

Deer Creek Mine

240. Reclamation Plan (R645-301-200)

R645-301-242 Soil Redistribution

At the time of reclamation, PacifiCorp will reduce the footprint of the Deer Creek mine site disturbed area by redistributing soil and spoil material to be consistent with the post mining land use and water drainage system. This will be accomplished by cutting and/or filling the existing mine site footprint in each of the three (3) disturbed canyons; Deer Creek Canyon, Deer Canyon, and Elk Canyon. These areas will be re-contoured as outlined on Drawings DS-1781-D through DS-1784-D in **Appendix R645-301-500-C**.

Deer Creek was developed prior to the Surface Mining Control Reclamation Act and topsoil/subsoil material was never segregated or stockpiled during construction activities. The native soils on steep slopes in the disturbed area provide very little topsoil material. Nowhere in the vicinity of the mine is there a source of material that would usually be referred to as "topsoil". Since it would be impractical and very costly to transport other suitable material to the site, the existing fill material must be examined to determine its suitability for vegetal growth.

The soil materials in the existing fill were originally derived from sandstone and shale parent materials from the terraced area on the south side of Deer Creek Canyon. Soil sampling of this area was conducted in 1999. Eighteen (18) samples were taken and analyzed for the parameters described in Table 6 of the *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining* (Leatherwood, 1988). A sample location map of the terrace sampling is included in **Appendix R645-301-200- B**.

The soil material particles are mostly sand with textures from sandy clay loams to loamy sands. The water holding capacity is low, typical of sandy soils. They are calcareous soils as indicated in pH's of 7.5 – 8.5 and calcium carbonate equivalents above 8%. Salt content is too low for any harmful affects on plants. Potassium, phosphate and nitrogen, important plant nutrients, are very low indicating the need for fertilization to insure plant growth. The organic material throughout the disturbed area is principally coal debris; **Percentage** nitrogen **percentage** is very low. For a more detailed discussion on soil type, characteristics, and quality, refer to **Volume 2, Chapter 2**.

Track-hoes, rubber tired backhoes, dozers and front-end loaders will be used to recontour the disturbed area. Travel over redistributed soil material will be minimized to the extent possible. This will be accomplished by reclaiming the mine in specific sequences, utilizing existing roads and travelways to live haul substitute soil material. It is important to understand that while reclamation will be specifically sequenced, various stages will be occurring simultaneously throughout the site. During ~~the operation period of the Deer Creek Mine~~ **the field season of 2002**, a soil sampling program ~~will be~~ **was** implemented (refer to Table 3-1 Reclamation Schedule for implementation of

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program) to determine the quality of substitute topsoil available for reclamation and to determine if refuse material is toxic- and/or acid-forming. Substitute topsoil must be used since no soil had been previously stockpiled for reclamation purposes. Quality of the topsoil will be analyzed to determine the suitability for revegetation success. Sampling locations and procedures are described below in complete detail.

As recontouring of an area is completed and available topsoil is redistributed, it will be fertilized, mulched, then roughened by deep gouging (pocking) with a trackhoe bucket or similar equipment that produces a depression approximately 3.0' dia. x 1.5' deep. These depressions will be developed throughout the reclaimed area and will influence the retention of moisture and greatly reduce sediment contributions to stream flow.

R645-301-233 Topsoil Substitutes and Supplements

To provide a suitable topsoil material for reclamation purposes, soil will be qualified through an established sampling program. Sampling will be conducted before reclamation activities commence and taken along the corridor of the existing undisturbed drainage culvert in the Deer Creek Canyon (refer to Table 3-1 Reclamation Schedule for implementation of program). Sample points will be placed randomly along the corridor and be taken at three foot depth intervals to a point four feet below the grade of the proposed final surface configuration. Samples will be collected by Energy West staff members qualified in collecting soil samples. If a contractor is used, the person will be trained and qualified to collect soil samples. In either case, R645-301-131 will be followed. The information required for by R645-301-130 will be submitted with the technical data

The cut and fill calculations in R645-301-500 assume that suitable soil in substantial quantity will be located within the corridor of the undisturbed drainage. The areas to be sampled for a suitable substitute topsoil and subsoil are those areas outlined in the soil sampling program found in **R645-301-200-A** and on Map DS-1810-D in **R645-301-200-B**. Sampling will commence during the 2001 and/or 2002 field seasons. Sampling will be conducted through the depth of the available material. The samples will be taken to a reputable soils lab where quality will be determined using the soil suitability criteria of Table 2, *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mines*, Leatherwood and Duce, 1988. The soil sample analysis results will be incorporated into **Appendix R645-301-200-A** of this section when it becomes available. Representative samples (site #1 and site #6; DS-1810-D) have been taken in conjunction with the slope stability study in the spring of 2000. The sample analyses for these sites are included in **Appendix R645-301-200-A**. According to the cut and fill mass balance calculations in the Engineering Section, sufficient quantity of soil materials (topsoil and subsoil) are available to reclaim the Deer Creek Mine as planned. The anticipated topsoil placement location is illustrated on Drawing DS-1816-D in **Appendix R645-301-500-C**. If suitability of the soil material is found to be inadequate, PacifiCorp commits to establishing a new soils plan in cooperation with the Division.

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According to the cut and fill mass balance calculations in the Engineering Section, sufficient soil materials (topsoil and subsoil) are available to reclaim the Deer Creek Mine. The anticipated topsoil placement locations are illustrated on Drawing DS-1816-D in **Appendix R645-301-500-C**. The cut and fill calculations in R645-301-500 assume that suitable soil in substantial quantity is located within the corridor of the undisturbed drainage.

To provide a suitable topsoil material for reclamation purposes, soils were sampled in 2002 as outlined on Map DS-1810-D in **R645-301-200-B**, the analytical results are found in Appendix R645-301-200A (refer to Table 3-1 Reclamation Schedule for implementation of program). Sample points were randomly placed along the corridor of the existing undisturbed drainage culvert and taken at three foot depth intervals to a point four feet below the grade of the proposed final surface configuration. Samples were collected by Energy West staff members qualified in collecting soil samples. The information required for by R645-301-130 was submitted with the technical data

The samples were analyzed at Intermountain Laboratory Inc. where quality was determined using the soil suitability criteria of Table 2, *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mines*, Leatherwood and Duce, 1988. The soil sample analysis results have been incorporated into **Appendix R645-301-200-A** of this section. Representative samples (site #1 and site #6; DS-1810-D) were also sampled in conjunction with the slope stability study in the spring of 2000. The description of this study is found in **Appendix R645-301-500-E** of the MRP. The sample analyses for these sites are also included in **Appendix R645-301-200-A**.

As shown in the analysis results, the substitute topsoil sampled within the corridor in 2002 was not suitable because of the high sodium content. Sodium Adsorption Ratio's (SAR's) in the upper portions of the soil profile were higher than 15. Those soils found in excess of an SAR value greater than 15 are considered unacceptable according the Guidelines. Therefore, to continue to rely on the cut/fill reclamation plan as described and to ensure an adequate quality of suitable substitute topsoil and soil cover for reclamation, Energy West commits to resample the substitute topsoil above the buried culvert and analyze for Electrical Conductivity and SAR values (and, if necessary, based on item 2 below, analyze for CEC and ESP) once within each permit term, until such time as the soils are found acceptable for substitute topsoil use. Soils found unacceptable at the time of reclamation due to their high sodium content, will be 1) buried in the fill with at least 4 feet of non-toxic material, or 2) reclaimed through the use of amendments, prior to placement on the surface of the reclamation site.

In order to provide the substitute topsoil and soil cover analyses prior to permit renewal in January 2012, an individual, qualified to conduct soil sampling will:

- 1) Provide field notes, surveyed map locations, and sampling of the following:

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a) Disturbed soils to provide a baseline for comparison of salt values. The native soils will be sampled by horizon down to lithic contact.

b) Resample the proposed substitute topsoil locations above the buried culvert to provide an indication of the extent of salt loading in the surface 0-3 feet along the roadway and/or to show that the salt is leaching out of the surface three feet over time. The Permittee will find a site accessible by backhoe at one of these locations, such that the qualified individual can resample to greater depth at three foot increments.

2) Direct the laboratory that if, in any of the above samples, the Sodium Adsorption Ratio (SAR) values are greater than 15, an analysis of total Cation Exchange Capacity (CEC) and Exchangeable Sodium Percentage (ESP), will be required, such that a calculation of the gypsum requirement can be made.

3) Formulate the soil amendment and fertilization plan for reclamation.

In addition to the pre-reclamation sampling program, PacifiCorp commits to conducting field sampling during the reclamation project. Sampling will be conducted by random examination of the sub-material used to construct final reclamation contours prior to placement of substitute topsoil material. A paste pH and EC evaluation will be conducted at all selected sites. The Division will be notified of the results of the evaluation. Table 2 in the *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mines* will be used to accept or reject this material.

Underground Development Wastes.

The refuse material cut during topographic contouring will be used as fill along cut banks and highwalls. Before recontouring begins, however, a complete sampling program of the refuse piles needs to be implemented so the chemical characteristics can be known. Any acid- and/or toxic-forming refuse fill material found will be covered with four (4) feet non-acid and/or non-toxic forming material. This will be accomplished by one or both of the following methods; 1) excavating a pit to bury the toxic soil material on-site and/or 2) sacrifice non-toxic substitute topsoil covering from certain areas of the mine site to cover the toxic soil material. The soil sampling program will identify problem areas throughout the mine site.

Partial sampling of the underground development waste (refuse) piles located in Deer Creek and Elk canyons was previously conducted (April 2000) in cooperation with the slope stability investigation. Two samples (Site #1 and Site # 6; **Appendix R645-301-200-A**) were taken to determine if the refuse material was acid or toxic forming or could be used as a suitable subsoil substitute. The sample analysis found that SAR's were elevated near the surface in each of the two samples taken. Heavy salting of travel areas during the winter months is most likely the contributing factor. Additional sampling of these refuse piles ~~is planned to be~~ **was** conducted in conjunction with the substitute topsoil material sampling and described below (refer to ~~Table 3-1 Reclamation Schedule for implementation~~

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of program). The addition sample analyses will be incorporated into **is found Appendix R645-301-200-A** as more information is made available. Specific site locations of both previously and planned Sampling and their procedures are outlined below.

Sampling Procedures for Refuse Piles

Sampling was conducted while performing slope stability investigations (**June, 2000**) on the slopes of the refuse piles. Test holes were drilled with a rotary rig using water as the drilling fluid and a rock bit with drive casing to advance the holes through the overburden. Sampling was performed at three- to five-foot intervals in the overburden throughout the depth investigated. Both disturbed and undisturbed samples were obtained during field investigations. Disturbed samples were obtained by driving a 2-inch split spoon sampling tube through a distance of 18 inches using a 140-pound weight dropped for a distance of 30 inches.

Undisturbed samples were obtained by pushing a thin-walled sampling tube into the subsurface material using the hydraulic pressure on the drill rig. The location at which the undisturbed samples were obtained are shown on the boring logs in **Appendix R645-301-500-E** and on map DS-1810-D in **Appendix R645-301-200-B**. The document provided in this appendix was assembled by RB&G Engineering Consultants.

Once the samples were analyzed for stability properties, the remnant sample for each site was sent to Intermountain Laboratories for quality analysis. The parameters described in Table 6 of the *Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining* (Leatherwood, 1988) were analyzed. Results of the analysis can be reviewed in **Appendix R645-301-200-A**.

To provide sufficient subsoil materials for reclamation purposes, refuse ~~will be~~ **materials throughout the site were examined** ~~qualified through an established sampling program.~~ Sampling ~~will be~~ **was** conducted **in conjunction with the substitute topsoil sampling program** during the ~~2001 and/or 2002~~ field season. ~~and be~~ **Samples of the material were** taken in the confines of the refuse piles in the Deer Creek and Elk canyons (~~refer to Table 3-1 Reclamation Schedule for implementation of program~~) **as well as in the mine site facility areas**. Sample points ~~will be~~ **were** placed randomly in these areas and ~~be~~ taken at ~~three foot~~ **various** depth intervals to a point four feet below the final grade of the proposed final surface configuration. Samples ~~will be~~ **were** collected by Energy West staff members qualified in collecting soil samples. ~~If a contractor is used, the person will be trained and qualified to collect soil samples. In either case,~~ **The requirements of R645-301-131 will be were** followed. ~~The information required for by R645-301-130 will be submitted with the technical data and~~ **Sampling details and results have been** incorporated in **Appendix R645-301-200-A**.

R645-301-243: Soil Nutrients and Amendments (Refer to **R645-301-300: Biology**)

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R645-301-244: Soil Stabilization (Also refer to **R645-301-500: Engineering** for slope stability analysis)

Various sized rocks and boulders (litter) will be randomly placed on slopes of reclaimed areas where feasible or helpful to control slope slippage and to promote microhabitats. Mid-sized litter material will be placed on the prepared slopes and nested into the soil at random locations. This process will provide a natural esthetic appearance as well as slope containment.

Where it is deemed necessary, especially on slopes greater than 20%, a soil tackifier (refer to **R645-301-300: Biology, Seeding Techniques**) will be incorporated into the reclamation process to stabilize soil material.

Rills and gullies, which develop in areas that have been regraded and topsoiled and which either; 1) disrupts the approved post mining land use or the reestablishment of the vegetative cover, or 2) causes or contributes to the violation of water quality standards for receiving streams will be filled, regraded, or otherwise stabilized.