Topography (slope and aspect), climate (including postulated microclimate), and parent materials (geological substrates) are considerations in site selection and reclamation plan development.

2. Steep topography: Steep slopes that would result in site instability should be avoided. If the slope is greater than 25 percent, the BLM may advise the site be relocated.

3. Poor or erodible parent materials, or a rocky surface or, marine shales, clay/siltstone, or selenium bearing geological substrates at the surface may result in difficult reclamation conditions and should be avoided. If such areas are planned to be disturbed by the Operator, all possible resources will need to be employed by the BLM to ensure successful reclamation.

4. Available climate information, including precipitation patterns and growing season relative to the site planned for disturbance, will be addressed by the Operator in the site-specific reclamation plan in the Application for Permit to Drill (APD) approved by the BLM.

III. Suitable soil inventory

a. Soil characteristics may strongly influence reclamation efforts. Fundamental characterization of soils ahead of disturbance can identify potential problems, so they can be addressed during disturbance, soil stockpiling and reclamation, instead of waiting for reclamation failure.

b. The phrase "suitable soil" is used mainly because of confusion over the definition of topsoil. Soil depth, pH, electrical conductivity, texture, surface features (e.g. barren, rocky, crusty, plant litter), and organic matter content are characteristics that may be used to determine if a soil is suitable. Other information may be needed. See: "Successful restoration of severely disturbed lands: Overview of critical components," B-1202, (and available for free at http://ces.uwyo.edu/PUBS/B1202.pdf.).

c. Soil characteristics that can signal a high probability of reclamation problems include: pH, electrical conductivity, soil texture, surface/subsurface features, sodium adsorption ratio, calcium carbonate content, soil compaction and saturation percentage and the below listed characteristics will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

1. Soils with pH 7.8 and higher progressively become less suitable for reclamation and will be addressed by the Operator in the site-specific reclamation in the APD approved by the BLM.

2. An electrical conductivity of soil greater than eight (8) dS/m and any increase in salt content of the soil above .5 dS/m will progressively negatively affect the establishment and growth of plants. Soils exhibiting these characteristics will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

3. Soils with textures representing clay, sand or loamy sand will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

4. Surface and subsurface soil in and through the root zone dominated by coarse material greater than 2 mm in diameter and greater than 40 percent in the soil profile to be stockpiled may signify reclamation difficulties and will be considered in the site-specific reclamation plan in the APD by the BLM and Operator.

5. Sodium adsorption ratio (SAR) is a key diagnostic soil trait that may be determined for soils to be disturbed and placed in the suitable soil stockpile; and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

6. Calcium carbonate content (percent lime) will control the amount of plant available phosphorus and will determined in the site-specific reclamation plan in the APD by the Operator and approved by the BLM.

7. The soil saturation percentage will control the ability for plants to germinate and survive after reclamation actions have been taken by the Operator

and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

IV. Vegetation inventory

a. Gathering vegetation data before a site has been cleared for drilling documents pre-disturbance site conditions and in turn guides management decisions regarding what species could be expected to successfully revegetate a site to match its existing or potential state. Seed mixes should be based on desired vegetation that has historically grown on-site and that has been shown to be successful in previous trials. Return of cover should be gauged by comparison with actual pre-disturbance site conditions and/or reference areas.

b. Vegetation characteristics that would signal a high probability of reclamation problems:

   1. The presence of Halophytes: e.g., Saltbush

   2. The presence of Alkali Halophytes: e.g., Greasewood, Halogeton

   3. The presence of Noxious and Invasive Species: e.g., Cheatgrass, Russian thistle, Russian knapweed, Alyssum, Canada thistle.

c. The methodologies to be used to determine the information for the vegetation inventory will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

   1. BLM guidelines for vegetation sampling: Sampling Vegetation Attributes, Interagency Technical Reference (1996) Revised in 1997 and 1999. BLM/RS/ST-96/002+1730. 171 pages. URL for Sampling Vegetation Attributes: http://www.blm.gov/nstc/library/pdf/samplveg.pdf. All BLM technical references: http://www.blm.gov/nstc/library/techref.htm.

V. Select a reference area

a. A reference area is a land unit which is representative, in terms of physiography, soils, vegetation and land use history, of an area to be affected by resource extraction. Reclaimed areas are compared to reference areas to determine successful interim and final reclamation.

b. In Wyoming, a site can have multiple ecological communities surrounding it (e.g. dunes, alkali flats, and sagebrush). Ecological variation at a given site can make it difficult to evaluate which adjacent area should serve as a reference. The most accurate way to choose a reference area is to perform pre-disturbance monitoring and identify the dominant community on or adjacent to a site before construction begins. This measure ensures that initial efforts to establish vegetation are consistent with species that naturally occur at that location. A reference area located adjacent to the construction site, with similar soils, vegetation, and aspect of the area to be disturbed will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

B. Invasive plant management plan for construction and reclamation activities

Disturbed sites can provide ideal opportunities for invasive plant species to propagate. Invasive plants can be transferred to the disturbed site from adjoining areas and out-compete desired vegetation during reclamation and/or spread to new areas. The best approach to combat invasive species is to use careful suitable soil handling and an appropriate seed mix. Pre-disturbance planning, including early weed management for invasive species is vital to reduce costs and ensure successful reclamation.

a. Assess for noxious and invasive weed species before initiating surface disturbing activities, during disturbance, during interim and final reclamation, and after reclamation is completed.

b. Web address for the Wyoming Weed and Pest Council: http://www.wyoweed.org/

c. Apply weed control treatments

d. Monitor weedy plant species at least annually to evaluate success of weed control treatments and determine if continued weed control is necessary.

C. Develop a reclamation plan

Reclamation planning provides a detailed strategy for returning a disturbed site back to a functioning pre-disturbance condition. Reclamation planning also may minimize costs and greatly improves chances of successful interim and final reclamation. The reclamation plan will be made part of the APD by the Operator and BLM.

I. Site preparation, storm water, surface stability, and soil management for interim reclamation

a. Site preparation activities readies a site for revegetation activities and in general include replacement of stockpiled suitable and unsuitable soils, reestablishing a stable subsurface environment, recontouring (reconstruction of landscape), incorporation of soil amendments and primary tillage/ripping to relieve soil compaction prior to spreading suitable soil and secondary tillage using a parabolic plow just prior to seeding.

b. Soil Management includes the handling and management of stockpiled soil on the site in a way that minimizes loss from erosion and best preserves its ability to support a productive plant community, the soil biota and their habitat as well as its physical and chemical properties.

c. A Construction Stormwater Permit from the Wyoming Department of Environmental Quality is required any time a project results in clearing, grading, or otherwise disturbing one or more acres. The disturbed area does not need to be contiguous. The permit is required for surface disturbances associated with construction of the project, access roads, construction of wetland mitigation sites, borrow and stockpiling areas, equipment staging and maintenance areas and any other disturbed areas associated with construction. A general permit has been established for this purpose and either the Operator or general contractor is

responsible for filing a Notice of Intent (NOI) and complying with the provisions of the general permit.

d. A reclamation plan should include a description of how the Operator will achieve the following for surface stability:

1. Redistribute soil materials in a manner to optimize revegetation potential.
2. Relieve compaction of the redistributed soil (suitable and unsuitable) to an appropriate depth (18-24 inches) just prior to seeding to accommodate desired plant species germination and sustained growth.
3. Prepare the seedbed, optimize roughness, furrow on contour to prevailing wind or pit, description of technology to be used, establish surface conditions that would enhance development of diverse, stable, self-generating plant communities, and description of erosion control to be maintained on the site.
4. reestablish slope stability and surface stability.
5. Reconstruct the landscape to the approximate original contour or a contour consistent with the land use plan.
6. Maximize geomorphic stability and topographic diversity of the reclaimed topography.
7. Eliminate high walls, cut slopes, and/or topographic depressions on site, unless otherwise approved.
8. Reconstruct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
9. Reconstruct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.
10. Minimize wind, sheet and rill erosion on/or adjacent to the reclaimed area.
11. There shall be no evidence of mass wasting, head cutting, large rills or gullies, down cutting in drainages, or overall slope instability on/or adjacent to the reclaimed area. Site selection is the favorable method to avoid these issues.
12. Protect seed and seedling establishment (e.g., erosion control matting, mulching, hydro-seeding, surface roughening, fencing, etc.).

II. Recommendations for suitable soil stockpiling to maintain soil quality

Suitable soil for reclamation will be stockpiled on the site for use in future site reclamation and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

III. Describe soil amendments

a. Soil amendment(s) may be used in reclamation if the soil is lacking the necessary chemical, biological, physical and /or organic materials to support sustaining growth of suitable plant materials. The soil type, soil characteristics (see A., ii. b), geographic location, along with soil mapping resources available should provide the information necessary to define the soil amendment.

b. The Operator should state what applying soil amendments is intended to accomplish. Soil amendment plans should be provided, including what amendments will be applied, method of application, timing relative to other reclamation activities (i.e. stockpiling, seeding, ripping).

c. The soil type is defined by the soil samples obtained prior to or in some cases after disturbance takes place. Soil amendments must be scientifically calculated based on the soil characteristics (see A., ii. b) so as to provide the most cost efficient and best assurances for successful reclamation.

d. Soil amendments include but are not limited to the following: Weed free grass hay, weed free wood chips or other weed free cellulosic materials, gypsum, elemental sulfur, and fertilizer.

IV. Describe seeding methods

a. Different plant species may require different conditions (e.g. seeding depth, seed scarification, mixing, and timing) for optimal germination success. Seeding methods should match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species.

b. The Operator will describe when seeding will occur and specify the methods they will use for seeding, including differential handling for different species (e.g. broadcast vs. drilling vs. Imprinting), and seeding depth in the site-specific reclamation plan of the APD. Re-seeding may need to occur if invasive and/or noxious weeds prevent establishment of the seed mix. See Appendix A below for references.

V. Seed mixes

1. The need to provide multifunctional and sustainable seed mixes for interim and final reclamation and soil stability is driven by a desire to increase potential for successful and timely re-vegetation and site stability. Plant diversity and habitat functionality are directly impacted by the seed choices applied to an area slated to be reclaimed or restored. To maintain as much stability and ecological function this section makes recommendations to specifically aid an operator's selection process. Please see Appendix A for references.

    1. Select site-appropriate, adapted native plant materials based on the pre-disturbance plant community composition, site characteristics, and ecological setting. Seeds may be obtained from commercial sources of

certified weed-free seed mixes. Alternatively, local collections may be used provided they are collected in an area without weedy species.

2. Perennial naturalized species may be used when attempts to reclaim using native plants have not succeeded for a minimum of 2 full growing seasons. Reclamation should succeed using native species if soils are properly managed, precipitation is not limiting, seed mixes are carefully selected and seeded areas protected from grazing.

3. Based upon site-specific conditions, a decision may be made to use non-natives sooner than identified above and will be used in only unique conditions defined in the site-specific reclamation plan in the APD.

VI. Describe if and how irrigation techniques will be used in the reclamation plan

a. Revegetation success is highly dependent on timing and amounts of precipitation. However, variable weather in Wyoming can limit or delay successful germination and establishment of plants. Irrigation can supplement natural precipitation to insure success of newly seeded site during the initial growth period of the plant. However, overuse of irrigation may result in plants that are dependent on supplemental water, therefore irrigation practices must be used carefully and conservatively.

b. Supplemental irrigation should be scientifically determined and applied.

c. Both soil and water samples should be tested before application and said water source should meet appropriate limits for SAR and EC. Special consideration of soil chemistry and amendments will be a determining factor for the use of the source water.

d. Water must be utilized from permitted sources and should be permitted for such purposes. Produced water from sources, i.e. “coal bed natural gas wells” must adhere to discharge permits and be recognized by the WDEQ. Water utilized from sub surface water wells must be permitted and in good standing with State Engineers Office.

e. Irrigation can be cost prohibitive and should not be a requirement for reclamation but used as a tool to enhance vegetative growth.

VI-I. Describe best management practices

Best Management Practices (BMPs) are techniques that can be applied to surface disturbance and reclamation actions to aid in reclamation success. Identify the appropriate BMPs during planning and they can guide the surface disturbance and reclamation process. Additionally, documenting BMPs provides opportunities to evaluate for success, so BMPs can be modified for future use in similar conditions. Please see Appendix A for BLM recommendations.

VI-II. Description of monitoring and reporting protocols for reclamation rollover

a. Site Monitoring is conducted to observe and keep track of environmental conditions on the reclaimed site. Specifically, monitoring is done to document proper development of the reseeded plant community, soil stability and proper ecosystem function. Continued characterization after disturbance and during interim reclamation is appropriate for monitoring site maturation and stability, particularly when problematic soil conditions or invasive weeds are identified.

b. Vegetative monitoring and disturbed site evaluation for any component of the reclamation plan applicable to the APD shall take place at intervals agreed to by the BLM and the Operator with input by any entity who utilizes the surface estate (i.e. grazing permittee) of the disturbed site. Generally, the intervals for monitoring and reporting will be set annually by the BLM unless otherwise documented in the site-specific reclamation plan for the APD. The Interim Reclamation Objective (IRO) achievement by the Operator will reduce the mandatory monitoring and reporting described in the reclamation plan to a time period agreed to by the Operator and BLM and will be added to the site-specific reclamation plan by the BLM. Once the disturbed site achieves the IRO, the site will be subject to all applicable requirements of the reclamation plan until a time that the Final Reclamation Objective (FRO) is achieved by the Operator and approved by the BLM. Once the BLM has accepted the site for IRO status the BLM will also notify the Operator of the resulting acreage gained for reclamation rollover.

c. The interim reclamation objective (IRO) is to reconstruct and revegetate the portion of the disturbed land unused for long term production and establish the vegetative cover sufficient to maintain a healthy, biologically active topsoil; control erosion; and minimize habitat, visual and forage loss during the life of the well and/or facilities.

d. The long-term final reclamation objective (FRO) is to return the land to a condition 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 reestablishment of a stable vegetative community, hydrologic systems, visual resources, and wildlife habitats. To ensure that the FRO will be achieved and maintained through human and natural processes, actions will be taken to ensure standards are met for site stability, visual quality, hydrological functioning, and vegetative productivity beyond the end of the life of the well or facilities.

e. Monitoring should be designed and implemented by the Operator to document continuing successful interim reclamation for reclamation rollover using methodologies approved by BLM.

    1. Once the IRO is achieved and reclamation rollover granted by BLM, the Operator will continue to monitor the condition of the reclamation, document that the revegetation continues to meet IRO, and that the revegetation trajectory is toward achievement of final reclamation objectives as defined in the site-specific reclamation plan approved by BLM.

2. Identify potential problems and determine appropriate mitigation measures with the implementation of adaptive management.

f. The required elements of monitoring to assess IRO and FRO will be identified and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM. Please see Appendix A for additional information.

D. Indicators for successful achievement for the IRO resulting in reclamation rollover

I. Beginning Monitoring

Monitoring should begin the first growing season. Evaluation is possible after a minimum of two full growing seasons.

II. Irrigation and monitoring

If irrigation is used initially, then the reclamation may be evaluated for interim reclamation success two (2) full growing seasons after irrigation ceases to assure that the plant community can survive without supplemental water.

III. The IRO reclamation rollover criteria is as depicted in the Rawlins Field Office RMP vs alternative criteria if this process is followed

The Current Rawlins Field Office RMP states "Criteria based on predisturbance surveys or surveys of adjacent undisturbed natural ground cover and species composition (The vegetation will consist of species included in the seed mix and/or occurring in the surrounding natural vegetation or as deemed desirable by BLM in review and approval of the reclamation plan. No single species will account for more than 30 percent total vegetative composition unless it is evident at higher levels in the adjacent landscape. Vegetation canopy cover production and species diversity shall approximate the surrounding undisturbed area) or—

- Eighty percent of predisturbance ground cover and ninety percent dominate species.

Should this pre-disturbance protocol be followed, it is our recommendation to provide an alternative to the above language and have revegetation cover be 70 percent of reference area cover to meet interim criteria. All of this 70 percent must be desirable perennial species as represented by the seed mix. Items D, I, ii and iv through ix would also need to be followed to interim reclamation criteria.

IV. Monitoring results must be from a standardized cover/species protocol finalized by BLM

V. Noxious weeds

No noxious weeds will be allowed.

VI. Invasive weeds

Invasive weed species cover no greater than adjacent invasive species cover. All other undesirable perennial or annual plants as defined in the site-specific APD shall be continually controlled or eradicated on the original disturbed area.

VI-I. Undesirable/annual plants

For purposes of successful Interim Reclamation Objective (IRO) achievement, the amount of undesirable perennial or annual plant species shall be as represented in the site-specific reclamation plan and determined by vegetative monitoring of the disturbed area and will be addressed by the Operator in the site-specific reclamation plan in the APD approved by the BLM.

VI-II. Vegetative trending

If vegetative trending is not positive within 3 full growing seasons without irrigation or 2 years after irrigation, the BLM and Operator will determine through adaptive management the needs for the disturbed site.

IX. Erosion

Erosion features equal to or less than surrounding area.

E. The monitoring data reporting required of the Operator as specified in the Rawlins RMP (with some additions to clarify and flow with document-original language in Appendix 36 of the Rawlins RMP)

Reclamation Monitoring Reporting Data required to be obtained and filed by the Operator.

General
WYW# (Oil and Gas Lease or Right-of-Way (ROW) Project Name: Project Type (e.g. Well, Access Road, Pipeline, Facility, Wind) Qtr/Qtr Sec, T, R, County, State
Disturbance
Disturbance Dates Start-End Reclamation Type (Interim/Final)
Reclamation
Earthwork Contractor Name Earthwork Completion Date Soil Preparation Ripping Depth (prior to re-spreading suitable soil) Area (Acres or Square Feet) Seeding Contractor Name Seeding Date Seedbed/Compaction Release Preparation Methods (Describe -Rip, Disc, Harrow, Parabolic, Depths)
Seeding
Seeding Method (Drill, Broadcast, Imprint, Depths) Copy of Seed Tag (Species %, Purity %, Germination %) Actual Seeding Rate (Lbs/Acre of each species) Area Seeded (Acres or Square Feet) Soil Amendments Used (Describe)
Other
Mulching/Erosion Netting/Tackifier used – yes/no and describe Fenced Location yes/no Snow Fencing yes/no
Weeds

Type(s) of Weed Treated - List Weed Contractor Name Contractor License # Weed Treatment Date Weed Treatment Type (Chemical, Mechanical) Chemicals Used and Rates Applied Area Treated (Acres or Square Feet) (GIS Extent and Location)
Inspection
Inspector's Name, Company, ID Inspection Date Time after Seeding (which Growing season) Seedlings/Square Feet Growing Percent and Extent of Bare Soil (Describe) Percent Ground Cover (Describe) Percent Desirable Species (Describe) Percent Noxious/Invasive Weeds (Describe) Erosion Features Present? (Describe) Evidence of Livestock Grazing (Describe) Reclamation Successful (Yes/No)
Reporting
Completed Spreadsheet or Database as defined by BLM GIS Layer With Attribute Table With Site Data as Detailed Detail Disturbance Extent and Location Permanent Photo Reference Point -Describe
Monitoring
Reference Photos Close-Up Photos Reseeding yes/no
Future Management Prescription
Weed Control Needed - yes/no and explanation Erosion control Needed - yes/no and explanation Grazing/Predation Issues - yes/no and explanation Other Cultural or Mechanical Needs - yes/no and explanation Record -yes/no and explanation

Appendix A

A. Suggestions on Stockpiling Suitable and Unsuitable Soils to Maintain Soil Quality

Stockpiled topsoil should not be piled too deeply or too shallow. The taller or deeper the piles, the more soil is buried under large amounts of pressure resulting in compaction. Soil buried deep in the pile also has little exposure to oxygen resulting in anaerobiosis; deeply buried soil also has no organic matter input. Both of these problems reduce soil quality.

Shallow or small topsoil stockpiles have large footprints on the land surface with the disadvantage of covering greater areas of undisturbed soil which will, in turn, require revegetation, resulting in a greater overall amount of disturbed soil. Smaller or shallow stockpiles also have a greater surface area per amount of soil stored which increases exposure of the stockpiled soil to wind and water erosion. The surface of soil stockpiles should always be vegetated to minimize erosion losses.

1. Salvaged stockpiles of suitable soil should be no deeper than 4 meters (13 feet) and should be less where possible.

2. Stockpile slopes should not exceed 5:1 angles (20 percent slopes) to allow for seeding and minimize erosion.

3. Suitable Soil stockpiles should be located in areas to prevent their disturbance and contamination by well pad activities. They should not be placed in streambeds or ephemeral drainages where they may be washed away. They should be protected from wind erosion.

4. A perimeter ditch/berm should be constructed around the stockpile for topsoil conservation and sediment control.

5. All suitable soil stockpiles should be seeded with native cool season grass to provide cover and protect them from water and wind erosion. Before seeding, the stockpile may be scarified along contours to minimize wind and water erosion.

6. If soil horizons or layers are to be stratified during soil salvage (stripping) operations, soil maps should be made of the well pad area to identify depths of soil horizons and surface slope. The pad area to be cleared of soils should then be divided into strips the size of the blades or equipment being used for soil removal. The depth of soil removal from each swath should be clearly marked so that equipment operators are removing a uniform layer from each strip. After the topsoil is removed from the area in this manner, the subsoil can then be removed in the same fashion, strip by strip, each strip at a uniform depth.

B. Suggestions on Supplemental Irrigation

Supplemental irrigation should be scientifically determined and applied in the initial four to six week period of growth of the seedling plants and then ended. Such determination could be the application of an amount of irrigation water equivalent to the average or average plus 25 percent of the precipitation expected during a given interval.

C. Suggestions on Vegetation and Soil Monitoring

Examples of monitoring components are listed below:

1. Reference: http://agriculture.wy.gov/forms/natres/rangelandmonitoring.pdf

2. Operators should use the same locations and methods used at baseline for repeat photography. Additional locations may be selected to document progress of reclaimed area to demonstrate interim and final reclamation success, and to monitor any identified problems such as erosional features. The site should be photographed once every year normally at the same time period, from the same locations and direction so that photographs are repeated through time. Photographs should be taken during the growing season.

3. Weed assessment: Disturbed and reclaimed areas should be evaluated for noxious and invasive weeds at least annually. Weed control should be promptly implemented by the Operator once weed species and infestations are identified. Weed control applied at planned chemical rates at times the weed is emerging can have positive impacts in minimizing weed growth through-out the year as well as promoting the growth of grass species. The timing of the control should be determined by the growth habits

of the weed species and when they are most effectively assessed. If weeds persist, reseeding the site could be considered as well as the species of grass, forb or shrub.

4. Erosion control/soil stability: The reclaimed area should be evaluated for any signs of erosion problems annually and when the site is subject to erosional events. Identified erosion features should be monitored using repeat photography. Absence of erosion features is a positive indication that the soil is stabilizing.

5. Cover and composition data should be used to document that the plant community continues to trend toward the requirements to achieve interim and final reclamation success. The data should be used to evaluate if species composition and cover are increasing. These factors should be considered relative to the number of species in the seed mix, the selected reference area, and offsite responses to seasonal growing conditions.

6. Plant community cover and composition measurements: The Operator should start collecting cover and composition data beginning in the first (1st) growing season after disturbance. Data should be collected using repeatable methods approved by the appropriate regulatory authority (BLM) and should be the same methods that were used to describe vegetation for baseline (or reference area). The same methods should be used each time the vegetation is monitored.

7. Soils should be monitored if reclamation problems suggest that soils might be the problem. Such problems include but are not limited to salt crusts, clay crusts, wind and/or water erosion and rapid changes in pH (up or down) Recommended soil monitoring would include sampling soils and analysis of soil characteristics as described in the Development of a comprehensive plan section.

D. Web Links

Equipment
Equipment — http://wwwreveg-catalog.tamu.edu Equipment — http://wwwnsl.fs.fed.us/great_basin_native_plants.html Mats — www.newparkmats.com Electric fence — www.hcam.net SpiderPlow — www.spiderplowinternational.com Truax — http://www.truaxcomp.com/
Government
2006 Gold Book — http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html BLM engineering drawings, roads & fences — http://www.blm.gov/nstc/eng/draw.html BLM VRM — http://www.blm.gov/nstc/VRM/ BLM NSTC — http://www.blm.gov/nstc/ EPA — http://www.epa.gov/owow/nps/ and http://www.blm.gov/bmp/ New Onshore Order #1, May 7-07 — http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/07-934.pdf Wyoming BLM requirements — http://www.wy.blm.gov/minerals/og/ Wyoming Climate Atlas — http://www.wrds.uwyo.edu/sco/climate_office.html WY DEQ — http://deq.state.wy.us/wqd/watershed/nps/npspg.htm NRCS fotog — http://efotg.nrcs.usda.gov/treemenuFS.aspx
Journals

American Society of Mining and Reclamation — http//dept.ca.uky.edu/asmr/W/ Global Restoration Network — www.globalrestorationnetwork.org Journal Range Management archives — http://jrm.library.arizona.edu/jrm/ National Roadside Vegetation Management Association — http://www.nrvma.org Society for Ecological Restoration (SER) — http://www.ser.org/ USFS Rocky Mountain Research Station publications — http://www.treesearch.fs.fed.us/pubs/rmrs/ Wyoming Native Plant Society — http://uwadmnweb.uwyo.edu/wyndd/wnps/plant_id.htm
Maps/GIS
Topo & aerial photos — http://geonames.usgs.gov/pls/gnispublic/f?p=171:1:6176131719238320356 NRCS National Water and Climate Center — http://www.wcc.nrcs.usda.gov/wcc.html Water Erosion Prediction project — http://octagon.nserl.purdue.edu/weppV1/ Wyoming Geographic Information Science Center — http://www.wygisc.uwyo.edu/
Mycorrhizae
http://mycorrhiza.ag.utk.edu/default.html http://invam.caf.wvu.edu/index.html http://www.ars.usda.gov/is/pr/2003/030205.htm
Oil/Gas
Completion and workover wastes — http://www.epa.gov/epaoswer/other/oil/w&c.pdf Dust suppression — http://www.oznet.ksu.edu/Stevenson/Dust%20Manual%20%20102704.pdf Hydraulic Fracturing (Fracking or Frac Job) — http://www.earthworksaction.org/pubs/DrinkingWaterAtRisk.pdf http://www.epa.gov/safewater/uic/cbmstudy/pdfs/completestudy/ch4_6-8-04.pdf National LTAP & TTAP Rural Roads — http://www.ltapt2.org/resources/ruralresources.php Oil & Gas Production wastes — http://www.epa.gov/epaoswer/other/oil/oil-gas.pdf Power lines — http://www.aplic.org/ Produced water — http://www.iogcc.state.ok.us/PDFS/2006-Produced-Water-Guidebook.pdf The T^2/LTAP Center University of Wyoming — http://wwweng.uwyo.edu/wyt2/ Western Governors CBM BMPs — http://www.westgov.org/wga/initiatives/coalbed/CoalBedMethane.pdf Wyoming Oil and Gas Commission requirements — http://wogcc.state.wy.us/
Restoration Handbooks
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