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TOTAL NUMBER OF PAGES (Including This Cover Sheet): 25

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Comments/Notes:

Daron/Bob - Attached are revised text pages, tables, and copies of sections fron the revied permit map (Map 4) reflecting the agreed upon revisions. We are forwarding hard copies to update your permit sets via UPS Overnight tonight. Please call with any questions -

Jerry

4/22

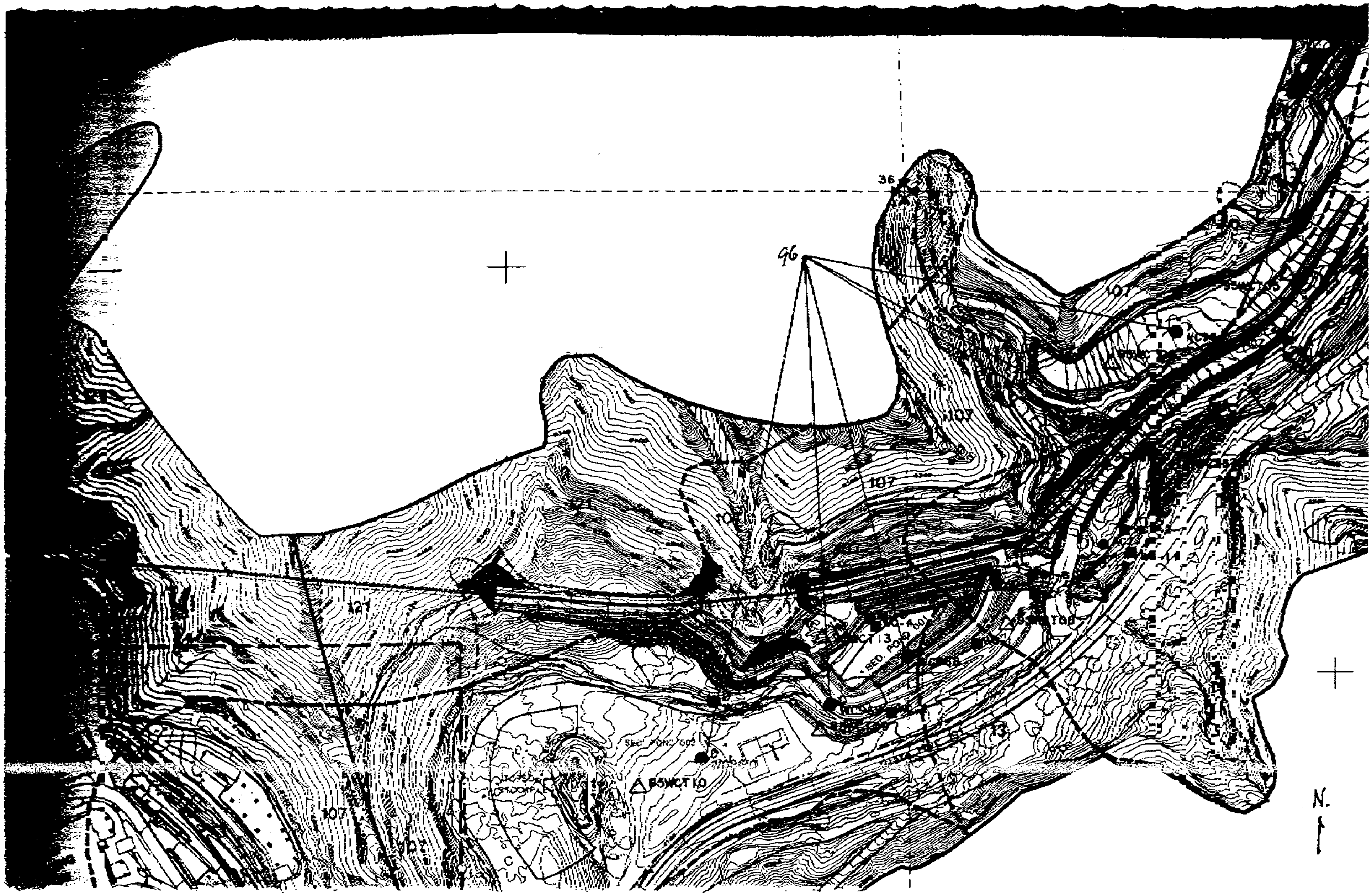
Daron —
Bob took a quick look at this ... He said there were some problems. He'll be @ Willow Creek on Tues. 4/23.
Thx. Pam

IF YOU DO NOT RECEIVE LEGIBLE COPIES OF ALL PAGES, PLEASE CALL BACK AS SOON AS POSSIBLE

LEGEND

- EXISTING PERMITTED CASTLEGATE MINE SURFACE DISTURBANCE TO BE INCLUDED IN THE WILLOW CREEK MINE SURFACE DISTURBANCE AREA
- PROPOSED WILLOW CREEK MINE SURFACE DISTURBANCE AREA (Offset Where it Parallels Castlegate Boundary)
- UTAH POWER & LIGHT PROPERTY LINE
- LIMITS OF WILLOW CREEK SOILS STUDY AREA
- LIMITS OF CEMETARY PROPERTY
- NEW WILLOW CREEK SOILS DISTURBANCE MAPPED IN 1995
- PRE-1977 DISTURBANCE AREA LOCATION
- GRAVEL CANYON PERMIT AREA BOUNDARY
- EXTENT OF CASTLE GATE SOILS SURVEY AREA

△ 95WCT12	1995 SOIL SAMPLE SITE
● 94-12-2R	1994 SOIL SAMPLE SITE
■ WC-10	1994 WETLAND/SOIL SAMPLE
● ACZ-1	ACZ 1989 SAMPLES
▲ 3	RECLAMATION SOIL SAMPLE LOCATIONS (November, 1988
o 2A	PHYSICAL SOIL SAMPLE LOCATIONS (June, 1989)
■ SD1	SOIL DENSITY SAMPLE LOCATIONS
④ HC	HARROCKS & CARROLLO 1979
△ 1	REFUSE SITE SOIL SAMPLING
◊ 2	1990 SOIL SAMPLING SITE
— — — —	PRE-DISTURBANCE SOIL TYPE
● D WC9610	96 SOIL PITS U = UNDISTURBED SOIL D = DISTURBED SOIL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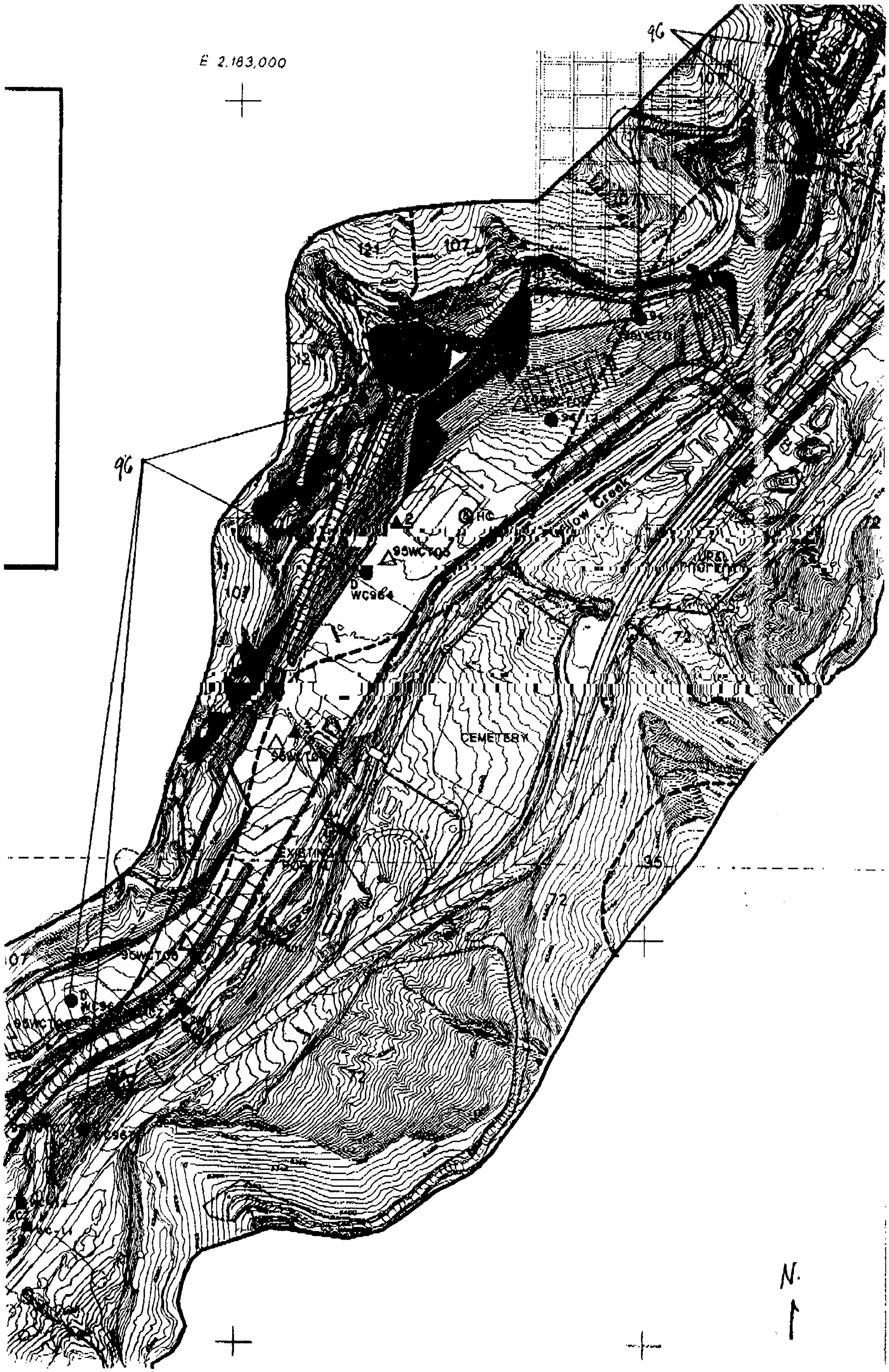
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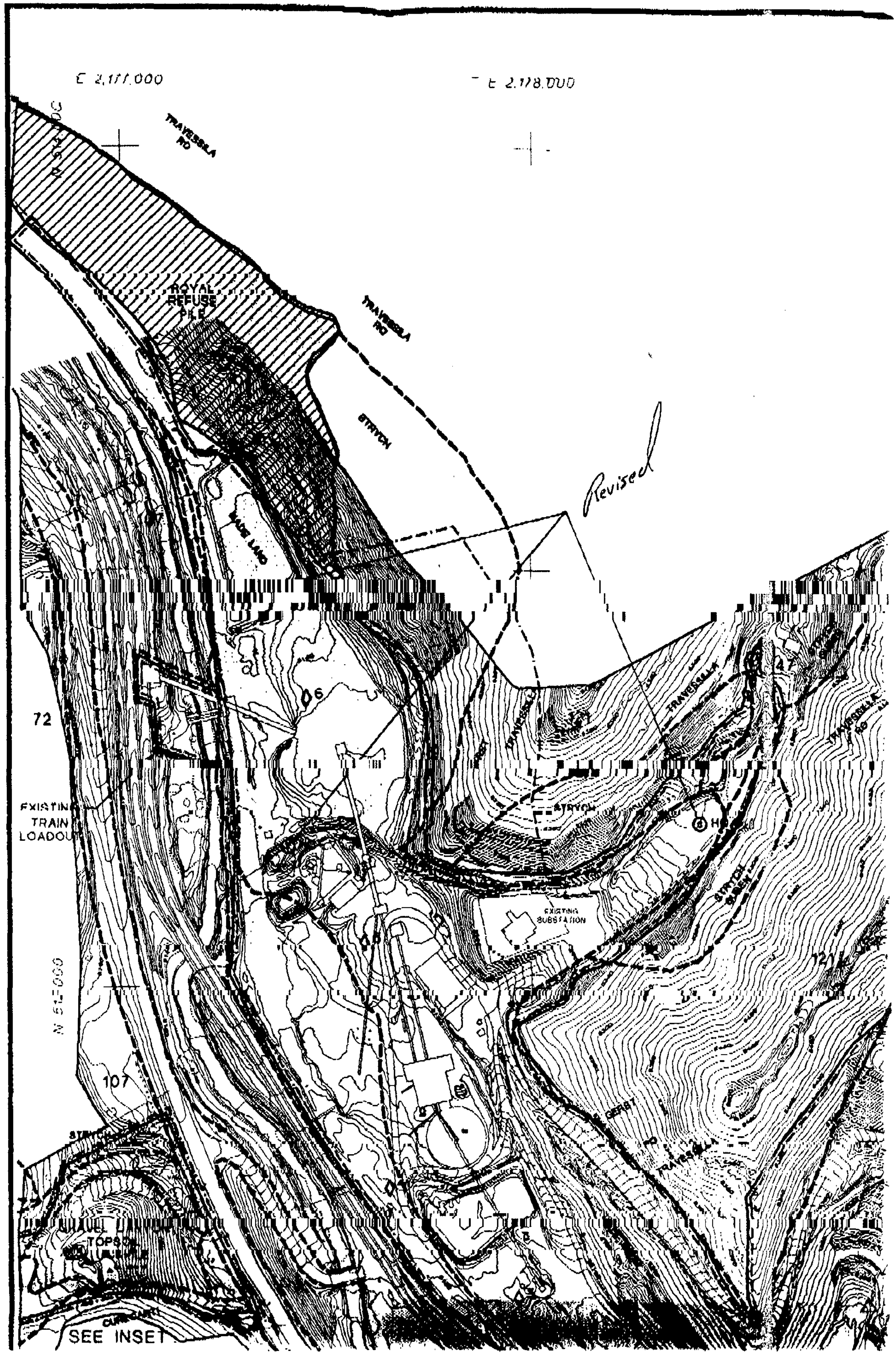
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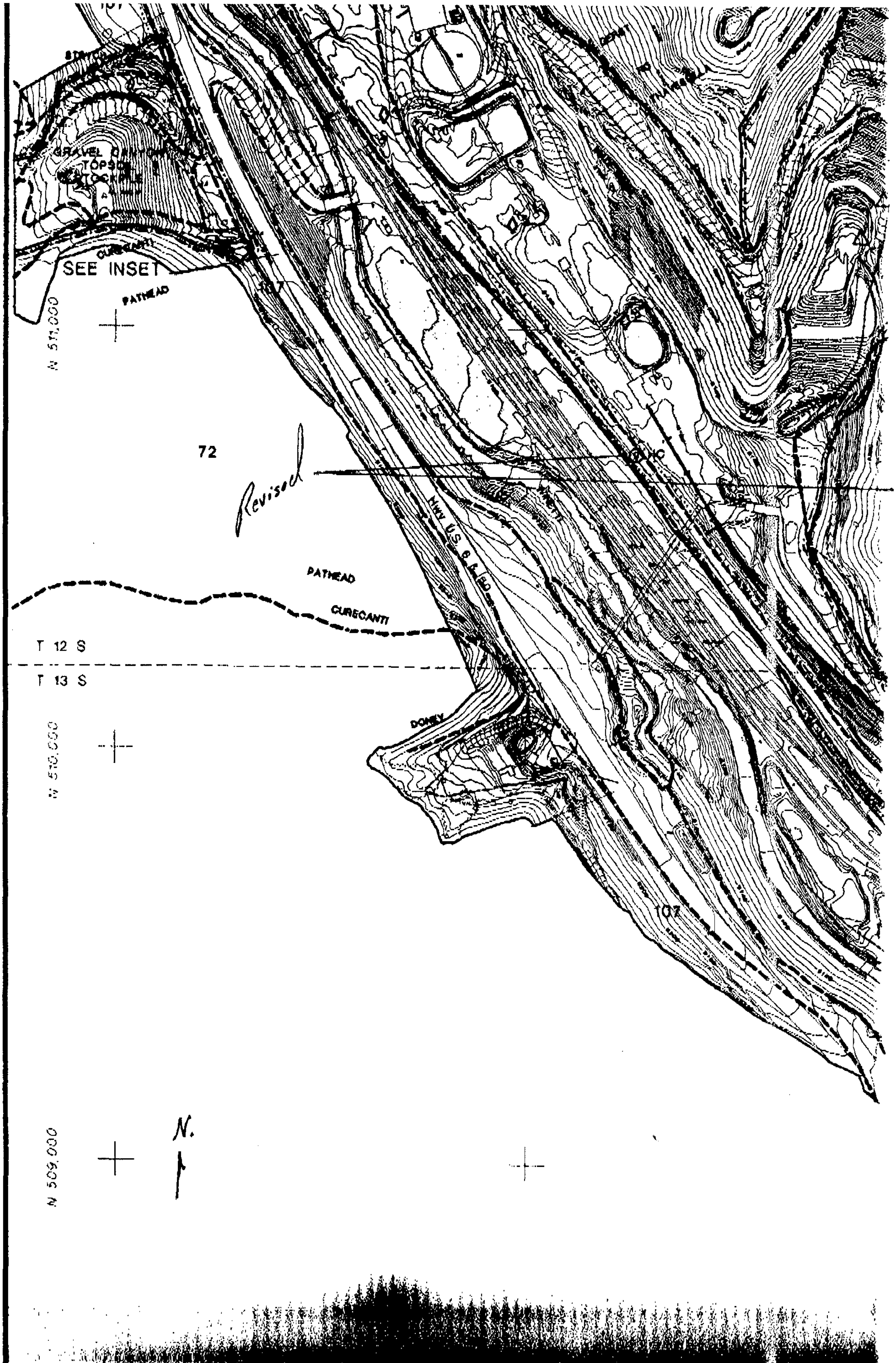
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precipitation is about 16 to 20 inches, the average annual air temperature is 38 to 45 degrees F, and the average freeze-free period is 60 to 100 days.

This unit makes up about 7 percent of the survey area. It is about 30 percent Beje soils, 25 percent Trag and similar soils, and 10 percent Senchert soils. The remaining 35 percent is components of minor extent.

Beje soils are on plateaus. These soils are shallow and well drained. They formed in residuum derived dominantly from sandstone and shale. The surface layer is brown loam. The subsoil is brown clay loam over sandstone as a depth of 14 inches. Unweathered sandstone is at a depth of 8 to 20 inches.

Trag soils are on valley floors and plateaus. These soils are very deep and well drained. They formed in alluvium derived from sandstone and shale. The surface layer is dark clay loam. The subsoil is brown and light brown clay loam. Below this to a depth of 60 inches or more the soils are light yellowish brown clay loam.

Senchert soils are on plateaus. These soils are moderately deep and well drained. They formed in alluvium and residuum derived dominantly from sandstone and shale. The surface layer is very dark grayish brown loam. The subsoil to a depth of 35 inches is brown clay loam and clay loam. Weathered sandstone is at a depth of 20 to 40 inches.

Of minor extent in this unit are Frandsen, Rabbitex, Cabba family; and Rottulee, Falcon, Silas, and Brycan soils.

This unit is used as rangeland, wildlife habitat, and recreation.

3.1.1.4 Soils Mapping Information

The mapping of all of the soils within the proposed Willow Creek Mine permit area has been completed by the USDA-SCS and these results have been published in the report entitled "Soil Survey of Carbon Area, Utah" issued in June of 1988. Soils mapping corresponding to the proposed permit area is shown on the Regional Soils Map, (Map 3). More detailed site-specific soils mapping for the proposed surface facilities disturbance area is presented on the Facilities Area Soils Map, (Map 4). The site specific soils mapping in the immediate vicinity of the proposed Mine Facilities Area has been modified from the published soils survey, a detailed Order I Soil Survey prepared by Dr. David S. Ralston, Certified Agronomist/Soils Scientist, for those portions of the Permit Area corresponding to the Castle Gate Facilities Area. The regional and facilities area soils maps provide the following specific soils information on the soils mapping units and soil types found in this area:

- Soil mapping units
- Soil types
- Soil sampling locations

3.1.1.5 Soils Analyses

Site specific soils characterization for the proposed mine facilities area is the result of a number of studies conducted over a period of several years. The majority of the soils information available for this area has been collected to address permitting concerns relative to the suitability of site soils as a vegetative growth medium. As a result, nearly all of the existing data has been collected using analytical sampling and testing procedures consistent with the UDOGM guidelines which were applicable at the time the samples were obtained. Since the available data may reflect varying technical data standards, all of the existing data have been analyzed using the current UDOGM Topsoil/Overburden Guidelines. The following summarizes the site specific soil characterization and analyses information used in evaluating existing soil condition for the proposed mine surface facilities area:

- **1979 Soil Investigations (Price River Coal Company (PRCC))** - Excavation of thirteen backhoe soil test pits. Three of the soil pits (Pits 11, 12, and 13) were in Sowbelly and

Hardscrabble Canyons, which are outside of the proposed Willow Creek Mine Permit Area. Three pits were dug in the Crandall Canyon area, two pits were dug in the proposed Willow Creek facilities area, and five pits were dug in the Castle Gate Coal Company (CGCC) preparation plant area. The locations of the soils test pits are shown on the Facilities Area Soils Map, (Map 4), with test pit locations denoted by the symbol HC.

- **1981 Soil Investigations for Crandall Canyon (PRCC)** - Detailed physical and geochemical testing of 23 topsoil and subsoil samples in an area of proposed development

- **1988 Soil Characterization and Sampling Program (Blackhawk Coal Company (BCC))** - Selection of three representative soil sampling sites, excavation of soil sample pits, development of detailed soil profile descriptions, collection of nine composite soil samples for each identified soil horizon, and analysis of all soil samples. The locations of the soils pits are shown on the Facilities Area Soil Map, (Map 4), and labeled as Reclamation Soil Sample Locations (November 1988).

- **1989 Soil Sampling Program (BCC)** - Nine soil samples were collected and analyzed relative to soil texture and coarse fragments. Three additional samples of coally sediment were collected from sedimentation ponds and analyzed for chemical constituents. Two bulk samples were also collected to evaluate soil densities. The locations of these samples are shown on the Facilities Area Soils Map, (Map 4). Sampling locations for the nine soil samples analyzed for soil texture and coarse fragment content are labeled as Physical Soil Sample Locations (June 1989) while sample locations for the three samples tested for geochemical content are shown as ACZ 1989 Samples. The location of the two bulk density samples, labeled as sites SD-1 and SD-2, are labeled on the map as Soil Density Sample Locations.

- **1990 Sampling Program (CGCC)** - Forty-seven coal refuse samples and 12 samples of disturbed soils collected from the Castle Gate preparation plant area were analyzed in connection with permitting actions by CGCC. The locations of those sample sites which could be identified from the available documentation are shown on the Facilities Area Soils Map, (Map 4). Identified sample locations correspond to Sample Sites 1 - 7 for the refuse samples and Preparation Plant (PP) Samples Sites 1 - 8 for the disturbed soil samples. Locations for the remaining CGCC samples could not be reconstructed. A complete listing of these samples is included in Chapter 8 of the CGCC Permit.

- **1991 Soils Mapping (CGCC)** - In May of 1991, Leland Sasser, SCS Soils Scientist for Carbon County delineated soil mapping units on 1" = 200' maps to the individual soils series level for all of the surface facilities areas within the CGCC Permit Area. This mapping effort was used as the basis for the soils information included in the Castle Gate Mine Permit and is reflected in the soils mapping information for the Castle Gate area as shown on the Facilities Area Soils Map, (Map 4). The extent of the area mapped by SCS is identified on the map as "Extent of the Castle Gate Soils Survey Area".

- **1994 Soil Sampling Program (CPMC)** - Excavation of twelve soils pits in lowland areas within and adjacent to the Willow Creek stream channel and evaluation of soil samples relative to potential characterization as hydric soils. Collection and analysis of two coal refuse samples. The locations of the refuse sampling sites are shown on the Facilities Area Soils Map, (Map 4), and labelled as 1994 Soil Sample Site and the soils pits along Willow Creek are labeled as 1994 Wetland Sample Plots.

- **1995 Soils Sampling Program (CPMC)** - In order to address concerns raised by the UDOGM permit technical adequacy review, 13 additional soils pits were excavated and soils samples corresponding to 17 different potential soil members were evaluated for chemical and physical properties outlined in the UDOGM Topsoil Guidelines. The location of these soils sample locations, three of which were located in undisturbed soils and 10 in disturbed soils are identified on the Facilities Area Soils Map, (Map 4), as 1995 Soil Sample Locations.

- **1996 Soils Sampling Program** - The 1996 soils survey effort was initiated to address UDOGM Technical Adequacy Concerns. The sampling program involved excavation of 12 additional soils pits and collection of soil samples from 11 of the pits. The locations of the 1996 soils pits are shown on the Facilities Area Soils Map, (Map 4).

3.1.1.6 Prime Farmland Investigation

Several previous investigations have been conducted for the permit area to determine whether any prime farmlands exist in the area. Each of these investigations involved formal consultation with the USDA-SCS. The initial determination, included in PRCC's Mining and Reclamation Permit application, was provided by Mr. George D. McMillan, USDA-SCS State Conservationist in a letter dated July 16, 1979. This letter concluded that, based upon the absence of any irrigation, and excessive slopes, no prime farmlands existed in the area corresponding to Townships 12 & 13 South, Ranges 8, 9 and 10 East. A second negative determination for prime farmlands in the permit area was issued in connection with the permitting efforts for the CGCC Permit submitted to UDOGM in February 1991. The CGCC permit application contains a letter dated May 21, 1991 from Mr. Ferris P. Allgood, USDA-SCS State Soil Scientist, stating that due to the excessive amount of rock fragments, high erodibility and lack of a reliable source of irrigation waters for lands within the CGCC Mine Permit area, the soils within this area are excluded from consideration as important farmlands. Confirmation of these negative determinations was included in the findings documents issued by UDOGM for both permit applications and documentation is provided in **Exhibit 5**, Soils Information.

Since the limitations which exclude these soils for consideration as prime farmlands still exist, and all surface disturbance associated with the mining and reclamation activities will occur on either previously disturbed areas or on slopes greater than ten percent, UDOGM is requested to reaffirm the negative determination regarding the presence of prime farmland soils in the permit area.

3.1.2 Site-Specific Soils Information

Two soils maps have been prepared for those areas potentially affected by the mining and reclamation activities, reflecting different levels of detail.

The Regional Soils Map, (Map 3) shows the soils mapping units as identified and mapped by the USDA-SCS Soils Survey for the entire mine permit area. This regional map reflects an Order III soils survey with soils mapping at a scale of 1 inch equals 2,000 feet. The legend on this map identifies all soil mapping units found within the proposed permit area, with the individual mapping units consisting of both soil associations and soil complexes. To the extent possible individual soil associations are identified, however, where individual soil series are so intermingled that it was not practical to map them separately, the corresponding mapping units may reflect a complex of similar associated soil types.

with the methods outlined in the National Soils Handbook (USDA-SCS, 1983). All of the sites examined had varying amounts of waste coal present which are assumed to have come from previous historical mining and related activities. One site was purposely sampled that contained a very high percentage of waste coal and which appeared to be composed largely of refuse materials. Soil samples were delivered to Book Cliffs Commercial Laboratories for analysis of the parameters and using the methods outlined in the UDOGM Topsoil/Overburden Guidelines.

1989 Soils Sampling Program

In the summer of 1989 additional detailed soils sampling and characterization efforts were performed by ACZ, Inc. for BCC to address UDOGM permit review adequacy concerns. The following summary describes the 1989 soil sampling efforts.

In order to address UDOGM concerns relative to the geotechnical stability of the Willow Creek stream bank, a total of nine soil samples were collected and analyzed for coarse fragment content as well as soil texture. The locations of the 1989 samples are shown on the Facilities Area Soils Map, (Map 4) and are denoted by the symbols 1A, 2A, 3A, 4A, 1B, 2B, 3B, 4B and 4C. Soil bulk density measurements were also obtained for Sites SD-1 and SD-2 as part of the overall geotechnical sampling and evaluation program.

In order to evaluate overburden suitability prior to revegetation of Sediment Traps 17 and 18, three samples of surficial coally materials were collected from the sediment trap areas and analyzed for the suitability parameters listed in Table 2 of the UDOGM Topsoil/Overburden Guidelines. These samples, designated as AEP Upper Sediment, AEP Lower Sediment, and AEP Upper Slope, were taken from the upper and lower sediment traps and from the outslope of one of the sediment basins. Samples from the sediment traps were obtained from the bottom of the collection basins and the slope sample was a representative sample of basin side slope materials. The BCC Permit provides no information on how these samples were collected with respect to specific sampling location, sample intervals, or sampling depth. In the absence of any specific information on sampling approach, it is assumed based on the permit discussion that these materials represent surface or near surface samples.

1994 Soils Sampling Efforts

Three supplemental soils characterization efforts focusing on the proposed mine surface facilities disturbance area were initiated in fall 1994. These supplemental soils investigations include; 1) Soils characterization in the Willow Creek drainage channel in conjunction with a wetlands delineation required for this area; 2) Sampling and analysis of existing refuse materials placed under the UDOGM AMR Program in the proposed portal face-up area; and 3) Sampling and analysis of roof and floor overburden materials in conjunction with the combined coal exploration and ground water well completion program.

As a component of the wetlands delineation program for the Willow Creek drainage, twelve soils pits were excavated and the associated soils evaluated using the sampling procedures outlined in the 1987 Corps of Engineers Wetlands Delineation Manual for the evaluation of hydric soils. These soil sampling sites, designated as sample sites WC-1 through WC-12, are shown on the Facilities Area Soils Map, (Map 4). At each of these sample sites a soil pit at least 18 inches deep was excavated and a soil sample was taken at a depth corresponding to either the zone immediately below the base of the A soils horizon or a depth of 10 inches, whichever was shallower. Exposed soils in each pit were also examined to determine whether or not soil mottling was present. Where soil mottling occurred, it was visually characterized by soil color using the Munsell Color Book and the corresponding soil color designation was then compared with the color criteria as defined in the Wetlands Delineation Manual. The Wetlands Delineation Manual defines a hydric soil as having a chroma value of 2 or less for mottled soils and a chroma value of 1 for unmottled soils. These color values and other soils criteria were also compared with the diagnostic criteria used in soil taxonomy as found in the 1992 Edition of the Keys to Soils Taxonomy, published as USDA-SCS, Soil Management Support Services Technical Monograph No. 19.

Results of the wetlands delineation soils characterizations revealed that of the 12 soils pits examined, mottled soils were present in five of the pits. The pits where mottling was present were consistently located in the bottom of the drainage and possessed mottle colors of either 7.5YR 5/6 or 7.5YR 5/8, corresponding to the strong brown soil color. The background matrix color of these soils all corresponded to the 10YR 3/2 (very dark grayish brown soil color, three samples), 10YR 4/2 (a dark grayish brown soil color, 4 samples) and 10YR 4/3 (a dark brown soil color, 5 samples) color ranges. The soils along the Willow Creek drainage are not differentiated in the USDA-SCS soils survey. Based on site-specific investigation of this area the soils located in the bottom of the Willow Creek drainage would be classified as belonging to the Typic Fluaquents soil subgroup.

In order to characterize existing coal refuse materials located in the mine surface facilities disturbance area, two samples were collected from hollow-stem auger holes completed to evaluate the physical properties of surficial soil materials as a basis for facility foundation design. These samples were analyzed for the parameters listed in Table 2 of the UDOGM Topsoil/Overburden Guidelines. The locations of the two refuse samples, identified as samples 94-12-1R and 94-12-2R are shown on the Facilities Area Soils Map, (Map 4).

1995 Soils Sampling Efforts

In order to address specific concerns raised by UDOGM during the Permit Technical Review, a supplemental soils sampling effort was undertaken. The results from this sampling effort provide a comparison between chemical and physical characteristics of existing site soil materials and the suitability parameters found in the UDOGM Soils Guidelines as summarized by Table 3.1-1, Summary of 1995 Supplemental Soils Sampling. Copies of laboratory results for the 17 additional soils samples collected to address specific Technical Adeqacy concerns have been inserted in Exhibit 5, Soils Information, under the section titled, Willow Creek Mine 1995 Soils Analyses. Analysis results for the supplemental samples have been utilized in evaluating the characteristics and suitability of soil substitute materials as a revegetation medium as discussed in Section 3.1.2.4, Soil Availability and Suitability.

1996 Soils Sampling

The 1996 soils sampling effort was initiated to address UDOGM technical adequacy concerns. A total of 12 additional soils pits were excavated and evaluated with additional soils samples being collected from 11 of these soils pits. Four of the soils pits examined were in undisturbed soils and eight were located in disturbed soils. The locations of these 12 soils pits are shown on the Facilities Area Soils Map, (Map 4). These locations correspond to those areas specified by UDOGM for supplemental sampling.

The 1996 soils survey effort complies with the standards of the National Cooperative Soils Survey (1962 Edition of the Soils Survey Manual, updated 1983). In addition, Keys to Soil Taxonomy (USDA-SCS, 1992) was utilized to provide general guidance for the 1996 soil surveys. The 1988 Soil Survey of Carbon Area, Utah was utilized to further refine site-specific soils mapping unit designations.

Soils Descriptions

At each soils pit examined in the 1996 sampling effort, soils descriptions were developed and recorded on a Soils Field Form for Pedon Description. This form is currently used by the USDA-Forest Service and is modified from forms originally issued by the USDA-SCS.

UDOGM requested that the soils descriptions include location, site description, horizon/layer identification, depth, color, texture, structure, acid reaction, and coarse/large fragment, boulders, etc." The following descriptions address each of these parameters with the exception of acid reaction. Since the samples were submitted for laboratory analysis, laboratory measurement of acid reaction will address this requirement. CPMC has provided extensive data from field and laboratory samples describing the soil reaction for the soils in this area.

Soil Pit WC96-1 - One of two sites required in the proposed Ventilation Fan Area. On the existing SCS soils mapping for this area these soils are designated as corresponding to Soils Mapping Unit 107, Shupert-Winetti complex. Examination of this area suggests that it is undisturbed and is covered by a tree over story of juniper with a relatively dense under story of Basin Big Sagebrush.

> **Soil Profile** - Disturbed - 0 to 11 inches - light gray (10 YR 7/2) gravelly sandy clay loam, dark brown to brown (10 YR 4/3) when moist; massive to very weak granular structure; slightly hard, friable,

slightly sticky, slightly plastic; common fine roots; many fine pores; 9 percent fine gravels; 11 percent medium gravels; 13 percent coarse gravels; abrupt smooth boundary.

Waste Coal Material - 11 to 20 inches - gray (10YR 5/1) gravelly sand, very dark gray (10 YR 3/1) moist; single grain structure; slightly hard, loose, non sticky, non plastic; common fine pores; many fine roots; 14 percent fine gravels; 17 percent medium gravels; 7 percent coarse gravels; abrupt smooth boundary.

A1b - 20 to 32 inches - very pale brown (10YR 8/3) very gravelly sandy loam, dark brown to brown (10YR 4/3) moist; moderate subangular blocky structure; slightly hard, friable, non sticky, non plastic; common fine pores; common fine roots; faint very fine clay films; 13 percent fine gravels, 16 percent medium gravels, 9 percent coarse gravels, 3 percent pebbles, 5 percent cobbles, 8 percent boulders; clear smooth boundary.

C1 - 32 to 44 inches - light gray (10YR 7/2) very cobbly sandy loam, brown (10YR 5/3) moist; moderate subangular blocky structure; hard, firm, non sticky, non plastic; few fine pores; common fine roots; 21 percent fine gravels, 8 percent medium gravels, 16 percent coarse gravels, 32 percent pebbles, 4 percent stones, 3 percent boulders; gradual smooth boundary.

C2 - 44 to 56 inches - pale brown (10YR 6/3) very cobbly sandy loam, brown (10YR 5/3) moist; moderate subangular blocky structure; hard, very firm, non sticky, non plastic; few fine pores; common fine roots; 26 percent fine gravels, 11 percent medium gravels, 24 percent coarse gravels, 30 percent pebbles, 11 percent stones, 4 percent boulders; gradual smooth boundary.

C3 - 56 to 68 inches + - very pale brown (10YR 7/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak subangular blocky structure; hard, very firm, non sticky, non plastic, few fine pores; common fine roots; 30 percent fine gravels, 16 percent medium gravels, 20 percent coarse gravels, 11 percent pebbles, 14 percent stones, 6 percent boulders.

Soil Pit WC96-2. This is the second soils pit placed in a disturbed soil in the vicinity of the proposed Ventilation Fan area.

Soil Profile - Disturbed - 0-22 inches - grayish brown (10YR 5/2) extremely gravelly sandy clay loam, dark brown (10YR 3/3) moist; massive structure; very hard, firm, non sticky, non plastic; common fine pores; common fine roots; 7 percent fine gravels, 8 percent medium gravels, 21 percent coarse gravels, 9 percent pebbles; abrupt wavy boundary.

Disturbed - 22 to 58 inches - very pale brown (10YR 7/4) very pebbly sandy loam, yellowish brown (10YR 5/4) moist; massive structure; very hard, very firm, non sticky, non plastic; few fine pores; few fine roots; 8 percent fine gravels, 8 percent medium gravels, 12 percent coarse gravels, 17 percent pebbles, 3 percent stones; abrupt smooth boundary.

Disturbed - 58 to 83 inches + - brown (10YR 5/3) extremely gravelly sandy loam, dark brown (10YR 3/3) moist; massive structure; very hard, very firm, non sticky, non plastic; few fine pores; few fine roots; 13 percent fine gravels, 14 percent medium gravels, 34 percent coarse gravels, 10 percent pebbles.

Soil Pit WC96-3. This soils profile was taken from the undisturbed Soils Mapping Unit 107 and corresponds to the undisturbed soils pit specified for the Upper Facilities Bench Area. The C horizon was very uniform in it's characteristics and differentiation into sub-horizons was not practicable.

Soil Profile - A1 - 0 to 6 inches - very dark grayish brown (10YR 3/2) extremely bouldery sandy loam, very dark brown (10YR 2/2) moist; weak subangular blocky to weak granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine pores; common fine roots; faint very few clay films; 8 percent fine gravels, 12 percent medium gravels, 12 percent coarse gravels, 2 percent pebbles, 13 percent stones, 36 percent boulders; clear smooth boundary.

C - 6 to 60 inches + - light gray (10YR 7/2) extremely bouldery sandy loam, dark yellowish brown (10YR 4/4) moist; weak subangular blocky structure; slightly hard, firm, non sticky, non plastic, few fine pores; few fine roots; 8 percent fine gravels, 7 percent medium gravels, 7 percent coarse gravels, 8 percent pebbles, 19 percent stones, 42 percent boulders.

Soil Pit WC96-4. This soils pit was dug in the disturbed soils associated with the Upper Facilities Bench and is located very close to soil sample 95WCT03. This soils pit contains respread disturbed soil material over waste coal material.

Soil Profile - Disturbed - 0 to 50 inches - white (10YR 8/2) very gravelly sandy loam, dark brown to brown (10 YR 4/3) moist; massive structure; slightly hard, friable, slightly sticky, slightly plastic; few fine pores; common fine roots; 9 percent fine gravels, 14 percent medium gravels, 10 percent coarse gravels, 11 percent pebbles, 6 percent stones, 4 percent boulders; abrupt smooth boundary.

Waste coal material - 50 to 72 inches + - gray (10YR 5/1) cobbly sandy, very dark gray (10YR 3/1) moist; single grain structure; loose, loose, non sticky, non plastic; few very fine roots; 13 percent fine gravels, 18 percent medium gravels, 21 percent coarse gravels, 23 percent pebbles.

Soil Pit WC96-5. This is the disturbed soil pit located in the kidney-shaped Lower Facilities Area between soils pits 95WCT05 and 06 as specified by UDOGM.

Soil Profile - Disturbed - 0 to 27 inches - light gray (10YR 7/2) very cobbly loam, yellowish brown (10YR 5/6) moist; massive structure; very hard, very firm, slightly sticky, slightly plastic; few fine pores; few very fine roots; 8 percent fine gravels, 9 percent medium gravels, 13 percent coarse gravels, 21 percent pebbles, 4 percent stones, 11 percent boulders; gradual irregular boundary.

Coal processing waste - 27 to 65 inches + - gray (2.5Y 5/1) gravelly sand, very dark gray (2.5Y 3/1) moist; single grain grading to massive structure; very hard, very firm, non sticky, non plastic; few fine pores; few fine roots; 9 percent fine gravels, 8 percent medium gravels, 15 percent coarse gravel, 14 percent pebbles, 2 percent stones, 5 percent boulders.

Soil Pit WC96-6. This undisturbed soils pit corresponds to the undisturbed soil found in the triangle-shaped area in the Lower Facilities area identified by UDOGM. It is located adjacent to soils sample 95WCT07. According to the SCS soils map, this soil corresponds to Soils Mapping Unit 107, the Shupert - Winetti complex.

Soil Profile - A1 - 0 to 6 inches - grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate to strongly medium granular structure; soft; very friable, slightly sticky, slightly plastic; common fine pores; common fine roots; distinct common clay films; 6 percent fine gravels, 9 percent medium gravels, 11 percent coarse gravels, 13 percent pebbles, 10 percent stones, 8 percent boulders; abrupt wavy boundary.

C1 - 6 to 13 inches - pale brown (10YR 6/3) gravelly loam, dark yellowish brown (10YR 4/4) moist; strongly granular structure; soft, very friable, slightly sticky, slightly plastic; common fine pores; common fine roots; distinct common clay films; 9 percent fine gravels, 13 percent medium gravels, 18 percent coarse gravels, 21 percent pebbles, 5 percent stones; clear wavy boundary.

C2 - 13 to 28 inches - pale brown (10YR 6/3) extremely gravelly loam, yellowish brown (10YR 5/6) moist; moderate subangular blocky structure; soft, very friable, non sticky, non plastic; common fine pores; common fine roots; few faint clay films; 13 percent fine gravels, 16 percent medium gravels, 24 percent coarse gravels, 31 percent pebbles, 11 percent stones, 5 percent boulders; gradual irregular boundary.

C3 - 28 to 44 inches - very pale brown (10YR 7/3) bouldery loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; soft, very friable, non sticky, non plastic; common fine pores; few very fine roots; few faint clay films; 5 percent fine gravels, 7 percent medium gravels, 8 percent coarse gravels, 5 percent pebbles, 7 percent stones, 26 percent boulders; gradual irregular boundary.

C4 - 44 to 72 inches + - very pale brown (10YR 7/3) bouldery sandy loam, yellowish brown (10YR 5/4) moist; very weak subangular blocky structure; loose, very friable, non sticky, non plastic; few fine pores; few very fine roots; faint very fine clay films; 7 percent fine gravels, 6 percent medium gravels, 8 percent coarse gravels, 11 percent stones, 35 percent boulders.

Soil Pit WC96-7. This soil pit is located in a disturbed soil and corresponds to the required pit for the Stream Realignment # 1 area. This site corresponds to an AML reclamation site.

Soil Profile - Disturbed - 0 to 29 inches - light gray (10YR 7/2) gravelly sandy loam, brown to dark brown (10YR 4/3) moist; massive structure; slightly hard, friable, slightly sticky, slightly plastic; few fine pores; common fine roots; faint very few clay films; 7 percent fine gravels, 8 percent medium gravels, 8 percent coarse gravels, 5 percent pebbles; abrupt smooth boundary.

Coal Processing Waste - 29 to 70 inches + - very dark grey (10YR3/1) sand, black (10YR 2/1) moist; single grain structure; loose, loose, non sticky, non plastic; few very fine roots; 5 percent fine gravels, 6 percent medium gravels, 2 percent coarse gravels, 3 percent pebbles.

Soil Pit WC96-8. This soil pit is located in a disturbed soil which corresponds to the Lower Stream Realignment Area.

Soil Profile - Disturbed - 0 to 25 inches - light gray (10YR 7/2) extremely gravelly sandy loam, very light brown (10YR 7/4) moist; massive structure; soft, loose, non sticky, non plastic; few very fine pores; many fine roots; 11 percent fine gravels, 17 percent medium gravels, 21 percent coarse gravels, 8 percent pebbles, 23 percent stones, 13 percent boulders; abrupt irregular boundary.

Disturbed - 25 to 50 inches - grayish brown (10YR 5/2) gravelly loamy sand, brown to dark brown (10YR4/3) moist; massive structure; slightly hard, firm, slightly sticky, non plastic; few very fine pores; few fine roots; faint very few clay films; 4 percent fine gravels, 9 percent medium gravels, 13 percent coarse gravels, 7 percent pebbles, 16 percent stones, 18 percent boulders; abrupt irregular boundary.

Disturbed - 50 to 82 inches + - very pale brown (10YR 8/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive structure; loose, loose, non sticky, non plastic; few medium pores; few fine roots; 21 percent fine gravels, 16 percent medium gravels, 26 percent coarse gravels, 14 percent pebbles, 5 percent stones, 21 percent boulders.

Soil Pit WC96-9. This soil pit is also located in a disturbed soil corresponding to the Lower Stream Realignment and is found on an AML Reclamation Area. This site is located adjacent to soil pit 95WCT09.

Soil Profile - Disturbed - 0 to 18 inches - pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; massive structure; slightly hard, friable, slightly sticky, slightly plastic; common fine pores; common fine roots; 5 percent fine gravels, 7 percent medium gravels, 4 percent coarse gravels, 10 percent pebbles; abrupt irregular boundary.

Coal processing waste - 18 to 65 inches + - very dark gray (10YR 3/1) extremely gravelly sand, black (10YR 2/1) moist; single grain structure; loose, loose, non sticky, non plastic; few coarse roots; 31 percent fine gravels, 6 percent medium gravels.

Soil Pit WC96-10. This soil pit is located in on a disturbed soil in the Office Trailer Area and corresponds to an AML reclamation site. This location is in the same vicinity as soil pit 95WCT10.

Soil Profile - Disturbed - 0 to 17 inches - very pale brown (10YR 7/3) gravelly sandy loam, brown to dark brown (10YR 4/3) moist; massive structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine pores; common fine roots; 8 percent fine gravels, 7 percent medium gravels, 8 percent coarse gravels, 5 percent pebbles, 3 percent stones; abrupt smooth boundary.

Disturbed, coal processing waste - 17 to 65 inches + - very dark gray (10YR 3/1) gravelly sand, black (10YR 2/1) moist; single grain; loose, loose, non sticky, non plastic; few very fine pores; 12 percent fine gravels, 6 percent medium gravels.

Soil Pit WC96-11. This soils pit corresponds to the undisturbed Soil Mapping Unit 107 in the Rock Outcrop Area. This soil pit is adjacent to the site sampled with soil pit 95WCT13.

Soil Profile - A1 - 0 to 3 inches - light gray (10YR 7/2) gravelly sandy clay loam, brown (10YR 5/3) moist; weak subangular blocky structure; slightly hard, friable, sticky, plastic; few fine pores; few fine roots; common distinct clay films; common distinct clay films; 8 percent fine gravels, 12 percent medium gravels, 14 percent coarse gravels, 2 percent pebbles; clear smooth boundary.

C1 - 3 to 12 inches - pale brown (10YR 6/3) very gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; very weak subangular blocky structure; slightly hard, friable, sticky, plastic; few fine pores; few fine roots; faint very few clay films; 11 percent fine gravels, 9 percent medium gravels, 26 percent coarse gravels, 5 percent pebbles; abrupt smooth boundary.

C2 - 12 to 19 inches - pale brown (10YR 6/3) shall clay, brown to dark brown (10YR 4/3) moist; massive structure; very hard, extremely hard, sticky, plastic; few fine pores; few fine roots; 9 percent fine shale, 5 percent medium shale, 5 percent coarse shale.

R - 19 inches + - shale

Soil Pit WC96-12. This soils pit is located in the undisturbed soils found in Soils Mapping Unit 107 in the proposed Ventilation Fan area. This soil pit is in close proximity to soil pit 95WCT12.

Soil Profile - O - 1 inches - dead Juniper leaves.

A1 - 0 to 8 inches - light gray (10YR 7/1) bouldery sandy loam, reddish brown (2.5YR 5/3) moist; moderate medium subangular blocky structure; soft, friable, non sticky, non plastic; common fine pores; many fine roots; faint very fine clay films; 8 percent fine gravels, 6 percent medium gravels, 4 percent coarse gravels, 3 percent pebbles, 18 percent stones, 47 percent boulders; abrupt smooth boundary.

C1 - 8 to 34 inches - light brownish gray (10YR 6/2) extremely gravelly sandy loam, reddish brown (2.5YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very firm, non sticky, non plastic; few fine pores; few fine roots; 27 percent fine gravels, 31 percent medium gravels, 24 percent coarse gravels, 8 percent pebbles, 2 percent stones, 2 percent boulders; clear smooth boundary.

C2 - 34 to 50 inches - light gray (10YR 7/2) extremely gravelly sandy loam, reddish brown (2.5YR 5/4) moist; weak granular structure; hard, very firm, non sticky, non plastic; few fine pores; few fine roots; 14 percent fine gravels, 22 percent medium gravels, 27 percent coarse gravels, 11 percent pebbles, 5 percent stones, 6 percent boulders; gradual smooth boundary.

C3 - 50 to 68 inches + - white (10YR 8/2) bouldery sandy loam, pale brown (10YR 6/3) moist; very weak granular structure; hard, very firm, non sticky, non plastic; fine few pores; few fine roots; 8 percent fine gravels, 10 percent medium gravels, 10 percent coarse gravels, 12 percent pebbles; 13 percent stones, 18 percent boulders.

Summary - Undisturbed Soils

According to Table 4.2-1, Soil Recovery and Storage Plans, included in Section 4.2.1.2, General Soil Availability and Handling Requirements, a total of 6.7 acres of new disturbance will result from the proposed mining and related activities. When the proposed disturbance area is superimposed on the soils map, it can be calculated that 4.7 acres or 70.2 percent of the ne disturbance will occur on Soil Mapping Unit 107, the Shupert - Winetti Complex; 1.5 acres or 22.4 percent will be on Soil Type 121, the Travessilla - Rock Outcrop - Gerst Complex; and 0.5 acres or 7.4 percent will be on Soil

Type 72, Pathead - Curecanti Family Association. The originally projected impacts to Soils Mapping Unit 63 in the vicinity of the proposed mine water tank area will not occur because subsequent mapping of this site in 1996 indicated that all of the proposed disturbance in this area will involve previously disturbed areas.

Examination of the 1979 Soils Report in the PRCC Permit resulted in the conclusion that Backhoe Pit No. 4 was dug in a partially disturbed cut-slope associated with Soils Mapping Unit 107. Based upon this conclusion, it appears that these soils corresponding to the Winetti Soils Type. Based on evaluation of the 1996 soils pits, where four different pits (WC96-1, WC96-3, WC96-6, and WC96-12) were established in this same area, it can be concluded with certainty that this previous determination was correct. Soils Mapping Unit 107 contains two taxonomic soil series, the Shupert and Winetti soils. According to the 1988 SCS Soil Survey the greatest difference between these two soils is in their rock fragment content. Shupert soils contain 0 to 15 percent rock fragments while Winetti soils contain between 35 and 60 percent rock fragments. Since all of the four soil profiles contain greater than 15 percent rock fragments, these soils clearly correspond to the Winetti soil phase of this Soils Mapping Unit.

According to the USDA-SCS Soil Survey, the Winetti soils correspond to the Loamy Bottom ecological or range site. Forage production of this soil is reported to be 1,000, 1,500, and 2,000 pounds of air dry forage per acre for unfavorable, average, and favorable precipitation years, respectively. A comparison of the site conditions for the Willow Creek Mine area indicate that soils in Mapping Unit 121 correspond with the Travessilla series with major inclusions of Rock Outcrop. Vegetation in the Travessilla Soil Type corresponds to the Upland Very Steep Shallow Loam (Pinyon-Utah Juniper) woodland site. Potential production of wood products for this soil type are reported to be 1 to 2 cords of wood per acre with a forage production potential of 300, 500 and 700 pounds of air dry forage per acre for unfavorable, average, and favorable precipitation years, respectively. The soils in Mapping Unit 72 correspond to the Pathead - Curecanti Family Association. These soils occupy the undisturbed valley bottom areas along Willow Creek. According to the USDA-SCS Soils Survey descriptions, these soils belong to the Pathead soil phase of this Mapping Unit. Pathead soils correspond to the Mountain Valley Steep Loam (Salina Wildrye) range site. The potential forage production of this range site is reported as 1,000, 1,200, and 1,400 pounds of air dry forage per acre in unfavorable, average, and favorable precipitation years, respectively.

Other Relevant Soils Information and Evaluation Approach

In addition to collection and evaluation of field data and analysis results, the PRCC, BBC and CGCC permit documents were reviewed for any relevant soils information. All of these documents contain the results numerous soils testing efforts in the mine surface facilities area. Review of the OSM Technical Environmental

The relative suitability comparison, which compares the suitability of existing surficial soil materials to pre-disturbance soil materials rather than a numerical standard, assigns values of 1, 2, 3, and 4 to the respective suitability categories of good, fair, poor and unacceptable for each parameter contained in Table 2 of the UDOGM Topsoil/Overburden Guidelines.

3.1.2.4 Soil Availability and Suitability

In order to evaluate the availability of existing surficial soil materials to support future revegetation efforts for the proposed disturbance areas, soil mapping information has been correlated with the limits of proposed surface disturbance to quantify available soil removal and replacement volumes. Since soil removal/replacement are operations and reclamation functions, the soil volumetric analysis is presented in Sections 4.2 and 5.2 of this permit application document. Evaluation of reclamation suitability for potential growth media materials focuses on comparison of available soil analysis data as outlined in the preceding section with applicable soil suitability criteria as outlined in the UDOGM Topsoil/Overburden Guidelines. Evaluation of the suitability of all materials which could be utilized as potential growth media requires three separate evaluations. The first part of this evaluation focuses on the existing surficial materials in the proposed mine surface facilities disturbance area. The second part of the evaluation addresses suitability characteristics for the coal refuse materials which would be generated from the proposed mining operations based on analyses of overburden roof and floor materials. The final component of the evaluation involves characterization of the chemical and physical properties of potential mine development wastes based on analysis data for coal roof, floor and parting materials.

CPMC is not proposing to use coal or coal waste material as substitute topsoil material. Since the Willow Creek Mine area has been extensively disturbed in the past, there is coal waste material in many locations. This material has been covered in many locations by soil materials that are usable as growth medium. The growth medium has been demonstrated in this Permit Application to be suitable for reclamation use. In areas where coal waste material will be covered with growth medium, the demonstrations provided in this Permit Application show that reclamation objectives can be acheived with less than four feet of cover. Final topsoil replacement depths for reclamation will depend on the amount of growth medium CPMC is actually able to salvage. The following sections provide suitability comparisons for both relevant soils data from the general permit area and adjacent areas and site-specific soils data for the mine surface facilities disturbance area. Sources for the general vicinity data include the following:

- The 1984 Price River Coal Company (PRCC) Permit Application; Chapter 8 and specifically Figures 8-5 through 8-28, which summarize soil chemical and physical analysis results

- The Blackhawk Coal Company (BCC) Willow Creek Site Final Closure and Reclamation Plan; Chapter 3, Reclamation Plan - Sections 3.3 and Section 3.12; Chapter 5, Soils; and Exhibit 11, Soils Analysis Results.

- The February 1994 Castle Gate Coal Company (CGCC) Mine Permit Submittal; Chapter 8, Soil Resources, and specifically Table 8-3, Comparison of Chemical Analysis of Coal Refuse and Rock Waste in Hardscrabble Canyon at Goose Island, and Appendix 8-2, Soil Testing Results and Letters of Certification.

- The Andalex Resources Centennial Mine Permit Application.

The general soils data for the permit area and adjacent areas which included characterization of soils and coal related strata identical to those occurring in the permit area was supplemented by site-specific data collected from the mine surface facilities disturbance area. Unless otherwise noted, only that data generated using the laboratory methods outlined in Table 1, Analytical Methods for Baseline Soils Data of the UDOGM Topsoil/Overburden Guidelines, is addressed by the following evaluations.

As detailed in Table 4.2-1, Soil Recovery and Storage Plans, development of the Willow Creek Mine will result in a total of 55.8 acres of new soil disturbance. Of this total acreage, all but 6.7 acres (12.01 percent) have previously been disturbed by pre-SMCRA mining activities which resulted in disturbance of the soils originally present on these sites. This means that 78.99 percent of the area associated with the proposed mine development lacks materials defined as topsoil per R645-100 and as specifically addressed in R645-301-200.

On the 6.7 acres of unaffected soils which will be impacted by this action, soil removal operations will be conducted as outlined in R645-301-232. On the 49.1 acres (or 78.99 percent) of the site which have no diagnostic A or E horizon materials, however, removal of taxonomically defined "topsoil" material is impossible since the surficial materials do not correspond to the typical diagnostic soil horizons as defined in R645-100. Since the disturbed soils occur on the surface, which according to page 185 of the SCS Soil Survey Manual is one of the commonly accepted definitions of topsoil, these material can be considered topsoil. CPMC submits that since R645-314.100 specifically directs that this reference be used in conducting soil surveys, it is implied that this definition is acceptable. The previous UDOGM approvals to salvage disturbed soils from the AMI, coal refuse site and place these materials in the Willow Creek Mine topsoil stockpile provide further evidence to support the use of this interpretation. Both the reasonable interpretation of the regulations and cited references and previous UDOGM permitting precedents support the interpretation and concept of recovering disturbed soils as "topsoil". Consistent with this interpretation, CPMC is not proposing the use of topsoil substitute or supplement materials.

Soils Materials - The initial suitability comparisons presented in the BCC Willow Creek Site Final Closure and Reclamation Plan were used as the basis for the following discussions, with modification of the original discussion to incorporate all additional information collected subsequently. Each of the suitability parameters identified in Table 3.1-1, Overburden Evaluation for Vegetative Root Zone, of the UDOGM Topsoil/Overburden Guidelines is addressed separately. The following suitability discussions address the site-specific sampling data first, then compare the previously collected data for this area found in the original PRCC permit and the other existing published data sources for this area, and finally compare all existing available data with the published USDA-SCS soils suitability data for soil mapping units to be affected by this proposed action.

pH - Soil reaction characteristics for the undisturbed soils in the vicinity of the proposed disturbance areas of the Willow Creek Mine have been sampled in various areas. In the original PRCC Permit application, pages 8-10 to 8-18 contains the results of soil reaction testing conducted in 1979 as well as ten backhoe pits which

In-seam comparisons between the drillhole data and in-mine or refuse materials for specific coal seams result in some important conclusions. The drillhole SAR values for the D-Seam roof and floor materials were compared to lithologically identical roof and floor D-Seam materials obtained from in-mine sampling. The mean D-Seam SAR values for the drillhole data are 10.74 while those of the in-mine samples are 6.02. These mean values are statistically different at the 10 percent level. When the identical comparison is made using the A-Seam roof and floor materials, the mean SAR value from the drillhole data is 11.70, while that of the in-mine samples is 2.24. Due to the smaller sample size these values are not significantly different. When the roof and floor materials from the K-Seam are compared, an average SAR value of 28.91 is obtained from the drillhole samples while a mean SAR value of K-Seam refuse materials obtained from the AMR site is 1.25.

Another important comparison is that of SAR values between different drillholes. Drillhole 94-33-1 yields an average SAR value of 25.02, drillhole 94-31-1 has an average SAR value of 10.79, drillhole 94-12-1 has an average SAR value of 10.52 and drillhole 94-5-1 has an average SAR value of only 3.03. Since these holes essentially intercepted the same geologic strata they should have similar SAR values. A statistical analysis of these values reveal that drillhole 94-33-1 has significantly higher SAR values than every other drillhole with the exception of drillhole 94-31-1. These comparisons suggest a possible contamination during drilling. Discussions with the CPMC geologist who supervised this drilling effort and a careful examination of the Daily Drilling Reports maintained by the drillers confirms that bentonitic mud, soap, polymer and calcium chloride was used in drilling drillhole 94-33-1. Drilling contamination provides a reasonable explanation for the excessively high SAR values associated with this hole and help to explain why the in-mine samples of the identical strata yielded significantly lower SAR values.

The conclusions based on these comparisons are that due to contamination of the drillhole samples or their reduced state, the SAR values obtained from drillhole samples are completely dissimilar to analysis results for corresponding materials from the same lithological units obtained from in-mine sampling or from refuse materials. This comparison suggests that the potentially suspect SAR values obtained from the geochemical testing program are completely inconsistent with other sampling efforts and that the actual potential for elevated SAR values in the refuse materials which will be generated from these materials is much lower than would be suggested by the analysis results. A careful examination of all of the available data suggests there is actually very little potential for sodicity in the coal refuse or waste materials.

Selenium (Se) - Water soluble Se content of undisturbed soils in the Willow Creek Mine Facilities Area ranged from < 0.005 to a maximum value of 0.010 mg/kg with a mean value of 0.0076 mg/kg. For the disturbed soils sampled in the 1995 sampling effort the water soluble Se content ranged from < 0.005 to 0.016 mg/kg with a mean value of 0.0084 mg/kg. Based on the UDOGM Suitability Guidelines, all of the undisturbed and disturbed soils sampled would possess a "good" suitability with respect to water soluble Se. Given the close correlation of elevated Se levels with salinity, it is safe to assume that the undisturbed soils possess Se values below the UDOGM suspect value of 0.1 mg/kg. The USDA-SCS Soils Survey does not report Se concentrations for area soils.

Disturbed soils sampled in 1988 for the BCC were found to have Se values ranging from -0.01 to 0.03 mg/kg with a mean of 0.017 mg/kg water soluble selenium. The 1989 BCC sediment samples were found to have Se values ranging from -0.01 to 0.20mg/kg with a mean value of 0.07 mg/kg. The selenium content for samples from the 1990 sampling of disturbed soils in the vicinity of the CGCC Preparation Plant area was reported to be to less than 0.01 ppm.

A single sample of D-Seam refuse material sampled in the PRCC Permit was reported to have an Se value of 0.002 mg/l. Analysis of the two K-Seam refuse samples from the Willow Creek AMR site resulted in selenium values of 0.03 and 0.02 mg/kg respectively. Se content of 41 refuse samples from the Schoolhouse Canyon refuse pile sampled in 1990 resulted in measured Se concentrations ranging from a low of less than 0.01 to a high of 0.14 ppm with an average of 0.0334 ppm. Analysis of the two K-Seam refuse samples obtained from the AMR site on Willow Creek resulted in Se values ranging from 0.02 to 0.03 mg/kg with an average value of 0.025 mg/kg.

Two roof and floor material samples reported in the PRCC Permit for the D-Seam had Se values of 0.003 ppm. Three A-Seam samples of roof and floor materials from the Centennial Mine were found to have Se values ranging from < 0.02 to 0.03 mg/kg with a mean value of 0.022 mg/kg. Se values obtained from the 1994

Where disturbed soils or other surficial materials are to be recovered and utilized as recovery depths will range from a minimum of 12 inches to a maximum of approximately 18 inches dependent on the topographic configuration of the recovery area and site specific material conditions. Generally, maximum recovery depths will be achieved on relatively flat or gently sloping areas where rock content, presence of coally materials, or natural obstacles are not limiting factors relative to full recovery. To the extent operationally feasible, zones or areas with any significant coal or coal refuse content will be avoided during soil material recovery operations and any coally significant deposits or accumulation will be excavated and the coally materials disposed of in the Schoolhouse Canyon Refuse Pile.

Soil material recovery areas and volumes for proposed mining and related surface disturbance are summarized by Table 4.2-1, Soil Recovery and Storage Plans and supporting documentation is provided by Table 4.2-1A, Justification for Soil Salvage Assumptions. This summary includes soil material volumes for both proposed future recovery operations and the existing material stockpiles which currently exist in the Crandall Canyon, Gravel Canyon, and Schoolhouse Canyon areas. The soil removal thicknesses and volumes summarized in Table 4.2-1 are estimates based on extensive field sampling of both disturbed and undisturbed soils in the proposed surface disturbance area. Actual recovery depths, and therefore volumes, may vary dependent on site-specific conditions and practical operating limitations. In order to assure that all operationally recoverable soil material is removed and stockpiled for later reclamation use, soil recovery operations will be supervised and monitored by a qualified and experienced reclamation specialist/soil scientist. Actual soil recovery depths and volumes will be documented and any site-specific limitations on soil recovery will be noted and described. Following completion of soil removal operations, a narrative description of soil recovery operations along with appropriate supporting documentation will be prepared and incorporated into the next Annual Reclamation Monitoring Report for submittal to UDOGM. Any variations between actual and projected soil recovery depths and volumes (as outlined by Table 4.2-1) will be identified and explained.

CPMC will remove all available soil material to a maximum depth of 3 feet or until highly consolidated, excessive coarse fragment content, or clayey materials are encountered. Both CPMC and UDOGM acknowledge that soil removal operations will bedependent on the topographic configuration of the recovery area and site specific conditions encountered. In order, therefore, to assure compliance with this permit commitment, CPMC will commit to supervision of all topsoil salvage operations by an experienced reclamation specialist/soil scientist who will assure that all available soil materials are removed prior to any mining-related disturbance. The results of the soil removal operations will then be reported in the Annual Reclamation Monitoring Report which will contain a written narrative documenting actual soil recovery thicknesses and volumes and comparing actual recovery versus projected recovery (as outlined by Table 4.2-1). For any areas where either less or more soil material is recovered than originally projected, the narrative will address the reasons for any soil recovery limitations and associated soil losses or increases in recoverable soil depths.

4.2.2.2 Soil Suitability and Testing

Given the lack of available natural soils and CPMC's resultant plans to recover disturbed soils for use as soil material, CPMC is relying primarily on the baseline soil sampling information presented in Section 3.1.2.4, Soil Availability and Suitability, to establish the relative suitability of disturbed soils as the best material available in the proposed disturbance area to support revegetation efforts. Based on the available soils sampling and testing information, which included undisturbed and disturbed soil and coal refuse materials, the following summarizes the overall suitability of disturbed soils as soil material based on the UDOGM Topsoil/Overburden Guidelines:

Parameter	Undisturbed Soils	Disturbed Soils
pH	Good to fair	Good
EC	Good to fair	Good to fair

SP	Good	Good
Texture	Good to unacceptable	Good to unacceptable
SAR	Good to fair	Good to fair
Selenium	Good	Good
Boron	Good	Good
AB Pot.	Good	Good
AWC	Good to fair	Good to fair

As documented by this summary of all existing available soil sampling data, the disturbed soil materials are an equivalent or better vegetative growth media than natural undisturbed soils in this area based on the UDOGM suitability criteria. The only parameter of concern relative to suitability of the disturbed soils as soil material is texture. The designation of both disturbed and undisturbed soils as unacceptable relative to texture is a due to a high gravel or rock fragment content which is a direct reflection of natural geomorphic and soil development characteristics in this area. The rugged terrain and extensive rock outcrops result in significant mass wasting and colluvial deposition with the accompanying characteristic occurrence of a large percentage of boulders, rocks, and large rock fragments in essentially all surficial deposits. While this may be considered a limiting factor under the UDOGM Guidelines and may in fact limit maximum vegetation potentials, it does not appear to have had a significant adverse impact on natural vegetation communities in the area nor on the natural reinvasion of previously disturbed areas which have not been intentionally revegetated.

TABLE 4.2-1
SOIL RECOVERY AND STORAGE PLANS

Disturbance Area	Acreage	Soil/ Substitute Type	Average Thickness (in.)	Volume (cy)	Stockpile
Existing Gravel Canyon Stockpile (for reclamation of Schoolhouse Canyon Refuse Pile)	--	Soil	--	97,000	Gravel Canyon
Existing Crandall Canyon Stockpiles (for reclamation of lower Crandall Canyon facilities)	--	Soil	--	18,000	Crandall Canyon
Water Tank Area	1.0	Disturbed	NRS	--	--
Ventilation Fan Area	2.7 1.3	Disturbed Undisturbed	30 30	10,890 5,243	Mine Facilities Mine Facilities
Bridge and Entrance Road	1.2 0.1	Disturbed Riparian	12 --	1,900 --	Mine Facilities --
Upper Facilities Bench (Refuse Pile Area)	9.7	Reclaimed	16	21,200*	Mine Facilities
ROM Stockpile Area and Lower Facilities Areas	19.9 2.2	Disturbed Undisturbed	20 20	53,616 5,927	Mine Facilities Mine Facilities
Stream Realignment 1	0.5	Riparian	24	1,600	Direct Placement
Stream Realignment 2	1.0	Riparian	24	3,500	Direct Placement
Office Trailer and Rock Outcrop Area	2.9 6.8 2.5	Disturbed Reclaimed Undisturbed	12 14 12	4,679 12,799 4,033	-- Mine Facilities Mine Facilities
Tunnel Portal Areas	3.3 0.7	Disturbed Undisturbed	NRS NRS	-- --	-- --
Subtotals	31.0 6.7 1.6 16.5	Disturbed Undisturbed Riparian Reclaimed	15 12-30 24 15	72,254 15,203 5,100 34,913	Mine Facilities Mine Facilities Direct Placement Mine Facilities
Totals	55.8	--	--	127,470	Mine Facilities

Notes: NRS No recoverable soil or area will be disturbed

Total Stockpile Volumes: Gravel Canyon (97,000 cy)
Crandall Canyon (18,000 cy)
Willow Creek Mine Facilities (21,200* cy)

Proposed Additional Topsoil Removal: Willow Creek Mine Facilities (127,470 cy-21,200 cy = 106,270 cy)
For justification of recovery depths see Table 4.2-1A

TABLE 4.2-1A
JUSTIFICATION FOR SOIL SALVAGE ASSUMPTIONS

Disturbance Area	Area	Volume (cy)	Justification for Soil Salvage Thickness and Volume
Existing Gravel Canyon Stockpile (for reclamation of Schoolhouse Canyon Refuse Pile)	--	97,000	The topsoil plan for the Gravel Canyon area was originally discussed in detail on pages 8-30 to 8-44 of the 1984 PRCC Permit. Approval from the Division was granted when this permit was approved.
Existing Crandall Canyon Stockpiles (for reclamation of lower Crandall Canyon facilities)	--	18,000	The topsoil plan for the Crandall Canyon Area was originally discussed in detail on pages 8-30 to 8-44 of the 1984 PRCC Permit. Approval from the Division was granted when this permit was approved.
Water Tank Area	1.0	NRS	As depicted on Map 4, all of the soil materials in this area have been disturbed by previous mining activities. Since only minimal disturbance is planned for this area which will not further reduce soil viability no soil salvage is proposed for this area.
Ventilation Fan Area	2.7 1.3	10,890 5,243	An estimated 30" of salvageable soil material exists on disturbed areas and undisturbed areas on this site. These thicknesses were obtained from Soils Pits WC96-1, WC96-2, WC96-12; and 96WCT12 and the soil profile on the bank of Willow Creek which indicates that approximately 30" of soil can be recovered. Recover in separate lifts would be very difficult.
Bridge and Entrance Road	1.2 0.1	1,900 --	An estimated 12" of salvageable disturbed soil exists at this site. Removal of the riparian soils which will be disturbed by the construction of the bridge abutments would be extremely difficult since they occur at the bottom of a drainage approximately 35 feet deep and no reasonable means exists to remove these soils without adversely impacting Willow Creek. The soils along the east and west streambank have significant amounts of waste coal material mixed into the soils limiting the value of these soil materials.
Upper Facilities Bench	9.7	21,200	Soil materials in this area were removed in the fall of 1995. This volume represents the actual volume of material removed and placed into the mine facilities stockpile. Soils pits 94-12-1R, 94-12-2R; 95WCT01, and 95WCT02 were completed in this area.

TABLE 4.2-1A JUSTIFICATION FOR SOIL SALVAGE ASSUMPTIONS			
Disturbance Area	**Area**	**Volume (cy)**	**Justification for Soil Salvage Thickness and Volume**
ROM Stockpile and Lower Facilities Area	19.9 2.2	53,616 5,927	15" of soil material will be removed from the disturbed area and 8 inches from undisturbed areas. Soil Pits; 4 HC, 5 HC; ACZ-1989-1, 1A, 1B, 2, 2A, 2B, 3, 3A, 3B, 4A, 4B, SD1, SD2; 95WCT04, 95WCT05, 95WCT06, 95WCT07, 95WCT11; and WC96-3, WC96-4, WC96-5, WC96-6 were completed in this area.
Stream Realignment #1	0.5	1,600	24" of soil material will be salvaged in this area. Justification for this thickness is based on Soils Pits WC-5, WC-6, WC-7, WC-10, WC-11, WC-12; and WC96-7 which were completed in this area.
Stream Realignment #2	1.0	3,500	24" of soil material will be salvaged in this area. Justification for these thicknesses is based on Soils Pits WC-1, WC-2, WC-3, WC-4, WC-5, WC-6, WC-7, WC-8, WC-9; WC96-10, and WC96-11 completed in this area.
Office Trailor and Rock Outcrop Area	2.9 6.8 2.5	5,848 13,713 4,033	12" of soil material will removed from the undisturbed areas and 15" from the disturbed and AML reclamation area. Justification for these removal depths are based upon Soils Pits 95WCT09, 95WCT10, 95WCT13; WC96-10, and WC96-11 as well as observations made during the mapping and sampling of the vegetation on this site.
Tunnel Portal Area	3.3 0.7	NRS NRS	Both the east and west portal areas are located in vertical rock ledges and contain no measurable topsoil. Recovery of these materials is impracticable.

5.2.2 Soil Replacement Plans and Practices

Generally, soil replacement practices will be essentially the same for all surface disturbance areas and will not vary between soil replacement and soil substitute replacement. Typical soil replacement activities will involve:

- Preparation of the regraded surface
- Soil recovery from stockpile, placement, and grading
- Soil sampling, testing, and evaluation
- Mitigation of any suitability concerns and application of soil amendments, if required
- Soil stabilization measures

The following sections describe these specific soil and substitute replacement, testing, and stabilization practices.

5.2.2.1 Timing of Soil Replacement Activities

Generally, soil replacement and revegetation efforts will be coordinated so that soil materials are revegetated as soon as practically possible following placement. Normally this will involve placement of soil and immediate reseeding at the end of the operating field season in late fall. This approach allows the seed to "winter over" with germination in the spring when soil moisture conditions are elevated due to winter snow accumulations and spring melt.

5.2.2.2 Soil Replacement Practices

Following completion of final backfilling, grading, and drainage reestablishment for surface disturbance areas, soil materials will be recovered from the previously established stockpiles and will be hauled, placed, and spread on the regraded areas. As noted in Section 5.4.2.3, Reclamation Practices, the regraded surface will be left in a roughened condition to control runoff, provide a good bond with the replaced soil/substitute material, and promote moisture infiltration. Prior to soil replacement, regraded surfaces will be deep ripped to alleviate compaction and enhance soil bonding and finely chopped native hay from the current years crop will be applied to increase organic content, provide soil biota, and increase infiltration and moisture holding capacity.

Typically either tractor-scrapers or wheel loaders will be utilized to recover and load the materials from stockpile and either scrapers or trucks will be utilized to haul and place the material. Where tractor scrapers are utilized for recovery, haulage, and placement, the soil material will be spread in thin horizontal lifts as it is placed. If trucks are used for haulage, a tracked dozer or motor grader will be used to spread and distribute the soil material at a relatively uniform thickness. Replacement thickness will generally be controlled visually by the equipment operators but will also be checked and monitored for general consistency by the CPMC operations supervisor responsible for reclamation activities. Based on the available existing soil stockpile volumes and the soil recovery plans as outlined in Section 4.2, Soil Handling Plans, the following summarizes approximate soil replacement thicknesses for the general disturbance areas:

Willow Creek Surface Facilities Area - (127,500 cy x 27)/(56 ac x 43,560) = 17 inches
Castle Gate Prep. Plant and Loadout Areas - (Existing surficial materials)
Schoolhouse Canyon Refuse Pile - (97,000 cy x 27)/(2.6 ac x 43,560) = 24 inches
Crandall Canyon Area - (18,000 cy, Replacement depth is variable)

Details relative to soil replacement plans and practices are provided for specific disturbance areas as follows; Castle Gate Preparation Plant, Loadout, and Schoolhouse Canyon Refuse pile - Exhibit 19, Castle Gate Information (Section 3.4); Crandall Canyon - Exhibit 20, Crandall Canyon Information (Section 3.7-5(5)); Willow Creek Facilities Area - Section 5.4.2, Reclamation Plans and Practices.

Soil placement thickness will vary somewhat dependent on terrain and practical operating constraints, however, every effort will be made to establish a uniform, stable soil layer on all regraded areas. To the extent operationally feasible, efforts will be made during placement to limit equipment traffic in order to minimize compaction. On gently sloping areas soil will be replaced parallel to the natural land contour to establish linear contour line features which help to minimize erosion potential.