Summary of Deficiencies
By Chapter

Legal Chapter 1

R645-301-121.200, The Permittee must update section 526.116 of the PAP to state that in addition to the office complex and sediment pond the topsoil storage area and security building are also within 100 feet of County Road 126. 106

Section 526.116, Page 41 in Chapter 5 was revised to read: "The only coal mining and reclamation operations that are planed within 100 feet of the County Road are office complex, sediment pond, topsoil pile, and security shack."

SOILS Chapter 2

R645-301-130, Include in PAP the qualifications of the consulting soil scientist. 28

Qualifications for Dan Larsen, soil scientist, have been added to Appendix 1-5.

R645-301-222.400, The Permittee should provide baseline soils analyses of total nitrogen and available phosphorus for the six soil map units. 56

Soil samples for total nitrogen, available phosphorous, and Potassium for the six soil map units were taken on May 1, 2003. The results have been added to Appendix 2-3.

R645-301-234.230, Application of cryptogams to the surface of the topsoil pile should include a test of the proposed method of application of cryptogams during final reclamation. i.e. crushing and sieving the soil and cryptogam colonies and adding them to the hydrospray of mulch. 128

Section 232.100 has been revised to read "Prior to topsoil removal a five gallon bucket of biocryptic soil will be recovered and stored in a cool dry place for redistribution on the topsoil pile."

Section 234.230 Up to 2 ounces of the sifted soil crusts will be added to each load of Wood fiber mulch applied to the top soil pile.

The statement in Section 231.400 "The top 0-4 inches of soil along with the vegetation will be set aside to be applied to the surface of the topsoil pile." has been removed.

R645-301-243, The PAP should indicate that sampling of the stored topsoil will be from the middle and bottom of the stockpile. 168

Text has been added to Section 243 to state: "Attempts will be made to sample the top, middle and bottom of the topsoil pile."

R645-301-553.252, The Permittee must explain what contaminants will be monitored in the stored subsoil and how the monitoring will take place. 128

Text in Section 232.500 has been revised to read "In the unlikely event visual observations indicate that subsoil has become contaminated from oil and grease, salts, or other visual contaminates, the contaminated soil will be disposed of at a sanitary landfill site (probably East Carbon).

R645-301-121-200,

(1) Plate 5-7A-2 refers to Plate 2-4 which does not exist

Plate 2-4 has been added.

(2) Section 232.500, page 13 of Chapter 2, the Salvageable Soils Map in Appendix A-2 is more easily found if cited as Appendix A-2 of Appendix 2-3. 128

Text in Section 232.500 has been revised to state "Salvageable Soils Map Appendix A-2 of Appendix 2-3."

BIOLOGY Chapter 3

R645-301-121, Present raptor information clearly. The Permittee must

(1) Update information on peregrine falcon

Since the original permit submittal the peregrine falcon has been removed from the T&E list Section 322.200 has been revised removing the reference to peregrine falcon.

(2) Provide a current and complete list of TE species

The current and updated TE species list for Emery County provided by USFW can be found in Appendix 3-3.

(3) Provide accurate information pertaining to raptor surveys: Correct nest number on the raptor map in Appendix 3-5 and map - Plate 3-1; Add 2002 survey date

Text in Section 322.220 has been revised to read: "Spring raptor inventories were initiated in the spring of 1998 and have been completed annually since 1998. The results of the annual raptor surveys are included in Appendix 3-5."

Plate 3-1 has been revised removing the reference to nest 820.

(4) Remove unrelated entries in Appendix 3-5: 1980 DWR letter on raptors; 1990 Letters; 1990 Raptor survey. 51

The 1980 DWR letter on raptors, the 1990 letters, and the 1990 raptor survey has been removed from Appendix 3-5.

R645-301-121, Provide the following changes to make the revegetation success standards of this PAP more clear and concise:

(1) Reclassify fringed sage as a shrub rather than a forb (Table 3.4/3.5)

Table 3.4/3.5 (Interim and Final Reclamation Seed Mix) has been revised to reflect the new vegetation survey.

(2) Remove the comment concerning species and ratios will be determined by BLM and DWR. (General Requirements)

Text in Appendix 5-8 has been revised. The comment concerning species and ratios of the supplemental stocking to be determined by BLM and DWR has been removed. The following statement has been added. "The species and numbers will be determined from the evaluation of the ocular estimates. The operator will follow R645-301-357.311."

(3) Remove or provide citation for comments concerning Russian Thistle

Comments relating to Russian Thistle has been removed from Section 357.320.

(4) Clarify the repeated paragraph from section 357.321 through 357.324

Sections 357.321 through 357.324 have been clarified.

(5) Clarify section 357.332 on animal control

Section 357.332 has been revised to read "Mine personnel do not anticipate a need to implement control measures for small mammals or insects. However, in the unlikely event that control is necessary, R645-357.332 will be followed. The Division must approved animal control methods sited in R645-357.332"

(6) Clarify sections 356.231-.233

Sections 356.231-233 have been clarified.

(7) Remove the letter in Appendix 3-3

The current and updated TE species list for Emery County provided by USFW can be found in Appendix 3-3.

(8) Clarify all the misguided references in this PAP. See specifics in the table provided in the Standards for Success section of this TA. 175

All identified misguided references in the PAP have been clarified.

R645-301-121, The PAP (Section [Sec.] R6450301-320) infers that all vegetation resources of the entire Lila extension are included. Information needed to predict the potential for reclamation, however, is either missing or is not presented clearly. To present required information more clearly, the Permittee should:

(1) Omit Appendix 3-1 and 3-2 because: Information does not directly and entirely relate to permit area; Reports have missing pages, plates, appendices, and tables; Information on community types in text does not directly match those shown on Plate 3-2; Reports do not include exact locations of survey sites; Reports do not cover riparian areas; Data is outdated

Old Appendix 3-1 has been removed from the Lila Canyon Extension to the

Horse Canyon Plan. However, the information from Appendix 3-1 remains in the Horse Canyon MRP. Appendix 3-2 has been removed from the Lila Canyon Extension to the Horse Canyon Plan. A new Vegetation inventory has been completed and is included as a new Appendix 3-1.

(2) Clarify Appendix 3-2A (unless omitted): Clarify appendix numbers to read 3-2, 3-2A_1 , and 3-2A_2; Clarify cover sheets; 3-2A_1: Provide survey dates of the vegetation inventory; 3-2A_1: Provide accurate and corresponding representations of the plant communities in the Vegetation map (Plate 3-2), Figure 1 of Appendix 3-2A, and Tables 1 and 2; 3-2A_1: Document whether or not *Chrysothamnus viscidiflorus* is found in the disturbed and reference areas; 3-2A_1: Describe why the map (Fig. 1) shows over 50 survey sites, yet text describes only 15; 3-2A_1: Remove inconsistencies between Tables 1 and 2 and text; 3-2A_1: Correct unknown or misspelled plant species; 3-2A_2: Describe the value for the percent cover survey of the pinyon juniper community; 3-2A_2: Justify the reason why surveying in November for percent cover is acceptable

Appendix 3-2A has been omitted from the PAP. A new Vegetation inventory has been completed and is included as a new Appendix 3-1.

(3) Clarify Appendix 3-4: Provide survey site locations for the TE and productivity studies (Appendices 3-4 and 3-7);

Provide correct year in the August 2002 survey submittal; The year is correct in the August 2002 survey. The correct year is 1999, in 1998 only a raptor survey was done.

Provide missing 1999 TE survey mentioned in May 2002 study; The cover page of the 1999 survey had an incorrect date of 1998.

Provide survey site locations for the productivity studies (App. 3-7). 42

The letter dated March 1, 2000 from George Cook located in Appendix 3-7 (moved to 3-2) describes the site locations for the productivity estimates. As per May 29th Meeting with DOGM, Jerriann Ernstsen said letter was adequate.

R645-301-121.200, Clarify the inconsistency between the paragraph on page 9 and habitat representation on Plate 3-1. 124

Both the paragraph on page 9 and the habitat representation on Plate 3-1 are correct. There is no inconsistency.

R645-301-121.200, Remove the incorrect and contradictory statement "Considering the low population density and the abundance of suitable similar habitat this impact appears to be minuscule" (pg. 9). 124

The permittee does not believe this statement is either incorrect or contradictory. The statement has not been removed. As per May 29th Meeting with DOGM, the word minuscule was changed to slight.

R645-301-130, The PAP must contain the names, organizations, and qualifications of all contributors

who conducted the following surveys

(1) Vegetation Study Horse Canyon; App 3-1 (Unless omitted - see Vegetation Resource Information R645-301-121.100)

Appendix 3-1 has been removed and replaced with a new Appendix 3-1, a new vegetation survey.

(2) Vegetation Study South Lease Area; Kaiser Steel; App 3-2 1 (Unless omitted - see Vegetation Resource Information R645-301-121.100)

Appendix 3-2 has been removed and replaced with a new Appendix 3-1, a new vegetation survey.

(3) TE Inventories; App 3-4 (#1-4, and #6; numbers refer to table above)

Regulations require names of persons OR organizations that collect data and technical analysis will be planned by or under the direct supervision of a professional qualified in the subject to be analyzed. Numbers 1-4 and 6 were all completed by EIS and were either planned or directly supervised by professional EIS employees. As per May 29th Meeting with DOGM, a letter documenting who did what in the inventories has been included in Appendix 3-4.

(4) MSO flyover survey

The EIS flyover survey was never completed and will not be performed as originally planned. DR. David Willey did perform a flyover survey and included it in his report "Assessing The Impact of Scale on the Performance of GIS Habitat Models For Mexican Spotted Owls in Utah." Dr. Willey refereed to the Lila Canyon area as "Dry Wash". Dr. Willey report has been added to Appendix 3-4.

(5) Raptor Surveys; App 3-5

Are under the direction and control of the UDWR. As per May 29th Meeting with DOGM, it was agreed that requiring qualifications and listing of participants in other agencies inventories, was not going to be required by DOGM.

(6) UDWR Wildlife Report; App 3-6

This report is an official Publication No. 90-11 prepared by Utah Division of Wildlife Resources. As per May 29th Meeting with DOGM, it was agreed that requiring qualifications and listing of participants in other agencies inventories, was not going to be required by DOGM.

(7) Productivity Within And Around The Permit Area; App 3-7. 28

George Cooks resume has been added to Appendix 1-5.

R645-301-321.100, Conduct a new vegetation survey. A qualified person in the field of plant taxonomy and quantitative ecology must conduct the survey and analysis according to the Division's Vegetation Information Guidelines. Perform vegetation sampling during a time of greatest

species diversity, preferably in late spring. Provide raw data sheets. Clearly define the disturbed and reference area communities. Include biologic soil crusts in the vegetation sampling. Before sampling, the Division must review more thoroughly the proposed location of the reference area. 43

A new baseline vegetation inventory was completed in Spring of 2003 by Dr. King from the College of Easter Utah. Table 3.4/3.5 (Interim and Final Reclamation Seed Mix) has been revised to reflect the new vegetation survey.

R645-301-322(.000-.200), Address how the mining effects to Range Creek will affect the southwestern willow flycatcher at Range Creek. 52

The hydrology section address the effects to Range Creek which concludes no effect.

R645-301-322(.000-.200), Provide the following:

(1) Habitat impact assessments for the bald eagle

Occurrence surveys and habitat impact assessments can be found in Appendix 3-4 and 3-5. As per phone conversation on June 24th with Jerriann Ernstsen, this maybe an oversight by DOGM. Jerriann will get back with the operator. This response should be OK as per phone conversation on 9/303 Jerriann .

(2) Quantitative water consumption impact assessment for bonytail chub, Colorado pikeminnow, Humpback chub, and razorback sucker. (R645-301-333; see below)

In the TA review DOGM noted the discussion on water discharge in section 332, but did not review the actual consumption calculations in the PHC. Discussions with Dave Darby and Jerriann determined that this deficiency was neither one of theirs. It appears that DOGM missed the calculations in table 6 of the PHC and this should not have been a deficiency. However comments directed at the USFWS concerns have been added to the PHC starting on page 16.

(3) Occurrence surveys and habitat impact assessments for the San Rafael cactus, Creutzfeldt cryptantha, and Canyon sweetvetch

Occurrence surveys fro the San Rafael cactus (Despain footcactus were completed in 1999 and 2002. The April 2002 survey did not reveal any Creutzfeldt plants which are a BLM sensitive species. The biological assessment for the San Rafael cactus can be found in Appendix 3-4. As per phone conversation on June 24th Jerriann Ernstsen will look at the 2000 BA to see if it is adequate. This response should be OK as per phone conversation on 9/303 Jerriann .

Canyon sweetvetch is not listed on the T&E list. Occurrence surveys and habitat impact assessments are not required by regulation. As per phone conversation on June 24th with Jerriann will check with Susan. This response should be OK as per phone conversation on 9/303 Jerriann .

(4) Suitable habitat assessments for the TE and sensitive plant species. 52

Habitat assessments for all T&E and sensitive plant species is included in Appendix 3-4.

As per phone conversation on June 24th Jerriann will look at the 2000 BA to see if it is adequate. This response should be OK as per phone conversation on 9/303 Jerriann .

R645-301-322, Append the modified plan in Appendix 3-4 to include the Division's requests for conducting and reporting the MSO surveys. Conduct occurrence surveys, habitat impact assessments, and suitable habitat assessment. 51

The MSO survey plan, found in Appendix 3-4, implementing the management actions recommended by Dr. Willey has been modified. All areas within ½ mile of the permit boundary was surveyed by Dr. Willey and the 1997 and 2000 models were evaluated. Areas outside projected mining areas and areas where the depth of mining is so deep as not to cause any surface effects will not be inventoried.

R645-301-322, Describe the riparian habitat, and amphibian presence or the potential for amphibian occurrences for all springs and seeps. Submit all results and summary in the PAP. 52

The statement "The permittee has never observed amphibians at or near this location." has been added to L-16-Gand L-17-G in Appendix 7-8. The statement is now present on all general descriptions of all water monitoring locations. As per phone conversation on June 24th Jerriann will check with Susan but should be adequate. This response should be OK as per phone conversation on 9/303 Jerriann .

R645-301-322.100, The entire area that may be affected and adjacent areas must be surveyed for raptors. The southwest section of the permit area appears as suitable cliff habitat. This area is outside the subsidence buffer zone but within the permit area and immediately adjacent to the buffer zone. Other rock outcrops are within the permit area and require surveys. Conduct a thorough survey during the 2003 (and subsequent-years) raptor survey of the southwest quadrants as well as other rock outcrops within and near the permit area. 51

DWR was informed about the concerns of DOGM. The 2003 raptor survey is included in Appendix 3-5. The operator is only required to complete raptor surveys two years prior to potential disturbance and not on an annual basis.

R645-301-323.400, The PAP must describe all plant communities, including those occurring near seeps and springs. 43

Appendix 7-8 has a description of all water monitoring locations. Text has been added in section 323.400 giving a brief description of the vegetation associated with each water monitoring location.

R645-301-323, Provide accurate vegetation map(s):

(1) Include all plant communities (shale and escarpments are not plant communities)

Shale and escarpment notations have been removed.

(2) Show accurate dimensions and aspects of the communities

The current map has accurate dimensions and aspects of the communities.

(3) Detail areas around springs and seeps

Details around springs and seeps are now shown on Plate 3-2 as well as Appendix 7-8.

(4) Include the reference site

A new baseline vegetation inventory was completed in Spring of 2003. A new detailed map of the vegetation contained in the proposed disturbed area is included in Appendix 3-1.

(5) Submit two vegetation maps – one that shows the entire permit B area and one that details the reference and disturbed areas. 43

Plate 3-2 shows the entire permit area B. A new detailed map of the vegetation contained in the proposed disturbed and reference areas is included in Appendix 3-1.

R645-301-323, Provide a brief description characterizing the resources that occur in or near the permit area for each of spring. 43

A brief descriptions characterizing the resource that occur in or near the permit area for each spring can be found in Appendix 7-8.

R645-301-332, The effects of subsidence on the seeps found in the unnamed canyon in the southwestern corner of the permit area must be addressed. As a valuable wildlife resource, these seeps must be protected from loss. Other effects of subsidence must also be discussed particularly in areas with less than 1000 feet of cover. The effects to snakes and other wildlife species must be addressed. 124

Section 525-120 addresses effects of subsidence on the seeps found in the unnamed canyon in the southwestern corner of the permit area. Section 525-120 states "DWR and BLM wildlife Biologist in consultation with the Division, have determined that any loss of snake dens to subsidence would be random and a minor impact to the population of snakes. As per phone conversation on 8/15/02 Jerriann to get with Susan and get back with me. This response should be OK as per phone conversation on 9/303 Jerriann .

Appendix 7-8 address effects to springs as a result of subsidence. As per phone conversation on 8/15/033, Jerriann stated that if Dave determined a no hydrology effect on the springs that this is a non issue.

R645-301-333, Address the potential for increased selenium and perhaps commit to monitor at the point of discharge into the Price River should waters ever reach that point. 123

If the modeling shows that mine discharge will reach the Price River the operator will commit to monitor at the point of discharge. As per phone conversation on 8/15/03 Jerriann said this commitment should be OK.

R645-301-333, The PAP must include a quantitative water consumption impact assessment for the endangered fish of the Upper Colorado River Basin and methods of minimizing those effects.123

In the TA review DOGM noted the discussion on water discharge in section 332, but did not review the actual consumption calculations in the PHC., Discussions with Dave Darby and

Jerriann determined that this deficiency was neither one of theirs. It appears that DOGM missed the calculations in table 6 of the PHC and this should not have been a deficiency. However comments directed at the USFWS concerns have been added to the PHC starting on page 16.

R645-301-341.210; R353; R356.210; R356.231, Provide the tentative seedling species names, planting rate, and ratios. 175

A new baseline vegetation inventory was completed in Spring of 2003 by Dr. King from the College of Easter Utah. Table 3.4/3.5 (Interim and Final Reclamation Seed Mix) has been revised to reflect the new vegetation survey.

R645-301-341.300, Adjust the warm and cool season species test plot to include four "quadrants" instead of two. 175

Section 354 has been revised to reflect a four square test area.

R645-301-342.230; R353.120, The final reclamation seed mixture must be modified to replace the diversity found on site. 176

A new baseline vegetation inventory was completed in Spring of 2003 by Dr. King from the College of Easter Utah. Table 3.4/3.5 (Interim and Final Reclamation Seed Mix) has been revised to reflect the new vegetation survey.

R645-301-356.231, Remove "1500 woody plant per acre" statements concerning establishment. The Division must consult with area agencies and authorize the stocking number. 176

The operator was required by the Division in previous reviews to put in a Woody plant density, realizing that the Division has final say. Section R645-301-356.231 has been revised to read "Woody plant density for the entire area will be established with 1,500 plants per acre, unless the Divisions consultation with area agencies determines a different density."

R645-301-358.100, Discuss that the environmental coordinator must first report a finding of a TE species to the Division before any actions are taken. 176

Section 358.100 has been revised to state "The environmental coordinator will confirm, if possible, the identification, notify the Division, and then take what ever actions are necessary to safeguard both the species and it's habitat."

R645-301-358.400, Address concerns listed in this regulation about habitat, specifically the springs.176

These two springs, L-16-G and L-17-G, were addressed in the last submittal in Appendix 7-8. They are below the coal seam outside of the limit of subsidence and well off the permit area. As per phone conversation on 8/15/033, Jerriann stated that if Dave determined a no hydrology effect on the springs that this is a non issue.

R645-301-356.100, Consult with the Division to relocate the reference area prior to any surface

disturbance. 176

A new baseline vegetation inventory was completed in Spring of 2003 by Dr. King from the College of Easter Utah. The Division was on site to help identify and concur with the location of the new reference area. The reference area was relocated approximately 300 feet south of the original site.

R645-301-358.400; R521.141; R526.222, Protect the drainage immediately south of the disturbed area from construction. This drainage is used by wildlife as a transportation corridor. It is not obvious to the Division that the mine needs to disturb this area when there are islands of undisturbed areas on the pediment. 124

The operator again evaluated the location of the sediment pond and determined that the proposed location was the most logical taking into consideration both the engineering and environmental aspects.

LAND USE & AIR QUALITY Chapter 4

R645-301-116.100, The Permittee must clearly state the anticipated number of acres of surface disturbance to be affected during the life of the mine and statements of the number of disturbed acres must be consistent within the PAP. 33

Section 542.200 has been revised to state"The surface facility area comprises approximately 42.6 acres within the disturbed area boundary. The actual disturbance, pads, silos, coal processing structures, parking constitute a total of 25.3 acres.

Appendix 5-8 has been revised to state; "The Lila Canyon Mine constitutes approximately 42.6 acres within the disturbed area boundary. For the purpose of reclamation, the total area is divided into two units. The upper unit consists of the water treatment area and the portal pad. The lower unit consists of the majority of the facilities; bath house, parking, shop, and coal handling structures, (See Plate 5-2 Surface Facilities). In addition to the above, there is a spoil/refuse disposal area and a sediment pond. The actual disturbance, pads, silos, coal processing structures, parking constitute a total of 25..3 acres."

R645-301-121.200, Clarify the inconsistency between the EA and PAP documents concerning archaeological site 42EM2517 and provide supporting evidence in the form of official documentation for the PAP statement of non-eligibility. 35

The text in the PAP has been revised for site 42Em2517 to state; "The site does meet National Register Criteria for age, unique architecture, historic persons or events.

R645-301-411.140; R301-122, The Permittee must provide the following

(1) Miller (1991) archaeological survey, cited by the EA
Personal phone conversation with Blaine Miller on 08/13/03 determined that in 1991 there were two additional sites identified. The formal report cannot be located. However, the field notes have been included in Appendix 4-1 and the text in Section 411 has been revised adding the two points identified by Miller. In addition Plate 4-3 has been revised adding the two sites Miller identified.

(2) Southworth and Nielson (1986) archaeological survey, cited in the PAP Section 301-411-140, page 11. 35

Southworth and Nielson 1986 is already in Appendix 4-1 in the permit on file at the Division.

R645-301-411.143, Present, on Plate 4-3, all archaeological inventoried sites located on or near the permit area. 35

Plate 4-3 currently contains all know cultural sites included within the permit area and a one mile buffer zone outside the perimeter of the permit area. The EA does state that "seven archaeological sites are located in Little Park, above the mine's surface facilities." The permittee believes that the seven sites referred to are 42EM1335, 42EM1339, 42EM1337, 42EM1338, 42EM1121, 42EM2255, and 42EM2256, all of which are in little park, above the mine surface facilities and within the permit area or a one mile buffer zone. All seven sites are now shown on Plate 4-3.

ENGINEERING Chapter 5

R645-301-120, Clearly define and map (on Plate 4-1) all of the mining structures and the partial road (R645-301-121.200). 58

Section 411.200 has been revised removing the statement "Another partial road was constructed which leads up the left fork of the canyon to the coal outcrop, where the coal seam was exposed and where coal was mined. An old portal was used for ventilation at this location." There never was a road up the left fork of Lila Canyon. The outcrop referred to in the text was mined from underground, and is shown on Plate II-2 in the Horse Canyon Plan.

R645-301-358.510, Provide structural information and map layout of power poles and 52

Section 520 states "The power lines and power poles location and design will be determined by UP&L. Withing the disturbed area it is anticipated that a single pole shown on Plate 5-2 will be all that is required. Underground lines will be run where feasible. PacifiCorp will design and construct the power line from the distribution line to the Lila Canyon substation to the surface facility. A typical power pole design is shown in the BLM EA.

R645-301-521.190 and R645-301-121.200, The Permittee must designate one map as the official disturbed area boundary map and state which map it is in the text of the PAP. 99

Plate 5-2 is the official disturbed area boundary map. Text in Section 521.180 has been revised to state "Plate 5-2 is the official disturbed area boundary map."

R645-301-521.111 and R645-301-121.300, The Permittee must list the line type for the exploration entries in the legend of Plate 5-1. 98

The exploration entries line type has been added to the legend of Plate 5-1.

R645-301-521.111, The Permittee must list all known mine workings in, and adjacent to, the permit area. The Division found mine workings in the area listed in Doelling that the Permittee did not show on Plate 5-1. The Permittee should show those workings or state why they did not list them.98

As required by R645-301.111 "The location and extent of known workings of active, inactive, or abandoned underground . . . . " All known workings of active, inactive or abandoned workings are shown on Plate 5-1. Doelling does list several mine names in parenthesis after Book Cliffs mine. The mine in parenthesis are either different names for the same mine or were mines engulfed by either the Book Cliffs Mine or the Geneva mine. On page 407 of Doelling he states "Two important mines have developed on the Woodside NE quadrangle. The others are old prospects now engulfed by the operations of the former (Table 74)." ALL known working are shown on plate 5.1. Text in Section 521.111 has been revised discussing the various prospects and mining activity in the area.

R645-301-521.121 and R645-301-121.200, In the text of section 521.121 and all subsections and related maps the Permittee must identify only the surface and subsurface man-made features that exist on the site prior to the permit being issued. 99

Sections 521.120 and all subsections have been revised to reflect only the existing surface and subsurface man made features.

R645-301-521.123 and R645-301-121.200, In the text of section 521.123 of the PAP and on all relevant maps, the Permittee must identify all public roads that exist in, and within 100 feet of, the permit boundary.

The text in section 521.123 has been modified to include the little park road. Both the existing county road 126 and little park road were shown on the original submittals. Plate 4-1 has been modified labeling the existing county road 126 and the little park road.

In section 521.123 of the PAP, the Permittee only refers to County Road 126 as being within the proposed permit area. Yet, in Appendix 5-4 the Permittee explains in detail the existence of Little Park Road and some other public roads within the permit area. To avoid confusion, the Permittee needs to show and label the full right-of-way for County Road 126 and all other public roads on a map that deals with conditions that exist before the permit being issued. To be clear and concise the Permittee should show the road information on two maps, one map for the entire permit boundary and the second for the disturbed area boundary. Note that preexisting structures in the operations section of the TA refer to structures on which construction began before January 21, 1981. 98

All relevant maps currently show the existing county road 126. The road is labeled "Existing County Road". Relevant plates currently show the little park road. Plate 4-1 shows the entire permit boundary with both the existing county road 126 and the little park road labeled. Width of RS-2477 roads is 66 feet from center or width of disturbance whichever is less. Plate 5-2 shows the road ROW as the width of disturbance.

R645-301-521.124, The Permittee must show the location of the structural fill and refuse disposal areas on the cross sections on Figure 1 Appendix 5-7. 139

The TA states that "Because the permittee will handle the rock slope material differently than the

material with coal, the permittee must distinguish between the two types of materials in the cross-sections and profiles." This statement is **incorrect**. The Permit states "Disposal of each of the 2 types of coal mine waste will be the same and both type will be deposited in the refuse storage area shown on plate 5-2. The rock slope material / underground development waste will be examined and tested as necessary to determine acid- or toxic-forming potential. Coal Processing waste and any underground development waste containing too much coal to leave underground, will be disposed of in the refuse storage area as described further in this chapter and in Appendix 5-7." All material, rock slope material, structural fill, underground coal mine waste is considered refuse and is all treated the same. The rock slope material which will created first and will be used as structural fill. The rock slope material will be essentially free of any coal. Figure 1 of Appendix 5-7 does show the location of the structural fill and refuse disposal areas on the cross sections. This should not have been a deficiency. However, figure 2 of Appendix 5-7 has been revised for clarification.

R645-301-521.125 and R645-301-121.200, In the text of section 521.125 of the PAP, and on all relevant maps, the Permittee must identify all existing sediment ponds, permanent water impoundments, coal processing banks, and coal processing waste dams and embankments. In section 521.125 of the PAP, the Permittee mentions the proposed sediment pond. Since the proposed sediment pond is just that, proposed, the statement is confusing. The Permittee must list only those dams and impoundments within the proposed permit area that exist prior to the permit being issued 98

Sections 521.120 and all subsections have been revised to reflect only the existing surface and subsurface man made features. Section **521.125 states** "There are no existing sedimentation ponds, permanent water impoundment, coal processing waste banks or coal processing waste dams near or within the permit area."

R645-301-521.141 and R645-301-116.100, The Permittee must identify all subareas for which additional permits may be sought over the life-of-mine. That information must be shown on maps and in the text of the PAP. In Section 521.141 of the PAP the Permittee only refers to the life of the permit which is 5 years. This issue is also addressed in the maps, plans, and cross-sections of resources information section of the TA. Examples of future expansion include but are not limited to southward expansion for additional coal reserves and expanding the disturbed area for a future discharge point. Due to the size of the two areas, the potential expansion areas must be shown on maps of adequate scale. 33

Section 521.141 has been revised to state "...life of the mine ..." There are no current proposals to expand the mine to include additional disturbed areas or additional reserves for the life of the mine. The operator has submitted to the BLM a request to the BLM for a lease-by-application. It is extremely premature at this time to include this LBA in the permit. If the BLM determines that this area can be leased, and once the area is delineated by the BLM, and once the BLM completes an EA, and if the area goes up for lease, and if the operator bids on the lease, and if the operator is the successful bidder, then the operator will submit either a new permit application for new portals or for an extension to the existing plan. Just because a lease by application has been filed does not necessarily mean that the coal will ever be leased or that the applicant will be the one to mine the coal if it is leased. For example: Horn Mountain was put up for lease in the early 80's, no one bid on it. No one bid on the Tie Fork tract. Genwal submitted an LBA and was not the successful bidder. Cottonwood LBA is over 10 years old and has yet to go up for lease. Flat Canyon LBA is over 7 years old and may never be leased let alone permitted.

In the past DOGM has refused to allow an operator to include unleased coal in a permit

application. DOGM would simply not review a permit applications with unleased coal reserves prior to the operator actually having legal access to the additional reserves.

Bottom Line the operator can not identify subareas for future expansion until they exist. There is no proposal to expand the disturbed area for any reason. Will refer to supervisor as per meeting with Wayne Western and Priscilla Burton on9/3/03.

R645-301-521.150 and R645-301-521.190, The Permittee must show the pre-existing contours on Plate 5-1A as intervals of 5 feet or less. The Division needs the information to establish the pre-existing site conditions. 98

Plate 5-1A does have 5' contours. This should not have been a deficiency. OK as per meeting with Wayne Western on 9/3/03.

R645-301-521.150, The Permittee must show the correct surface elevations and configurations on all operational maps. The correct elevations are shown Figure 1 of Appendix 5-7.

All surface elevations on Figure 1 of Appendix 5-7 were checked and found to be correct. Probably adequate as per meeting with Wayne Western on 9/3/03.

The Permittee must show how they will cover the refuse pile with fill before construction of the buildings.

Detailed design of the refuse pile can be found in Appendix 5-7 figures 1 and 2. The current figures show the refuse pile covered with fill. Figures 1 and 2 shows cut and fill areas for the refuse pile. Probably adequate as per meeting with Wayne Western on 9/3/03.

In addition, the Permittee must show that the area where they will construct buildings is flat. 156

Plates 5-7A2 and 5-7A3 have been modified showing areas of buildings being flat and the red hatched area (structural fill) has been added to the key.

R645-301-522 and R645-301-521.190, The Permittee must show the logic mining unit boundaries on Plate 5-4 or an equivalent map. The Division is aware that the permit boundaries and the LMU boundaries overlap so showing both on the same map could be difficult. 109

The LMU is currently shown on Plate 5-4. The LMU boundary is shown with a blue dashed line as indicated on the legend. LMU line type was changed to dashed in the legend.

R645-301-522, The Permittee must discuss the potential for expanding the mine. The Division is interested in future plans for expanding to the south and east. 109

There are no current proposals to expand the mine to include additional disturbed areas or additional reserves for the life of the mine. The operator has submitted to the BLM a request to the BLM for a lease-by-application. It is extremely premature at this time to include this LBA in the permit. If the BLM determines that this area can be leased, and once the area is delineated by the BLM, and once the BLM completes an EA, and if the area goes up for lease, and if the operator bids on the lease, and if the operator is the successful bidder, then the operator will submit either a new permit application for new portals or for an extension to the

existing plan. Just because a lease by application has been filed does not necessarily mean that the coal will ever be leased or that the applicant will be the one to mine the coal if it is leased. For example: Horn Mountain was put up for lease in the early 80's, no one bid on it. No one bid on the Tie Fork tract. Genwal submitted an LBA and was not the successful bidder. Cottonwood LBA is over 10 years old and has yet to go up for lease. Flat Canyon LBA is over 7 years old and may never be leased let alone permitted. Will refer to supervisor as per meeting with Wayne Western and Priscilla Burton on9/3/03.

R645-301-525.110, The Permittee must show the precise location of each seep, spring, stock pond, existing water right and dirt road on Plate 5-3. Note that the information on Plate 5-3 is inconsistent with that of Plate 7-3. See the analysis section for more details. 117

Roads have been added to Plate 5-3. Plate 5-3 has been corrected. Plate 7-3 shows the location of the water rights according to the State Water Rights Maps. Plate 7-3 shows water right 91-2521(Cottonwood Spring) located according to the incorrect Water Rights maps. However, the correct location is shown on Plate 5-3 where it is being monitored by the operator. Both Plates 7-3 and 5-3 are correct.

R645-301-525.120 and R645-301-121.200, The Permittee must define the blue dot symbol on Plate 5-3. 117

On Plate 5-3 the blue dots (IPA) Piezometers) have been changed to black which indicate water monitoring locations. This is reflected in the legend.

R645-301-525.130 and R645-301-121.200, The Permittee states in section 525.130 that they do not entirely agree that R645-301-525 requirements should apply. The Division is unaware of any options that the Permittee has about the need to comply with the R645-301-525 regulations. The Permittee must discuss those issues in the PAP. The discussion in Chapter 7, Section 727 is inadequate to comply with R645-301-525.130 and R645-301-121.200. 117

Section 525-130 has been removed. The removed text stated "The operator does not entirely agree that R645-301-525 requirements should apply. However, knowing that the Division does not concur with the operators conclusions the appropriate sections of R645-301-525 will be addressed.

R645-301-525.130, The Permittee must show that all property owners in, and around, the Lila Canyon tract, as well as the water conservancy district received copies of the water rights survey.117

Section 525-130 has been revised to state "According to Mark Page (State Water Rights), there is not a water conversation district associated with Lila Canyon Mine. The BLM is the property owner of all the lands within the influence of subsidence of the Lila Canyon Mine.

R645-301-525.400, The Permittee must list the possible sources and methods to replace State-Appropriated water supplies that subsidence may damage. The Permittee needs to determine what replacement sources are available and how they will implement them. 117

Text in Section 727 of Chapter 7 has been revised to read "Any State-Appropriated water supply that may be damaged by mining operations will either be repaired or replaced. As soon as

practical, after proof of damage by mining in Lila Canyon, of any State-Appropriated water supply, UEI will replace the water. Water replacement may include sealing surface fractures, piping, trucking water, transferring water rights, or construction of wells. The preferable method of replacement will be sealing of surface fractures effecting the water supply. As a last resort UEI will replace the water by transferring water rights or construction of wells." Sounds OK according to Dave Darby as per meeting with Wayne Western and Priscilla Burton on9/3/03.

R645-301-526.115.4 and R645-301-526.116.1, The Permittee must show

1) what section of the culvert the County will install and what part the Permittee will install,

Plate 7-6 has been revised showing what section of the culvert the County will install and what part will be installed by the Permittee.

2) during reclamation, what work will be done by the County regarding modification of the culvert. The Division assumes that when the undisturbed bypass culvert is removed, modifications to the culvert will include a fluted inlet and the placing of riprap on the surrounding slope. 104

R645-301-526.220, R645-301-521.161, R645-301-521.190 and R645-301-300.121.200, The Permittee must show the location of each surface facility on Plate 5-2, or an equivalent map. To avoid confusion and to insure that all surface facilities and utilities are shown the Permittee will number all facilities and utilities, a list of the numbered facilities and utilities will be shown in the engineering section of the PAP, on Plate 5-2 and in the bond calculation section of the PAP.153

Plate 5-2 has been modified numbering each facilities and utility. Section 520 has been modified numbering each facility and utility. The bond calculation forms were modified showing numbers corresponding to the numbers on Plate 5-2.

R645-301-527.210 and R645-301-121.200, The Permittee must either include Figure 6 in Appendix 5-4 or remove reference to that figure. 133

There is no reference to figure 6 in Appendix 5-4. The reverence to Figure 6 has been removed from page 2 of Appendix 5-5.

R645-301-527.210, R645-301-527.220 and R645-301-527.230, The Permittee needs to give the Division detailed maps and cross-sections that show how the South Fork of the Lila Wash will be protected from mining activities, especially from the Main Facility Road, which is located 10 feet from the drainage. 133

As shown on Plate 5-2 the Main Facility Road was realigned and moved 35' from drainage.

R645-301-527.210, The Permittee must give the Division detailed designs for each road that will be constructed in the disturbed area. A general commitment to provide the Division with additional engineering designs is inadequate. If the Permittee needs more time to develop road designs then they should wait until the designs are complete before submitting the PAP.

At a minimum, the Permittee must give the Division detailed designs for both the Main Mine Road, and the Portal Access Road

Detailed design for both the portal access road and the mine facilities road is included in Appendix 5-4.

The information in the text and that in Appendix 5-4 are contradictory. See analysis section for details. 133

Detailed design for both the portal access road and the mine facilities road is included in Appendix 5-4.

R645-301-527.230, The Permittee must show that trucks and other vehicles they will use during the construction, use, and reclamation of the portal will have enough room to turn around and be loaded, or they must modify the portal access road design. 133

Contractor to determine what equipment is used could use coal haulers. A 40' Diameter portal pad will be constructed.

R645-301-534, The Permittee must state how they will modify the county road that lies within the disturbed area boundary during reclamation. Specifically, the Division wants to know how the Permittee will modify the culvert, and how the surface will be stabilized 169

Plate 7-6 has been revised showing what section of the culvert the County will install and what part will be installed by the Permittee.

R645-301-534.130, The Permittee must include a safety factor analysis for all the roads in the disturbed area or show why they are not needed. The Permittee must also include summary sheets from the computer printouts. 133

Appendix 5-5 has been redone using new software. Computer generated summary input and output sheets are included.

R645-301-542, The Permittee will submit reclamation maps portraying reclamation at Phase I to illustrate the reclaimed surface area configuration after all mining structures are removed, and at Phase II to illustrate the reclaimed surface area configuration after all hydrologic structures are removed 178

Revised Plate 7-7 shows a Phase I reclamation. Illustrating the reclaimed surface area configuration after all mining structures are removed and earthwork completed. The notes on Plate 7-7 explain what will be completed at Phase II reclamation.

R645-301-553, The Permittee must describe the location of cut slopes that will be left after final backfilling and grading. The Permittee will also explain why those cut slopes will be left. For example, the Permittee could discuss stability issues (see analysis section for details). 166

Steep cut slopes (steeper than 1H:1V) will not be left after reclamation some minor cut slopes will be left and are addressed in Section 553. The Cut slope stability analysis can be found in Appendix 5-5.

GEOLOGY Chapter 6

R645-301-731.111, 731.121, Because the PAP uses the Sunnyside Mine as an example of why there is no need to perform further analysis for acid- and toxic-forming materials, the PAP needs to better explain how the handling and disposal of coal mine waste at the Lila Canyon Extension is designed to avoid the acid- and toxic-drainage such as occurred at the Sunnyside Mine refuse pile. This is partially explained in Appendix 5-7 – that the refuse pile will not contain reject from coal washing and is to be placed in a pit and covered with 4 feet of subsoil and topsoil rather than left exposed on the surface. The Permittee identified several differences between the Sunnyside and proposed Lila refuse piles in the cover letter for the December 6, 2002 submittal; this information needs to be included in Section 6.5.5.1 of the PAP. 68

The following text has been added to Section 6.5.5.1 of the PAP.

"A small amount of acid- and toxic- drainage occurred at the base of the Sunnyside Mine refuse pile. The Lila Canyon refuse pile is not at all designed like the Sunnyside pile. Acidic water has seeped from the base of a refuse pile at Sunnyside. Even with the seepage there were no offsite problems or impacts because of the buffering environment. The refuse piles at Sunnyside contained reject material from the washing of coal. This reject would have an elevated sulfur content much higher than Lila. The Sunnyside piles were above ground, Lila is totally incised, below the surface. The events at Sunnyside that lead to the seepage of acidic water from the bottom of the refuse pile cannot happen at Lila.

Appendix 5-7 states: "Since coal washing is not proposed, the refuse will not contain consolidated reject, which is higher in sulfur. The refuse pile is completely incised and will be compacted and covered with 4' of material. Thus eliminating the potential of water percolation causing problems. Drainage over the compacted pile with 4' of cover will be diverted into the sediment pond." "

R645-301-120.122, The PAP states that the last observed water elevations are on Plate 7-1 (Section 724.199, p. 11). The 5,870 feet water elevation in the Horse Canyon Mine that is shown on Plate 7-1 was determined from underground work performed by BXG in 1993. This BXG work is briefly discussed in the PHC (Appendix 7-2, p. 8) but not in Section 724.100, so this reference to the "last observed water elevations" - without giving the 1993 date - at the end of the paragraph discussing the 1986 measurement at the rotary car dump in Section 724.100 (p. 11) is confusing. The conclusion that water levels haven't changed since mine operations ceased (Section 724.199, p. 11 and Appendix 7-3, p. 9) is also questionable without including the BXG data in the discussion. Information on the BXG exploration needs to be added to Section 724.100. 68

BXG's observation of 5870 feet in 1993 was added to section 724.100.

R645-301-120.122, The PAP states in Section 724.100 on page 6 that there are no observable discharge points in the lower Blackhawk Formation,

The text in Section 724.100 has been revised to read "Other than the two seeps in Stinky

Spring Canyon, which appear to be fault related, no observable discharge points have been observed within the permit area or adjacent areas or down dip from these areas."

Page 9 states that there are no springs below the Price River Formation.

Text on page 9 has been revised to state" Other than the two seeps in Stinky Spring Canyon, which appear to be fault related, no springs occur below the Price River Formation.

It states in section 731.520 that no water issues from the strata above or below the coal outcrop (although this is not clear - this statement may refer only to the area immediately around the proposed portals). The springs in Stinky Spring Canyon issue at the contact of the Blackhawk Formation and Mancos Shale, so these statements need to be updated, corrected, or otherwise clarified. 68

Section 731.520 has been revised to read "In the area immediately around the proposed portals, no water is presently issuing from the strata above or below the coal outcrop; therefore, it is assumed any water encountered in the underground mining will not be under artesian pressure or with sufficient hydrostatic head to raise it to the portal site."

HYDROLOGY Chapter 7

R645-301-121.200 The Permittee shall reevaluate the PAP to give specific, detailed information to address and substantiate comments under each regulation. 28

R645-301-121.200, It states in Section 731.211 that there is a total of 17 ground water monitoring sites proposed for this property, and refers to Table 7-3. Including mine-water discharge at L-5-G and the IPA piezometers, Table 7-3 shows only 13 ground-water monitoring sites. This needs to be clarified. 151

Section 731.211 was revised to state There are a total of 13 ground water monitoring sites proposed for this property

R645-301-121.200, -724.300, Information in Table 5 (Chapter 7) on the strata from which springs flow does not match statements throughout the PAP and does not match the information on Plates 6-1 and 7-4: there is no separately identifiable Flagstaff formation in this area, and according to Plates 6-1 and 7-4, L-10-G and L-12-G issue from the North Horn Formation. 88

References to the Flagstaff formation now refer to Flagstaff - North Horn formation. Plates 6-1 and 7-4 are correct.

R645-301-121.200, The first page of the 1989 Water Monitoring Data in Appendix 7-2 is illegible, and the Permittee needs to provide a legible copy. If a better original version is not available for reproduction, the Permittee should redo the table so the information is usable. 89

The first page of the 1989 Water Monitoring Data in Appendix 7-2 was redone so that the information is legible.

R645-301-121.200, The Permittee needs to clarify statements in Section 724.100 (page 9) that no springs occur in or below the Price River Formation or Castlegate Sandstone are not accurate; although there may be no large springs below the Price River Formation, the seeps in Stinky Spring Wash issue at the contact of the Blackhawk Formation and Mancos Shale. 89

Text on page 9 has been revised to state" Other than the two seeps in Stinky Spring Canyon, which appear to be fault related, no springs occur below the Price River Formation.

R645-301-121.200, The Permittee must update section 526.116 of the PAP to state that in addition to the office complex and sediment pond the topsoil storage area and security building are also within 100 feet of County Road 126. 106

Section 526.116, Page 41 in Chapter 5 was revised to read: "The only coal mining and reclamation operations that are planed within 100 feet of the County Road are office complex, sediment pond, topsoil pile, and security shack."

R645-301-130, In Section 724.100 (p.11), "(personnel communication, 1990)" is given as a reference, but the individual is not identified. Is this a direct quote from the Horse Canyon Mine plan? The Permittee needs to provide the name of the individual who provided this information. 90

This is a direct quote form the Horse Canyon Mine and it is unknown who the individual was who provided this information.

R645-301-521.150, and R645-301-121.200, To avoid confusion the Permittee should not show elevations to the nearest 1,000th of a foot. See analysis section for more details. In addition, the Permittee must label the red hash marks on cross-section 5-7A-2 and similar maps and cross-sections. 156

The elevations on Figure 1 of Appendix 5-7 are shown to the nearest foot and are no longer shown to the nearest 1,000th of a foot. The red hash marks are described in the map legends on Plate 5-7A.

R645-301-622, -722, Resource maps showing water rights, need to be extended at least as far as the channel of Range Creek to help evaluate potential impacts in the Range Creek drainage.99

Plate 7-3 has been revised to include the channel of Range Creek.

R645-301-622, -722, Water rights 91-4959 (Redden Spring), 91-183 (Horse Canyon Creek), and 91-185 (MDC well), all held by UtahAmerican Energy, are not shown on Plate 7-3. 99

Water rights 91-4959, 91-183, and 91-185 were shown on Plate 7-3 but were hidden by the permit hatching. The hatching has been removed on Plate 7-3 so that water rights 91-4959, 91-183, and 91-185 are visible.

R645-301-721,· (1) The Permittee shall submit a surface monitoring plan to survey all streams and

channels in, and adjacent to, the permit area.

The Permittee shall identify and describe all water resources within the drainage basins and potential impacts to the resource and downstream users.

Appendix 7-7 "Surface Water Characterizations" along with Appendix 7-1 "Baseline Monitoring" and Appendix 7-8 "Monitoring Location Descriptions" identify and describe all water resources within the drainage basins. The appendices also address potential impacts to the resource and down stream users.

The Permittee will collect and evaluate quantitative and qualitative data for all surface water sources. The survey will establish baseline information and trends for each monitoring site.

Baseline water data found in Appendix 7-1 and the text in Chapter 7 address the quantitative and qualitative data for all surface water sources.

From the data, the Permittee will characterize the surface waters in, or adjacent to, the permit area as perennial, intermittent, or ephemeral. The Permittee can provide survey information to characterize surface waters if weather conditions and access prevent the collection of reliable monitoring data

Characterization Information can be found in Appendix 7-7.

(2) The Permittee shall provide specific stream characterization information in a table and illustrate the reaches on a map.

The table shall identify the length of the reaches classified and other quantitative and qualitative information defining the reach. The Permittee can base classification on water table elevations (with respect to channel surface) and biologic (plant and aquatic) communities present.

The table can be found in appendix 7-7 as Table 2 page 5.

The Permittee will classify stream reaches or segments according to the type (perennial, intermittent or ephemeral) established in the definitions under R645-301-100

Characterization Information can be found in Appendix 7-7.

(3) The Permittee should make descriptive adjustments based on the life of the mine to describe unusual wet or dry periods that may confound average rainfall and runoff conditions.

Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

The Permittee will conduct representative monthly sampling for all perennial sources and monitor for parameters as per Table 7-4, as committed to in the application, Section

731.220, Volume 6, and in accordance with the DOGM Water Monitoring Guidelines.

The permittee is conducting monthly water sampling in accordance with Section 731.220, Volume 6 of the application.

The Permittee will conduct monthly sampling during periods of flow for intermittent streams and monitor for water quality as committed to in the application, Section 731.220, Volume 6, and in accordance with the DOGM Water Monitoring Guidelines.

The permittee is conducting monthly water sampling in accordance with Section 731.220, Volume 6 of the application.

The Permittee will conduct quarterly surveys for ephemeral streams and monitor for water quality as committed to in the application, Section 731.220, Volume 6, and in accordance with the DOGM Water Monitoring Guidelines. 87

The permittee is conducting monthly water sampling in accordance with Section 731.220, Volume 6 of the application.

R645-301-721, The Permittee shall conduct surveys of streams and channels and describe methods to mitigate potential mining impacts from discharges and subsidence. The Permittee must submit the surveys and mitigation plan before the Division will issue a mining permit.

A stream survey was completed by the Permittee and the results are presented in Appendix 7-7.

The survey will describe water use, water rights, channel morphology, and likely impacts. The Permittee will describe impacts to channels or perennial streams, or identify the extent (point) where impacts are no longer realized.

A stream survey was completed by the Permittee and the results are presented in Appendix 7-7.

For mine discharge sites, the Permittee shall model impacts based on flow from 0 to 500 gpm.

New Appendix 7-9 addresses impacts based on flow from 0 to 500 gpm.

For channels above mine areas, the Permittee shall identify the probable impacts if subsidence should intercept stream or spring flow, specifically to water rights and downstream uses. The Permittee will describe access and feasibility of mitigation of subsidence impacts to perennial, intermittent, or ephemeral stream channels and how channel restoration could be accomplished. 88

A stream survey was completed by the Permittee and the results are presented in Appendix 7-7.

R645-301-722, The Permittee shall show water rights 91-4959 (Redden Spring), 91-183 (Horse Canyon

Creek), and 91-185 (MDC well), all held by UtahAmerican Energy, on Plate 7-3. 88

Water rights 91-4959, 91-183, and 91-185 were shown on Plate 7-3 but were hidden by the permit hatching. The hatching has been removed on Plate 7-3 so that water rights 91-4959, 91-183, and 91-185 are visible.

R645-301-722, The Permittee will submit a map identifying the characterizing of stream reaches showing where mining will take place within 100 feet (horizontal) of a stream channel. 99

This requirement is not part of R645-301-722.

R645-301-722.100, -624.100, (1) The PAP asserts that the Mesa Verde Group (the Price River Formation, Castlegate Sandstone, and Blackhawk Formation) is not an aquifer because: The group does not transmit ground water to supply any water sources; The water has no potential to be used or developed, and it is not elemental to preserving the hydrologic balance in the permit and adjacent area, and; that there are no observable discharge points in the permit and adjacent areas (Section 724.100)

Text in Chapter 7 and Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

(2) The Permittee needs to clarify such statements in the PAP on or adjacent to the permit area because the seeps in Stinky Spring Wash, adjacent to the southwest corner of the Lila Canyon Extension area, issue at the contact of the Blackhawk Formation and Mancos Shale. Although these seeps are not a water supply and have limited use, they appear to be an important source of water for Bighorn sheep, specifically in the early spring. Plate 7-1 indicates the source for the water flowing from these seeps could be connected to the saturated zone, evident in the IPA piezometers, that will be intercepted by the proposed mine. The Permittee needs to evaluate the hydrogeology of these seeps, whether their source is regional, intermediate, or local in extent, and what impacts the proposed coal mining might have on them. 90

Text in Chapter 7 and Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

R645-301-722.100, The Permittee needs to portray seasonal variations of head on contour maps or cross-sections. 88

Figure 7-1 and 7-2 found at the end of Chapter 7 text portrays seasonable variations of head on a contour map and cross section

R645-301-724.100, At least four water level measurements and one suite of water-quality analyses were done at S-32, but there is no information on the current condition of S-32 in the PAP. The Permittee visited this piezometer, attempted to measure water levels, but found S-32 unusable; this is discussed in the cover letter for the December 6, 2002 submittal, but this information has not been included in the PAP. 89

The following statement was added to Section 722.400. "The Permittee visited S-32 in 2002 and attempted to measure water levels, but found that piezometer S-32 was

unusable."

R645-301-724.200, -728.344, Streams in the Lila Canyon Extension have been monitored since December 2000 and there has been no flow observed except in response to precipitation runoff or snow melt. There are no field data or laboratory reports in the PAP for water quality and quantity for these runoff and snow melt events. These data need to added to the PAP and used in determining the PHC. 89

All streams above the permit area have been classified as ephemeral. As is shown in Appendix 7-2 and on the DOGM data base, the Permittee has monitored the ephemeral washes above the permit area randomly since 1988 and without exception they have been found to be dry. They flow only in response to significant precipitation events. There are no water rights downstream in these washes therefore their can be no negative impacts.

R645-301-724.410, The Permittee shall identify current information in the evaluation of climatic data. The Permittee shall indicate if the Sunnyside Weather Station is still functioning. 36

It appears as if the Sunnyside Weather Station operated until 1988 when the name changed to Sunnyside City Center.

R645-301-724.410, The Permittee shall provide up-to-date climatological information. 36

Table 7-1A has been revised to reflect data from 1971 to 2000.

R645-301-727, Plate 7-3 does not show water rights 91-4959, 91-183, and 91-185, held by UtahAmerican Energy. Contrary to the statement in Section 727, UtahAmerican Energy does not hold the majority of water rights in the Horse Canyon Mine – Lila Canyon Extension area. 90

Water rights 91-4959, 91-183, and 91-185 were shown on Plate 7-3 but were hidden by the permit hatching. The hatching has been removed on Plate 7-3 so that water rights 91-4959, 91-183, and 91-185 are visible.

R645-301-728, (1) The Permittee needs to make specific findings for the PHC, which identify potential impacts to all surface water sources. The Permittee shall characterize the channels and flow patterns within each drainage-backed by data, describe all water uses associated with those basins, potential impacts to those uses and describe the total hydrologic impacts to surface water resources on and adjacent to the permit area based on sampling, monitoring, characterization and studies. The Permittee shall use this information to summarize the potential for mitigation and hydrologic impacts on and off the permit area in the PHC. The PHC shall describe all probable hydrologic consequences from subsidence, discharges to stream channels, impacts to channels, sediment loading, salt loading and impacts to aquatic wildlife

Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

(2) The Permittee shall discuss what impacts will take place from increased salinity to the Colorado River by discharging water from the mine, and especially how salts dissolved from the Mancos Shale by mine-discharge water might impact the salinity of the Colorado River. 88

As can be seen from the modeling in Appendix 7-9, mine discharge will not reach the Colorado River therefore no negative impacts to the Colorado River will result.

R645-301-728.333, There is no PHC determination of what impact the proposed operation will have on flooding and streamflow alteration. The Coal Mining Rules require this determination to be in the permit application, that is, the Permittee must provide this information **before** the permit is issued. 90

Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

R645-301-728.350. The PHC states that it is unlikely contamination, diminution, or interruption of any water resources will occur within the permit area (p. 14). The PHC needs to contain an explicit determination regarding contamination, diminution, or interruption of State-appropriated Water; not only for the permit area, but also for the adjacent area. Somewhere in the PAP, preferably in the PHC itself, the Permittee needs to clearly present the basis for this determination. If there is a possibility of contamination, diminution, or interruption of State-appropriated Water in the permit or adjacent areas, a water replacement plan under R645-301-525.400 and –525.480 is needed. 89

Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

R645-301-731, (1) The Permittee will submit design plans for a sedimentation pond to contain and control the runoff from the mine pad area for treatment of the 10 year-24 hour precipitation event falling on the mine pad and treatment of at least a 500 gpm mine water discharge.

The sediment pond has been designed to contain and control the runoff from the pad area for treatment of a 10 year-24- hour precipitation event falling on the mine pad. The mine water discharge will bypass the pond. The mine water discharge will meet the UPDES discharge requirements.

(2) The Permittee will submit design plans of the sedimentation pond showing the discharge area and erosion protection structure for the undisturbed area UA-4 entering the pond. 150

Plate 7-6 has been revised to include rip rap protection for the undisturbed area UA-4 entering the pond.

R645-301-731, Prior to mining, the Permittee will be required to assess the channel morphology and characteristics of channels downstream from proposed UPDES monitoring sites. The Permittee is required to assess the potential impacts of mine water discharges to downstream channels from the discharge site to the Price River. In the PHC, the Permittee will describe the impacts to downstream channels. 151

Appendix 7-9 describes the impacts of mine water discharge to downstream channels from the discharge site to the Price River.

R645-301-731, The Permittee shall evaluate and describe all mining activity within 100 feet of a

perennial or intermittent stream channel. 151

All streams have been determined to be Ephemeral acting. UEI will not be mining within 100 feet of a perennial or intermittent stream channel.

R645-301-731, The Permittee shall evaluate the probable impacts from mine discharges and sedimentation pond discharges on receiving channels **before** mining.

The Permittee will assess the level of impact contaminates such as dissolved salts, toxic elements (such as boron and selenium), and channel sediments will cause downstream of the permit area to the Price River.

As can be seen from the modeling, found in appendix 7-9, the mine discharge will not reach the Colorado River therefore no negative impacts to the Colorado River will result.

The Permittee will submit plans for the mine-water discharge system **before** mining. The plan will specify pipe size to handle at least 500 gpm, routing, discharge area and designs for erosion control at the discharge area.

Plate 7-5 shows the location of the 4" mine water discharge line and shows the erosion control at the discharge point.

A model using mine water discharges ranging from 0 to 500 gallons per minute shall be evaluated to determine the potential of impacts to the Price River and the fishery.

As can be seen from the modeling, found in appendix 7-9, the mine discharge will not reach the Colorado River therefore no negative impacts to the Colorado River will result.

In the PHC, the Permittee shall describe the probable impacts from mine water discharges impacting the Price River and fishery from high mine water discharges, chemical and sediment contamination. 150

As can be seen from the modeling, found at Appendix 7-9, the mine discharge will not reach the Colorado River therefore no negative impacts to the Colorado River will result. Appendix 7-3 "Probable Hydrologic Consequences" Has been revised by Tom Suchaski.

R645-301-731, The Permittee shall provide updated facilities maps to show the change in sedimentation pond location, change of the mine discharge system, sedimentation-pond discharge system, disturbed area drainage reconfiguration, and UPDES discharge structures. 156

The sedimentation pond was not relocated, mine discharge system is shown on Plate 7-5. The sedimentation pond discharge system was not changed.

R645-301-731, The Permittee will consolidate discharge points by routing mine water through the

sedimentation pond or, if meeting UPDES limits discharging in the same area as the sedimentation pond discharge. This action should reduce impacts to stream channels and reduce monitoring and reporting of data. 150

The sediment pond has been designed to contain and control the runoff from the pad area for treatment of a 10 year-24- hour precipitation event falling on the mine pad. The mine water discharge will bypass the pond. The mine water discharge will meet the UPDES discharge requirements.

R645-301-731.600, The Permittee shall submit maps depicting a 100-foot buffer zone along perennial and intermittent channels. 157

All streams have been determined to be Ephemeral acting. UEI will not be mining within 100 feet of a perennial or intermittent stream channel.

BONDING Chapter 8

R641-301-761, The Permittee shall submit reclamation maps to conform to the changes identified in the technical analysis. 169

All Applicable maps within the MRP have been revised.

R645-301-830.140, The Permittee must list every proposed structure in the bond calculations, and all revegetation costs 180

Chapter 8 "Bonding" has been revised.

ROADS

R645-300-121.150, The Permittee must provide public notice of the intention to conduct mining within 100 feet of the outside right-of-way of the public roads and timing and duration of closure during installation of a culvert in the existing public road. 24

Pubic notice of the intention to conduct mining within 100 feet of the outside right-of-way of a public road was given during the "Large Site Development Plan" approval process by Emery County. The culvert is being installed by the County.

Reporting of Data

R645-301-121.300, The Permittee needs to better integrate the existing Horse Canyon Mine MRP and the Lila Canyon Extension PAP into a more clear, concise, and unified set of documents.25

Applicable portions of the Horse Canyon Mine MRP have been included in the Lila Canyon Extension.

R-645-301-122, -725, Referenced materials are to be provided to the Division by the Permittee or be readily available to the Division. The Kaiser South Lease PAP should be appended to the Lila Extension PAP or otherwise be made available to the Division to use in preparing the TA and CHIA. 28

A copy of the Kaiser South Lease PAP is being submitted for the Divisions use in preparing the TA and CHIA but will not be appended to the Lila Extension PAP. The Kasier South Lease PAP shall be returned to the Permittee once the TA and CHIA have been completed.

115. Status of Unsuitability Claims.

115.100. The proposed permit area is not within an area designated as unsuitable for mining. **UtahAmerican Energy, Inc.,** is not aware of any petitions currently in progress to designate the area as unsuitable for coal mining and reclamation activities.

115.200. Since no exemption is requested this section does not apply.

115.300. UtahAmerican Energy, Inc., will not conduct mining operations within 300 feet of a currently occupied dwelling. However, UtahAmerican Energy, Inc., will conduct mining or mining related activities within 100 feet of a public road. UtahAmerican Energy, Inc., has received permission from Emery County to construct facilities and operate coal mining activities within 100 feet of a public road. Refer to the Emery County letter found in Appendix 1-4.

116. Permit Term.

116.100. The anticipated starting and termination dates of the coal mining and reclamation operation are as follows:

Phase	Begin	Complete
Mining Pad, Support Structures, and Portals	June 2004	Dec. 2004
Begin Underground work	June 2004	
Terminate Mining	Dec. 2028	

Reclamation operation dates can be found in Table 3-3.

All dates are assuming the extended mine life from acquisition of adjacent federal leases.

Approximately 5,992.07 surface acres, which include federal, state and private lands are included within the permit area. These surface acres are described in Table 4-2, and coal acres are shown on Table 4-2A.

Out of the approximately 42.6 surface acres within the disturbed boundaries

only 25.3 acres will actually be disturbed. The remainder will be left in isolated islands of undisturbed within the disturbed boundary. See Plate 1-2.

116.200. The initial permit application is for a five year term with anticipated successive five year permit renewals.

116.210 Since the initial permit application is for a term of five years this section does not apply.

116.220 Since the initial permit application is for a term of five years this section does not apply.

117. Insurance, Proof of Publication and Facilities or Structures Used in Common

117.100. The Certificate of Liability Insurance is included as Appendix 8-2.

117.200. A copy of the newspaper advertisement of the permit extension and proof of publication can be found in Appendix 1-5.

117.300. Since no structures are going to be shared by two or more separately permitted coal mining permit applications this section does not apply.

118. Filing Fee.

A filing fee of $5.00 has been submitted.

120. Permit Application Format and Contents.

121. The permit application contains current information and is written in

Appendix 1-5

Daniel M. Larsen
Soil Scientist/ Soil Management Specialist
EIS

EXPERIENCE

Forest Soil Scientist, GS-12 - USDA Forest Service, Manti-LaSal National Forest, Price, Utah

1979 - 1997 (Retired): Served as soils project staff responsible for soil survey, soil management services, and watershed improvement activities on the Manti-LaSal National Forest. Participated as an interdisciplinary team member for Forest Land Use and Management Planning and Project Support. Responsible for soils program planning and budget preparation. Provided numerous soils management services for minerals, range, timber, wildlife, recreation, and special use projects. Much of this activity was related to environmental assessment. Provided soils information for coal, gas and oil leasing, exploration, ad development. Reviewed company provided soils information for data adequacy standards.

Conducted and coordinated soil survey activities on lands administered by the Manti-LaSal National Forest covering about 1,400,000 acres. This included progressive soil surveys at the order of 3 intensity level on six different soil survey areas. It involved working closely with the Natural Resources Conservation Service as well as contractors. Prepared and administered contracts for three soil surveys. Completed a draft soil survey report for the Manti Division and contributed to the preparation of a draft soil survey report for the Monticello District of the Manti-LaSal National Forest. Contributed to ecological mapping, primarily at the section and subsection levels, and was part of a team to determine "properly functioning condition" of subsections.

Detailed to the Tongass Nation Forest at Sitka, Alaska during the summer of 1991 to work on soil/slope stability analysis of potential timber sales areas.

Soil Scientist GS-12 - USDA Forest Service

1977 - 1979: Served as a soils and reclamation specialist on an Interagency Environmental Task Force to evaluate proposed coal mining projects in the state of Utah. This task force involved working with several state and federal agencies and was under the lead of the US Geological Survey. Assisted in preparation of two Regional Environmental Impact Statements: one for Central Utah and one for Southern Utah. Was part of an I.D.Team to evaluate mine reclamation covering projects in an eight state area. Co-authored a publication on The Reclamation of Mined Lands in the Western Coal Region, USGS Circular 872. Complected the soils portion of the Nation Erosion Inventory on the Manti-LaSal National Forest.

Forest Soil Scientist, GS-11 - USDA Forest Service, Deschutes National Forest, Bend Oregon

1971 - 1977: Primary duties consisted of soil management assistance to Forest resource managers. Responsible for Environmental Analysis Reports and Impact Statements. Worked on soil, topography, climate and vegetation input for the Land Use Plan and Environmental Impact Statement for Deschutes National Forest. Soil management services were primarily related to sensitive soil areas where logging activities were proposed and to the use of prescribed burning in forest management. Also provided soil management assistance to the Bend Pine Nursery. Completed the final report of The Soil Resource Inventory of the Deschutes National Forest (1,852,000 acres).

Forest Soil Scientist, GS-11 - USDA Forest Service, Wayne-Hoosier National Forest, Bedford, Indiana

1968-1969: Conducted soil resource inventory and assisted in the Forest Soil Scientist with soil management services. Duties included soil mapping on aerial photographs, making soil profile descriptions, vegetation identification and correlation with soils, identifying soil-landscape relationships, and evaluating laboratory data obtained in soil investigations. Mapped about 21,000 acres at a scale of 4 inches to the mile. Aided in obtaining soils information on two recreation sites and several reforestation sites.

Research and Teaching Assistant - University of Minnesota, St. Paul, Minnesota

1965 - 1968: Conducted soil fertility studies on mineral and organic soils in northern Minnesota. Studies fertilization rates and dates of application as related to seed production and plant tissue analysis of Kentucky bluegrass and Timothy. Obtained soil and climatic data at various plot locations. Conducted soil chemical analysis tests. Acted as a teaching assistant by providing instruction for a three hour per week class in "Soil Fertility Evaluation." Wrote a Master's Thesis on "The Effect of Fertilization on Timothy Seed Production in Northern Minnesota."

Biological Aide, GS-4, USDA Forest Service - Tongass National Forest, Ketchikan, Alaska

1964 - 1965: Aide to a Soil Scientist conducting a soil resource inventory. Worked on the north half of the Prince of Wales Island. The job consisted of digging soil pits, assisting and making soil profile descriptions, plant identification and notations on distribution, and some independent soil mapping on aerial photographs.

AWARDS

Certificate of Merit for superior performance as a member of the Interagency Environmental Task Force on Coal.

Certificate of Merit for evaluation of factors leading to the preparation of the Forest Land and Resource Management Plan, Manti-LaSal National Forest.

Extra Step Award for soils presentation for Conservation Day on the Manti-LaSal National Forest.

Extra Step Award related to the minority employment program, Manti-LaSal National Forest.

Certificate of Appreciation for soils input to the plan and Environmental Assessment for the South Manti Timber Sale, Manti-LaSal National Forest.

Scholarship in Conservation, University of Wisconsin, Stevens Point.

PROFESSIONAL ORGANIZATIONS

Member of the Utah Society of Soil Scientists

PUBLICATIONS

Soil Resource Inventory of the Deschutes National Forest, Oregon, 1979.

Reclamation of Mined Lands in the Western Coal Region, Geological Survey Circular 272, Co-Author.

Conducted field work on Natural Resources Conservation Service Publications:
- Soil Survey of Canyonlands Area, Utah.
- Soil Survey of Fairfield-Nephi Area, Utah
- Soil Survey of San Miguel Area, Colorado

Numerous in-service Forest Service Reports in Forest Service files.

Thomas J. Suchoski

EDUCATION

MS, WATERSHED MANAGEMENT	1979
University of Arizona	*Tucson, Arizona*
BS, GEOLOGY	1977
Utah State University	*Logan, Utah*
OSHA HAZARDOUS WASTE SAFETY TRAINING	1987
CHANNEL RESTORATION SHORT COURSE	1986
Utah Division of Oil, Gas, & Mining	*Salt Lake City, Utah*
DESIGN OF WATER QUALITY MONITORING NETWORKS	1985
Colorado State University	*Fort Collins, Colorado*
GEOMORPHOLOGY SEMINAR AND SHORT COURSE	1980
U.S. Office of Surface Mining	*Denver, Colorado*

EMPLOYMENT

PRESIDENT/HYDROLOGIST	1999-PRESENT
Hydrologic Design	*Salt Lake City, Utah*
PROJECT MANAGER/HYDROLOGIST	1990-PRESENT
EarthFax Engineering, Inc.	*Salt Lake City, Utah*
SENIOR HYDROLOGIST	1989-1990
Powder River Coal Company	*Gillette, Wyoming*
SENIOR HYDROLOGIST	1987-1989
Sergent, Hauskins, and Beckwith Geotechnical Engineers	*Salt Lake City, Utah*
PROJECT MANAGER/HYDROGEOLOGIST	1986-1987
Uintex	*Salt Lake City, Utah*
HYDROLOGIST/ENGINEERING GEOLOGIST	1979-1980, 1984-1986
State of Utah, Division of Oil, Gas, & Mining	*Salt Lake City, Utah*
PROJECT HYDROGEOLOGIST	1982-1984
Ford, Bacon & Davis Inc.	*Salt Lake City, Utah*
PROJECT HYDROLOGIST	1980-1982
Vaughn Hansen Associates Inc.	*Salt Lake City, Utah*

EXPERIENCE

Responsibilities have included conducting and managing surface and groundwater projects for public and private clients. Groundwater projects included: supervision and contract management of groundwater well drilling activities for numerous projects for water quality monitoring and water supply development; preparation of well head source protection plans, water right applications, and permits and specifications for well drilling; design and installation of well monitoring networks to conduct hydrogeologic characterization and water quality sampling; design of groundwater interception and re-injection systems; design of spring collection systems; developed MODFLOW groundwater flow models and associated interface routines; performance of a sensitivity analysis of MODFLOW groundwater model for the Jordanelle Reservoir in northern Utah; modeling of groundwater flow for mines; groundwater flow and contaminant migration modeling for various facilities to determine the rate and extent of plume development and evaluated various treatment options; performance of a seepage study for a tailings facility to determine the extent of a contaminant plume; review and evaluation of a groundwater dewatering model for an open pit gold mine in New Guinea; evaluation and preliminary design of groundwater dewatering system for an open pit mine; evaluation, design, and installation of a groundwater dewatering well for a surface copper mine; analysis of data from numerous pumping tests for aquifer parameters; supervision and coordination of hydrogeologic characterization efforts at a hazardous-waste site; collection of groundwater quality samples and analysis of

chemistry data to determine compliance with water quality regulations; conducting and supervising groundwater quality characterization and environmental audits; evaluation of water quality data from problem sites not meeting water quality standards; analysis of water quality data using database management and GIS software; collection of water chemistry and aquifer parameters for hydrogeochemical characterizations of abandoned uranium mill tailings sites in the western United States; performance of hydrologic and geologic review and feasibility studies to locate a super conducting-super collider in western Utah; groundwater dewatering and water quality monitoring associated with a uranium mine in central Wyoming.

Surface water projects have included: supervision of hydrological aspects of environmental permitting for surface water diversions, impoundments, and runoff-control facilities; development and maintenance of runoff control plans for mine facilities; preparation of construction specifications for various surface water control projects; developed runoff-control plans for gold-ore heap-leach facilities in Nevada, South Carolina, and Utah; conducted runoff evaluations using SCSHYDRO and HEC-1 software for projects in West Texas, Arizona, Nevada, Montana, and Utah; designed surface hydrology facilities; evaluation of meander potential for rivers affected by channel modification and preparation of permit applications for stream channel alterations in Arizona, Colorado, Utah, and Wyoming; determination of scour and depositional potential of reclamation channels; design of storm water handling system for 1,500 acre subdivision in northern Utah; conducted surveys of stream channels, runoff control facilities (i.e., ditches, ponds, and outlet structures), and earthwork construction areas; conducted construction inspections, coordinated subcontractors for water resources projects and determined budgetary compliance; evaluation of erosion potential and sediment loading from reclaimed mining sites; determination of 100-year flood and associated flood plains for complex natural channels; design of runoff-control facilities for a probable-maximum flood (PMF) event; determination of flood-inundation areas associated with PMF and 100-year flood plains; collection of surface water base line flow, groundwater level, and water chemistry monitoring data; analysis of water quality data for compliance with water quality standards using database management software; supervised preparation of hydrologic, geologic, and engineering portions of coal and mineral mining permits in Colorado, Nevada, and Utah; development and management of capital improvements budget for hydrologic projects and permitting activities; preparation of a surface and groundwater monitoring database and evaluation of data for compliance with water quality standards using database management software; participated in environmental assessments and audits; coordinated large scale permitting projects with local, state, and federal agencies; collection of stream flow and surveyed cross-section data and water quality parameters; and performance of alluvial valley floor evaluations in Colorado, Utah, and Wyoming.

Engineering projects have included: preparation of grading plans for mine site reclamation, commercial sites, and residential subdivisions; design, layout, and specification of water wells, water systems, and water tanks and controls; and design and layout of expansion of existing sanitary sewer systems.

Managed computer network and workstations for both Netware and Microsoft operating systems. Configured hardware, installed software, conducted network maintenance and backups, and handled help desk functions. Managed CAD and GIS translation software use and customization. Provided advanced word processing, spreadsheet, database, Visual Basic, FORTRAN, and C software development. Worked with clients to ensure compatibility of the electronic data files with various systems and platforms.

MEMBERSHIPS

Association of Groundwater Scientists and Engineers
American Institute of Hydrology

CERTIFICATIONS AND REGISTRATIONS

Registered Professional Geologist (Utah)
Registered Professional Hydrologist (AIH)
Engineer in Training (Utah)

TABLE OF CONTENTS

200 SOILS . . . . . Page -2-
210 Introduction . . . . . Page -2-
211 Premining Soil Resources . . . . . Page -2-
212 Topsoil Handling . . . . . Page -2-
220 Environmental Description . . . . . Page -2-
221 Prime Farmland Investigation . . . . . Page -2-
222 Soil Survey . . . . . Page -3-
223 Soil Characterization . . . . . Page -6-
224 Substitute Topsoil . . . . . Page -6-
230 Operation Plan . . . . . Page -6-
231 General Requirements . . . . . Page -6-
232 Topsoil And Subsoil Removal . . . . . Page -9-
233 Topsoil Substitutes and Supplements . . . . . Page -15-
234 Topsoil Storage . . . . . Page -15-
240 Reclamation Plan . . . . . Page -17-
241 General Requirements . . . . . Page -17-
242 Soil Redistribution . . . . . Page -18-
243 Soil Nutrients and Amendments . . . . . Page -19-
244 Soil Stabilization . . . . . Page -19-
250 Performance Standards . . . . . Page -20-
251 Topsoil, Subsoil Removal Maint. Redistribution . . . . . Page -20-
252 Topsoil Stockpiles . . . . . Page -20-

List of Plates

Plate 2-1 Soils Map
Plate 2-2 Detailed Soils Map of Mine Facilities Site
Plate 2-3 Soil Salvage and Replacement Map
Plate 2-4 Soils Transfer Map for Operational Use

List of Appendixes

Appendix 2-1 Prime Farm Land Determination
Appendix 2-2 Soil Descriptions NRCS
Appendix 2-3 Soil Survey (1998)
Appendix A1 Detailed Soil Survey Map
Appendix A2 Salvaged Soils Map

repaired if erosion appears to be excessive.

Undisturbed islands located within the disturbed area will not be disturbed unless the mine reclamation plan is amended to allow for the disturbance. The islands will be signed as undisturbed to help protect them from any disturbance.

231.200. Soil inventories indicate that no topsoil substitutes will be needed.

231.300. Topsoil will be tested as per Section 243. If testing identifies a potential problem, additional samples may be collected to determine the extent and severity of the problem.

Vegetation monitoring will compare the results of plant growth on the replaced topsoil with the growth on the in-place soil materials. If there is a distinct difference between the two areas, the Operator will consult with the DOGM to determine the nature of the problem and will make corrections as recommended for improvement.

231.400. Construction of the topsoil storage site will begin by removing any large boulders and existing vegetation. Diversion ditches will be installed after the stockpiles are in place to channel drainage away from the stockpiles. Once the topsoil stockpile has been created with the material removed during construction of the proposed mine site, it will be reseeded and will remain in place until final reclamation occurs.

The surface of the stockpile will be left rough and irregular to increase retention of rainfall and snow melt. Seeding will be done following placement of the topsoil, and after September 15, to take advantage of winter moisture.

A silt fence or berm/ditch configuration will be installed at the perimeter of the pile to protect it from water erosion and vehicular traffic. Maintenance of the topsoil pile, during the life of the mining operation, will consist of: seeding the new stockpile, reseeding if erosion or other elements cause a loss of vegetation, and maintenance of the ditches and/or silt fence

in the stockpile areas.

232. Topsoil and Subsoil Removal

232.100 Prior to topsoil removal a five gallon bucket of biocryptic soil will be recovered and stored in a cool dry place for redistribution on the topsoil pile. Topsoil material will be removed from those areas of the mine yard where material will be excavated in order to achieve final yard configuration and which have been identified as suitable topsoil for reclamation based on the soil survey. This includes the access road to and around the topsoil pile. This material will be used to construct a berm around the topsoil pile.

The following volumes represent soil resources that may be available for salvage, storage and subsequent redistribution during reclamation. The actual amount salvaged will be reported to DOGM following topsoil removal and stockpiling operations.

AVAILABLE SOIL RESOURCES

Map Unit	Potential Salvage Depth In.	Potential Acres	Potential Estimated Volume YD3	Actual Salvage Depth In.	Actual Salvaged Acres	Actual Salvaged Top Soil YD3
SBG	48	11.83	76343	18	11.25	26873
VBJ	30	9.62	38801	18	4.51	9526
XBS	12	12.09	19505	12	4.78	7351
DSH	40	1.56	8389	18	1.40	3291
RBL	8	9.34	10046	8	2.59	2709
RBT	6	3.79	3057	6	0.77	486
TOTAL		48.23	156141		25.30	50236
Bank to Loose Cubic Yards *1.18 (Amount topsoil pile is designed to hold.)						(1) 59278

(1) An additional 800 yd^3 will come from the access road around the topsoil pile. This material will be placed in the berm around the topsoil pile.

The actual topsoil salvage will consist of removing a surface layer up to 18 inches thick over the disturbed area. If shale is encountered within 18 inches only the soil above the shale will be salvaged. (Plate 2-3). This would cover about 25 acres where soil would be salvaged and stored in the topsoil stockpile.

Total volumes of soil stored in the topsoil pile would be approximately 50,000 bank cubic yards. Removal of stones and boulders would be considered in volume estimates where they are part of the soil layer removed.

The stockpile has been sized to allow for bulking or swell of the soil as it is removed from the bank state to the loose state. A bulking number of 1.18 has been used. The area allowed for topsoil storage is 50,000 bank cubic yards x 1.18 which equals 60,000 loose cubic yards to be placed on the topsoil pile.

Boulders of approximately three feet in diameter and larger will be separated from the topsoil and piled or placed at appropriate locations such as adjacent to roads, pads etc. No attempt will be made to collect the large boulders into common piles. Boulders above ground level are in addition to topsoil volumes and may account for approximately 10,000 cubic yards.

UEI is not stockpiling large stones "boulders". Boulders will be pushed to the side and left during construction and then upon reclamation the boulders will be pushed back into the approximate location form which they came. Rocks of 36" or less will be stored in the topsoil pile with the soil and will be redistributed with the soil.

The approximate 60,000 loose cubic yards of topsoil will be stored in a topsoil pile as shown on Plate 5-2. This topsoil pile will be approximately 246' long and 146' wide with 2:1 slopes. The height of topsoil pile needed is approximately 26 feet. The pile as designed has the capability of storing well over the required 60,000 cubic yards. See Figure 1 for topsoil pile calculations.

232.410. This section is addressed in 232.700.

232.420. This section is addressed in 232.700.

232.500. Topsoil will be considered as the upper 18 inches of soil in most cases. Subsoil ranging in thickness from 12 to 30 inches from cutslope sites will be used as fill material for site development and replaced in an approximate original sequence during reclamation.

In order to verify subsoil depths, soil pedestals or other survey methods will be utilized for proper identification. Pedestals of undisturbed soil will be left at selected locations as reference points to show the type of soil thickness that has been removed from the slope cut areas. Records will be maintained to keep track of what materials are removed and where they are placed (topsoil storage or fill). Pedestals will vary in size depending on depth of cut. They will be designed to maintain stability of the soil column.

These soil pedestals may have to be removed once they have been properly logged to facilitate the mining operation.

An As-Built map will be prepared to show where soil materials have been used as fill material. This will include thickness records for topsoil, subsoil, and substrata. This information will be used to verify subsoil salvage depths according to Salvageable Soils Map Appendix A-2 of Appendix 2-3. This as built map will be incorporated into the Mining Reclamation Plan.

If shale is encountered in the slope cuts, the shale material will be separated from the other soil and returned to or near its original position upon reclamation.

Subsoils that are stored as pad material will be protected by a surface that is covered by asphalt, concrete, or gravel. The subsoil material will be under parking areas, buildings, roads, and storage sites. Graveled areas will have an impervious membrane placed between the subsoil and gravel.

Precautions will be taken to avoid contamination. In the unlikely event visual observations indicate that subsoil has become contaminated from oil and grease, salts, or other visual contaminates, the contaminated soil will be disposed of at a sanitary landfill site (probably East Carbon).

232.600. Topsoil will be removed from excavation areas and stockpiled prior to construction activity. Vegetation and boulders that might interfere with topsoil salvage will be removed prior to removal and stockpiling of the topsoil.

232.700. It is anticipated that topsoil can be salvaged on areas to be disturbed. Approximate thickness of subsoil by Soil Map Unit are: SBG - 30 inches, DSH - 22 inches, and VBJ - 12 inches.

232.710. Soil removal from some local sites may be difficult due to rockiness and steep slopes. The area between the rock slopes and the ROM coal stockpile is an area of concern. In the area between the rock slopes and ROM coal stockpile the disturbance is minimal. The topsoil will not be removed from this area due to steep slopes. To protect this area from coal contamination the conveyor will be enclosed. The area on either side of the conveyor for 20', will be periodically cleaned if accumulation of coal fines exceed one inch. Upon final reclamation this area will again be cleaned. Jersey Barriers will be installed to prevent the coal stockpile from encroaching this area. Topsoil will be removed in all areas of disturbance except for the area between the ROM coal pile and the rock slopes where either one or two bents will be constructed. Available underlying soils will be salvaged from stony disturbed areas. Areas too steep and rocky for equipment and where it would be unsafe or impractical for construction activities will not be included in the site development plan.

232.720. No substitute soil materials will be needed.

233. Topsoil Substitutes and Supplements.

erosion. As much as practical, the same vegetation techniques used on the main topsoil pile will be utilized on the fan topsoil berm. Silt fence will be utilized to prevent the topsoil from leaving the site.

Presently there is not a subsoil stockpile required for this project, therefore, details are not provided.

234.200. Section 232.100 contains information on the topsoil stockpile.

234.210. The stockpile site selected is on the Strych soil. It is a well drained and stable site on cobbly alluvium.

234.220. The stockpile will be located and protected to avoid contamination. Unacceptable compaction will not be permitted. In areas where undisturbed soils are in close proximity to coal mining or reclamation activities a 20 foot buffer zone will be delineated by "Undisturbed Area" signs. Quarterly inspections will be made to insure there is not an accumulation of coal dust or coal related debris. In the event coal dust is observed in excess of one inch on undisturbed areas, a vacuum truck will be employed to clean up residual coal dust and fines.

234.230. The stockpile will be mulched and seeded with the seed mix presented in Table 3-4. Up to 2 ounces of the sifted soil crusts will be added to each load of Wood fiber mulch applied to the top soil pile. The slopes will have an irregular, pitted surface to help retain precipitation and minimize runoff. Silt fencing will be placed at the base of the stockpile.

234.240. Plans are to leave the topsoil in place for the life of the mine.

234.300. These regulations are not applicable to the action described within this permit document.

234.310. These regulations are not applicable to the action

242.200. This section has been addressed in 242.100.

242.300. This section has been addressed in 242.100.

242.310. This section has been addressed in 242.100.

242.320. This section has been addressed in 242.100.

243. Soil Nutrients and Amendments. Nutrients and soil amendments will be applied to the redistributed material if deemed necessary by assessment of the laboratory analyses. Nutrients and amendments will be added, to make the redistributed soil similar to the undisturbed soils and aid in establishment of the vegetative cover. The nutrients will be added by hydro seeding.

The topsoil will be sampled and tested prior to replacement. Sampling will either be performed by a Certified Soil Scientist or by a person who is determined qualified by the operator and the Division. Grab samples will be collected from the stockpile approximately every 15' to a depth of approximately 18". Attempts will be made to sample the top, middle and bottom of the topsoil pile. The grab samples will be analyzed for nitrogen, phosphate and potassium. Fertilizer, if needed, will be applied to the topsoil prior to seeding and mulching activities.

244. Soil Stabilization.

244.100 Exposed surface areas will use vegetative stabilization where practical to control erosion and fugitive dust. Revegetative efforts (including regrading, topsoiling, fertilizing and mulching) will be conducted prior to the end of October.

244.200 After approximate original contour (AOC) is achieved, the surface will be prepared. Pocking will be the primary method used to roughen the surface. Pocking consists of imprinting the surface with a pattern of depressions as per Figure 1 in Appendix 5-8. The purpose of these pocks is to capture and retain water (moisture), and provide a cradle for seedlings and other plant materials.

In the event that soil crusts form on the topsoil stockpile, the Permittee will add up to 2 ounces of the sifted soil crusts to

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Soil and Plant Analysis Laboratory
255 WIDB
Provo, UT 84602
801-422-2147

Plant and Animal Science Department

SOIL TEST REPORT AND RECOMMENDATIONS

Name: Utah American Energy, Inc.
Street: P.O. Box 986
City: Price State: UT Zip: 84501

Date: 12-May-03
Time: 01:53 PM
Telephone: 637-5032 ext. 724

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
SBG 5/1/03	Turf							

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	2.16	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	4.99	X					apply 2.1 lbs of P2O5/1000 sq ft
Potassium ppm K	44.80		X				apply 0.9 lbs of K2O/1000 sq ft

Notes:

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SOIL TEST REPORT
AND
RECOMMENDATIONS

Name Utah American Energy, Inc.

Street P.O. Box 986

Price UT 84501

City State Zip

Date: 12-May-03

Time: 01:53 PM

Telephone: 637-5032 ext. 724

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
XBS 5/1/03	Turf							

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	2.07	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	4.00	X					apply 2.1 lbs of P2O5/1000 sq ft
Potassium ppm K	4.80	X					apply 1.4 lbs of K2O/1000 sq ft

Notes:

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RECOMMENDATIONS

Name Utah American Energy, Inc.
Street P.O. Box 986
Price UT 84501
City State Zip

Date: 12-May-03
Time: 01:53 PM
Telephone: 637-5032 ext. 724

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
RBL 5/1/03	Turf							

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	1.06	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	5.17	X					apply 2.1 lbs of P2O5/1000 sq ft
ssium ppm K	3.20	X					apply 1.4 lbs of K2O/1000 sq ft

Notes:

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SOIL TEST REPORT
AND
RECOMMENDATIONS

Name Utah American Energy, Inc.
Street P.O. Box 986
Price UT 84501
City State Zip

Date: 12-May-03
Time: 01:53 PM
Telephone: 637-5032 ext. 724

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
VBJ 5/1/03	Turf							

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	1.86	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	5.53	X					apply 2.1 lbs of P2O5/1000 sq ft
Potassium ppm K	28.80		X				apply 0.9 lbs of K2O/1000 sq ft

Notes:

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SOIL TEST REPORT AND RECOMMENDATIONS

Name Utah American Energy, Inc.

Street P.O. Box 986

Price UT 84501

City State Zip

Date: 12-May-03

Time: 01:53 PM

Telephone: 637-5032 ext. 724

Sample Identification	Crop to be grown	pH	% Sand	% Silt	% Clay	Soil Texture	Cation Exchange meq/100g	% Organic Matter
Mix XBS/VBJ 5/1/03	Turf							

Soil Test	Results	Very Low	Low	Medium	High	Very High	Recomendations
Nitrate-Nitrogen ppm N	2.28	X					apply 2.8 lbs of N/1000 sq ft
Phosphorus ppm P	7.34		X				apply 1.4 lbs of P2O5/1000 sq ft
Potassium ppm K	6.40	X					apply 1.4 lbs of K2O/1000 sq ft

Notes:

Lila Canyon Extension

Chapter 3
Biology

Volume 2 of 7

TABLE OF CONTENTS

300. BIOLOGY . . . . . Page -3-
310. Introduction . . . . . Page -3-
311. Vegetative, fish, and wildlife resources . . . . . Page -3-
312. Potential impacts . . . . . Page -3-
313. Proposed reclamation designed . . . . . Page -3-
320. Environmental Description . . . . . Page -3-
321. Vegetation Information . . . . . Page -3-
322. Fish and Wildlife Information . . . . . Page -4-
323. Maps and Aerial Photographs . . . . . Page -11-
330. Operation Plan . . . . . Page -13-
331. The permit area . . . . . Page -13-
332. The extent and degree of subsidence . . . . . Page -13-
333. Major Impact . . . . . Page -16-
340. Reclamation Plan . . . . . Page -20-
341. Revegetation . . . . . Page -20-
342. Fish and Wildlife . . . . . Page -24-
350. Performance Standards . . . . . Page -25-
351. General Requirement . . . . . Page -25-
352. Contemporaneous Reclamation . . . . . Page -25-
353. Revegetation . . . . . Page -25-
354. Timing . . . . . Page -26-
355. Mulch . . . . . Page -27-
356. Standards for Success . . . . . Page -27-
357. Extended Responsibility Period . . . . . Page -30-
358. Protection of Fish, Wildlife Values . . . . . Page -35-

List of Tables

Table 3-1 Threatened and Endangered Species
Table 3-2 Ranking of Wildlife Habitat
Table 3-3 Reclamation Time Table
Table 3-4 Permanent Seed List
Table 3-5 Interim Seed Mixture

List of Plates

Plate 3-1 Wildlife Habitat
Plate 3-2 Vegetation

List of Appendixes

Appendix 3-1 Vegetation Inventory Lila Canyon
Appendix 3-2 Productivity Within and Around the Permit Area
Appendix 3-3 USFWS Correspondence
Appendix 3-4 Threatened and Endangered Species Inventories
Appendix 3-5 Raptor Surveys
Appendix 3-6 UDWR Wildlife Report

300. BIOLOGY

310. Introduction.

311. Vegetative, fish, and wildlife resources of the permit area and adjacent areas are described in section 320.

312. Potential impacts to vegetative, fish and wildlife resources and methods proposed to minimize these impacts during coal mining and reclamation operations are described in sections 330 and 340.

313. Proposed reclamation designed to restore or enhance vegetative, fish and wildlife resources to a condition suitable for the designated post-mining land use are described under section 340.

320. Environmental Description.

321. Vegetation Information: The permit application contains the following vegetation information.

321.100. This section presents a discussion of the vegetation resources in the Lila Canyon Mine Extension Area and adjacent areas. The work was authorized initially by Kaiser Steel Corporation in 1982 and was referred to as the "South Least Tract." In 1985 Kaiser Coal incorporated a portion of the data from the South Lease and expanded it to include the Horse Canyon mine permit area. In 1990 this data was again updated and used to formulate the Mine Reclamation Plan for the Horse Canyon mine site and adjacent disturbance. This information can be found in the Horse Canyon MRP.

The Lila Canyon mine permit area encompasses a portion of the reclaimed Horse Canyon Mine and virtually all of the South Lease area (See Plate 1-1 Permit and Lease Areas). Aerial photography was used to map the vegetation within the permit area.

A vegetation inventory was commissioned by

UtahAmerican Energy, Inc. in 2003 to determine vegetation resources specific to the Lila Canyon Mine surface area. A copy of the report is included in Appendix 3-1.

321.200. A determination of the productivity of the land within and around the permit extension area was implemented by George S. Cook, Range Conservationist for the USDA Soil Conservation Service, (Retired) and is included in Appendix 3-2. Productivity of the vegetation in the grass-shrub resource area was 850#/acre. The pinyon juniper area to be disturbed the production was estimated to be 250 to 300 #/acre. The pinyon Juniper area, within the disturbed area, will be reclaimed to a grass shrub community.

322. Included in the permit extension application is fish and wildlife resource information for the extension area and adjacent areas.

322.100. The scope and detail of the fish and wildlife resource information presented in this chapter is sufficient to design the protection and enhancement plan.

322.200. Site specific resource information necessary to address the respective species or habitats is included.

322.210. The United States Fish and Wildlife Service publish yearly, in the federal Register, lists of endangered and threatened species. TABLE 3-1 cites federally listed threatened or endangered species which may occur in this area of Utah. Two species listed are potential inhabitants of the general area of Lila Canyon; the black-footed ferret, and bald eagle. Neither of these species have been observed within or adjacent to the permit area.

The proposed addition to the permit area does

not contain habitat for southwestern willow flycatchers. There are no perennial water sources or riparian areas in either the current permit area or the proposed addition, and according to verbal information from UEI's consultant, there are few, if any, willows or similar riparian-type vegetation associated with the seeps and springs in the proposed addition to the permit area. There may have been a few willows or shrubs, but there were no dense patches as would be required by southwestern willow flycatchers.

Lila Canyon Mine will have above-ground electrical power lines. These lines will be constructed to minimize potential hazards to all raptors new to the site, all will be designed and constructed in accordance with the guidelines set forth in Environmental Criteria for Electric Transmission Systems or as approved by DOGM.

322.220. The permit area for Lila Canyon Mine is located within the Price River Resource Area. Surface water in the adjacent areas drains into Grassy Trail Creek and Cottonwood Wash, both tributaries of the Price River. The environment around the 40.77 acre mine site is within the Upper Sonovan life zone. Vegetation within the area is associated with the Greasewood-Shadscale desert shrub community.

The Upper Sonovan life zone can provide habitat for approximately one hundred and forty-two species of wildlife. Two separate reports by the Utah Division of Wildlife Resources (DWR) identify species having potential to inhabit the region. The species that is considered to be of high interest in the local area is the Pronghorn. Pronghorns are found as year-long residents within and adjacent to the permit area. These

animals were transplanted to this site by the DWR in 1972 and are part of the Icelander Antelope Herd Unit II. Pronghorn prefer open sagebrush-desert and shrub-grassland habitats in areas of the Western United States. They are primarily browsers but are known to forage on grasses and forbs during spring and summer (FWS, 1978).

The pinyon-juniper woodlands, and interspersed sagebrush parks are winter range for mule deer. Many of the drier slopes are essentially juniper stands of scattered trees. The mule deer winter use is restricted to periods when snow is available or surface water is present during snow melt in the early spring, and the UDWR has rated this winter range as high priority.

Elk winter range is located at higher elevations than that of the permit area and is not a factor in the disturbed site.

Other wildlife in the pinyon-juniper woodlands are reptiles, passerine birds, lagomorphs, and small rodents.

The talus slopes in the canyon are home to rodents and reptiles. They are also used by chukars. Snake dens are unknown in the talus slopes.

The cliffs are generally north-facing and have potential as raptor nesting sites. Spring raptor inventories were initiated in the spring of 1998 and have been completed annually since 1998. The results of the annual raptor surveys are included in Appendix 3-5.

TABLE 3-1

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES
WHICH MAY OCCUR IN THE LILA CANYON AREA

Mammals	
Black-footed ferret (1)	(Mustela nigripes)
Birds	
Bald eagle (2)	(Haliaeetus leucocephalus)
*Southwestern willow flycatcher (2)	
Mexican Spotted Owl (3)	(Strix occidentalis lucida)
Fish (Do not occur, but theoretically could be impacted).	
Colorado squawfish	(Ptychocheilus lucius)
Bonytail Chub	(Gila elegans)
Humpback Chub	(Gila cypha)
Razorback Sucker	(Xyrauchen texanus)

(1) No confirmed sightings have occurred in Utah in recent years.

(2) Nests in Utah.

* No suitable nesting habitat within the permit area.

(3) Nests in Utah. (See Appendix 3-5 for Mexican Spotted Owl Habitat Survey Plan)

(A complete list of all potential T&E species found in Emery County is included in Appendix 3.3)

The intermittent / ephemeral stream channels lacks riparian vegetation; thus many bird species of high federal interest would not utilize this area example southwestern will flycatcher. The lack of trees or large shrubs precludes the use of woodpeckers. The stream channels do not support fish or an established invertebrate fauna.

The UDWR has submitted general information to be included in the wildlife plans of previous permit applications. Their information covers all the biogeological areas found on the Tavaputs Plateau which includes the Upper Sonoran, Transition, Canadian, and Hudsonian life zones. As noted previously only the Upper Sonoran life zone is represented within the permit area.

This UDWR general information is included in this application because it provides an overall description of the wildlife and wildlife habitats in the general area. The information is also useful in providing habitat information for design of the reclamation of the disturbed area. Thus the past wildlife habitat conditions can be emulated by reclamation and wildlife accommodated as they return to the mine site area upon final reclamation. (See Appendix 3-6, abbreviated)

The USFWS has submitted information over the years in commenting on the various wildlife plans submitted in prior permit applications. The ranking of wildlife values on coal-producing lands in Utah are found in Table 3-2 and are as follows:

1 = Crucial-critical habitat
2 = High priority habitat
3 = Substantial value habitat
4 = Seasonal

Table 3-2 Ranking of Wildlife Habitat

Species	Permit/lease Area	Management Area
Rocky Mt. Big Horn (Seasonal)	800 Acres	5,411 Acres
Elk (Winter habitat)	8,960 Acres	19,840 Acres
Elk (Summer habitat)	0 Acres	1,280 Acres
Mule Deer (Critical)	6,720 Acres	9,280 Acres
Mule Deer (Year Long)	960 Acres	16,000 Acres
Pronghorn Antelope (Year Long)	0 Acres	12,160 Acres

It is important to note that the actual disturbed area (approximately 40.77 acres) is not critical elk or deer winter range but is habitat for Rocky Mountain Big Horn Sheep.

According to DWR, Rocky Mountain Bighorn Sheep spend all year along the escarpments in the Lila Canyon area of the Book Cliffs. DWR and the Division visited the proposed disturbed area on June 11, 2002. Prior to the visit, the DWR representative was concerned that sheep may need to move further up the cliff when traveling the escarpments because of the mine and that sheep would likely leave the area. After the visit, the DWR representative felt that the sheep use of Lila Canyon may not be affected. The change in opinion may be due to the fact that the DWR representative was not familiar with the specifics of the mine plan until the site visit.

Rocky Mountain Big Horn Sheep appear to have a low tolerance for disturbance. Considering the low population density and the abundance of suitable similar habitat this impact appears to be slight.

The loss of range for Big Horn Sheep is mitigated and is defined in the Environmental

Assessment submitted in association with the Right-Of-Way applications.

The USFWS recognizes that the permit area is within range of endangered species, including the black-footed ferret *(Mustela nigripes)*, and the bald eagle *(Haliaeetus leucocephalus)*. (Letter dated February 4, 1998, Appendix 3-3)..

Raptor surveys were conducted in the spring of 1998, 1999, 2000, 2001, and 2002. The results of these survey are contained in Appendix 3-5. The entire Book Cliffs escarpment within the permit area was inventoried for cliff nesting raptors. In addition, a 1-mile buffer zone was inventoried around areas of potential development.

None of the Eagle nests in the close proximity to the mines surface facilities (less than 1/4 mile). have been active nor tended in the last three years. However, historically one active and one tended Golden Eagle Nest is within close proximity to the mines surface facilities. After consultation with USFW, Laura Roma, UDWR, Chris Colt, and BLM, Dave Mills, it was determined that there was a high probability these nest sites would be abandoned. A cooperative agreement with the regulatory agencies and UEI was finalized and is made part of the mitigation for the Lila Canyon EA. One nest discussed above, also lies in an area of potential subsidence which is a mute point due to its close proximity to the mine site. Since the nests are located so close to the mine surface facility, their future potential use was deemed to be lost and were so mitigated by a prey base off-site vegetation treatment project approved by the USFWS, UDWR and BLM. However, if this nest(s) or any future nest is lost as a result of mining activities (subsidence), UEI is committed to working with the Division who will then consult with USFWS and UDWR for

mitigation requirements.

The mitigation developed is based on the premise that there is sufficient nest sites in the area to accommodate the population base. The limiting factors appears to be available prey base. Mitigation is designed to enhance the prey base while concurrently enhancing habitat for big game, deer, elk, and bighorn sheep.

In addition, there are a number of aquatic Threatened and Endangered (T&E) species associated with the Colorado drainage systems. In the Lila Canyon Permit Area, there are no perennial streams, or ephemeral drainages which are in close enough proximity to perennial streams which could pose a potential threat to any aquatic species.

322.230. All known species or habitats needing special protection under state or federal law have been addressed.

322.300. Adequate copies of the Mine Reclamation Plan have been submitted to the Division to allow for distribution to the Fish and Wildlife Service for their review.

323. Maps or aerial photographs of the permit area and adjacent areas have been provided. Plate 3-1 Wildlife Habitats, is a map that shows all critical habitat, raptor nests and all special habitat features. This plate will be updated on an as needed bases to reflect current conditions such as new raptor nests and/or changes in wildlife use.

323.100. The location of the proposed reference area is shown on Figure 1 of Appendix 3-1. Appendix 3-1 is the report for the 2003 vegetation inventory. The reference area for the mine site disturbance was established during the summer of 2003. The reference area was chosen in an area which represents the natural premining conditions of the permit area. The reference area will facilitate the

determination of successful revegetation and the resultant final bond release for the Applicant.

323.200. Monitoring locations are shown on Plate 3-1 and can also be found on the raptor inventory map in Appendix 3-5.

323.300. Protection facilities: There will be no facilities used exclusively for the protection or enhancement of fish and wildlife. The goal of the mine is to construct all facilities and conduct mining in such a manner to minimize adverse impacts to wildlife. These measures will include but are not limited to:

1. Interim revegatation with desirable plant species for wildlife, with the exception of transportation corridors.
2. Speed limits on all roads to lesson potential for possible animal/vehicular collisions.
3. Wildlife awareness training to be incorporated into the annual safety training for all employees.
4. Possible restrictions on firearms on the mine site, and restrictions on off road vehicle usage to lesson disturbance.
5. Raptor surveys will be conducted 1-year prior to all purposed new construction or potentially disruptive mining activity.
6. An active golden eagle nest, with young, was documented during the 1999 spring raptor survey. The nest is located in the left fork of Lila Canyon within the 1-mile buffer zone. (See Plate 3-1). A consultation with USF&W, BLM, and UDWR was held in the fall of 1999. Line of site and potential mitigation was addressed during this meeting. The results of this consultation are addressed in Sec 322.220 and the Lila Canyon EA. This nest was not active in 200, 2001, or 2002.

323.400. Plate 3-2 Identifies each vegetative type and plant community. The sample locations used during the vegetation inventory can be found on Figure 1 of Appendix 3-1. Critical or high priority wildlife use areas

can be correlated to vegetation with the incorporation of the Wildlife Map, Plate 3-1.

Appendix 7-8 provides a description of each water monitoring location. In Summary monitoring locations L-6-G, L-7-G, and L-11-G have a habitat overstory of Douglas Fir-Mountain Brush association. Water monitoring location L-8-G has a habitat of predominantly pinyon - juniper and sagebrush grass associations. Water monitoring locations L-9-G, L-10-G, and L-12-G have some minor wet meadow habitat with an overstory of pinyon-juniper and sagebrush grass immediately adjacent along each side of the sites. Water monitoring sites L-16-G and L-17-G are both seeps and have a habitat of a mix of grasses and salt desert shrub with some invasive tamarisk.

Sites L-1-S, L-2-S, L-3-S, L-13-S, L-14-S and L-15-S are dry washes with a habitat consisting of sagebrush with an overstory of pinion-juniper.

Monitoring site L-4-S and L-5-G are for sediment pond discharge and for the mine discharge and have a habitat consisting of an overstory of pinion-juniper.

330. Operation Plan. A plan for protection of vegetation, fish and wildlife resources follows:

331. The permit area is approximately 5,992.07 acres of which only 40.77 acres are within the surface disturbance area. All incidental disturbance, which will not be utilized in operations, will be revegetated with an interim seed mix proven beneficial to wildlife. The revegetation plan is addressed in Section 341 and the seed mixes are addressed in Tables 3-4 and 3-5. Revegetation will occur the first desirable period following disturbance and/or abandonment.

332. The extent and degree of subsidence will be in large dependent on both the amount of overburden as well as the mining method. Employees and or consultants of the operator have numerous years of experience mining the Bookcliffs and Wasatch areas and none have observed nor are aware of any negative impacts on wildlife or vegetation, as a result of subsidence, with the exception of

1) Escarpment Failure which is not anticipated.

2) Disruption of Surface and / or Ground Water, which is not anticipated.

(1) Escarpments will be protected by implementing escarpment barriers. An escarpment barrier of a minimum of 200', within which no second mining will take place, will be used to protect all escarpments.

(2) Disturbance of Surface and / or Ground Water. Considering, the permit area has no surface water with the exception of intermittent or ephemeral flow associated with precipitation events and / or snow melt, subsidence should have no adverse effect. The ephemeral stream channels, in the area's of potential subsidence, will be monitored to insure there are no adverse impacts to the ephemeral flow.
No negative impacts to vegetation are anticipated. However, vegetation will be monitored in conjunction with subsidence monitoring, utilizing infrared aerial photography once every five years for those areas that are undermined. This will be done in accordance with the subsidence control plan. (See Section 525). Any loss of or diminished appearance of vegetation will be noted, confirmed on the ground, and a corrective plan to mitigate the loss will be submitted to the Division of Oil, Gas, and Mining for their approval and concurrence prior to implementation.

It is anticipated that the saturated zone will most certainly produce some water when intercepted in the course of mining. The effect could be positive in the event the mine were to discharge surplus water to the surface. Assuming the water quality was suitable for wildlife, a valuable enhancement fixture could be sustained at a minimum through the life of the mine. While it is possible subsurface disruption of ground water could occur as a result of subsidence it is problematically slight. (See Appendix 7-3 Probable Hydrologic Consequences (PHC).)

The losses of wildlife habitat and or vegetation through subsidence is not anticipated. The mined portion of the permit area will be monitored visually each spring for evidence of

subsidence. In the event vegetation and or wildlife habitat where impacted; mitigation could take the form of: 1) habitat enhancement - through selected manipulation of existing undisturbed areas to increase productivity of preferred forage species, and 2) off site water sources such as construction of guzzlers and stock water impoundments.

Each of the above would need to be analyzed on a site specific bases, taking all agencies (UDWR, UDOGM, and BLM) input into a viable, workable, course of action to be implemented by the mine and as stipulated in the Lila Canyon EA.

Table 3-3
Time Table of Reclamation

April 16, 2024	Begin Demolition
November 15, 2024	Complete Demolition
April 16, 2025	Commence Earthwork
August 30, 2025	Completion of Phase 1 (Earthwork) Lower Area
September 1, 2025	Begin Earthwork Road / Portal Upper Area
October 1, 2025	Seeding and Mulching (Weather dependent) Completion of Earthwork Upper Area
November 1, 2025	Planting Seedlings / Fencing
November 15, 2025	Reclamation Completed
July 2026	Ocular Estimates of Success (Remedial seeding if necessary September 2026)
July 2031	Quantitative Vegetation Inventory
August 2033	Quantitative Vegetation Inventory Site and Reference Area
August 2040	Quantitative Vegetation Inventory of Referenced Area and Project Site, Bond Release Criteria

333. Major Impact: The major impact to the wildlife in and around Lila Mine site will be loss of habitat. The loss of habitat will occur during the construction of the site, and will be residual throughout the life of the mine. The operational activities at the site will impact the wildlife slightly. But as observed at operations located in both the Book Cliffs and Wasatch plateau, most of the wildlife in the area will either accept or adjust their behavior to coexist with the operation.

The examples below are just some of the observations that the operator has experienced that demonstrates most wildlife accepts or adjusts to coexist with mining operations:

At U.S. Fuel Company, deer were observed crawling under railcars. Deer were observed fawning just inside old portals for three consecutive years.

At Genwal, deer have been observed on a consistent basis crossing a perennial stream to drink from the sediment pond. Bear and elk have been observed on numerous occasions from the bathhouse, office, and parking lot grazing only a few hundred feet away.

At Beaver Creek, deer have been observed drinking from the sediment pond on an almost daily basis. Bear, lion and elk were observed from the bathhouse offices. Deer were observed crawling under low conveyors instead of using a 10' elk crossing only 20' away.

At Kaiser, Rocky Mountain Bighorn Sheep were observed from the mine office on a regular basis.

At Horse Canyon Bighorn Sheep have been observed in and around the #1 and #2 sediment ponds. The Bighorns have been photographed grazing directly across the road from the inactive mine facilities.

Dust abatement and dust control as outlined in Chapter 5, such as covered conveyors, water sprays, and the minimization of large stockpiles will adequately protect adjacent undisturbed area within and surrounding the surface facilities.

First seam mining (Leaving the pillars) should adequately protect existing raptor nests from subsidence. All nests within a ½ mile

radius of the surface facilities were assumed lost due to indirect disturbance associated with mine activities. The Lila Canyon EA # UT-070-99-22, outlines mitigation recommended through a cooperative effort between Utah Department of Wildlife Resources, Bureau of Land Management, U.S. Fish and Wildlife and UtahAmerican Energy, Inc. where mitigation would be implemented to increase prey base off-site. The construction of alternative nests was considered to be ineffective. Eagle distribution was not limited by suitable nest sites but by available prey.

Construction at the mine to upgrade drainage controls and to construct the road will have a minor impact on wildlife in the area. The impact will mainly be increased human activity associated with the construction and a small, less than 40.77 acre, loss of habitat for the mine site, roads and sedimentation pond. These impacts will have little or no affect on the wildlife because they will be completed in an environmentally sound manner.

UEI will instruct all personnel as to current regulations regarding the use of off-road vehicles, firearm regulations, and where current UDWR proclamations are available. This training will be part of the annual refresher offered to all employees. The company will encourage strict compliance with these regulations.

DWR will be notified of any road kills involving large game and request to have them removed to safeguard raptors. Mine personnel will be instructed to remove road kills a safe distance from the road way.

The Lila Canyon Mine has agreed to mitigate the loss of wildlife habitat as well as the potential loss of habitat use due to disturbance.

This mitigation is under advisement of the wildlife professionals of both the BLM and the Utah Division of Wildlife Resources. The mitigation designed will offset impacts to bighorn sheep, mule deer, elk, and chukker specifically. The mitigation committed to in association with the Lila Mine EA is :

(1) Install two guzzlers

(2) Participate in a habitat enhance program on 70+ acres-conversion from Pinyon/Juniper to shrubs, forbs, and grasses.

333.100. This section is addressed in 333. And 333.300.

333.200. This section is addressed in 333. And 333.300.

333.200. The Applicant does not plan to monitor any wildlife species during the life of the operation with the exception of raptors. Helicopter spring raptor surveys will be conducted at a minimum of a 1-mile radius around any new or potentially disruptive mining activity, one-year prior to the proposed activity.

The mine will emphasize their commitment to legal requirements of firearm and off-road vehicle-use by employees. This type of program has been adopted by the operator and will continue throughout the operation. An education program aimed at minimizing potential negative impacts by employees will be presented during the Operators annual retaining programs. Employees will be informed about the wildlife in the area and about which species are protected. They will be counseled to refrain from poaching or harassing animals and about the need to preserve the wildlife. They will also be instructed on the danger of animals on the road during dusk and night hours and consequently the need to reduce speed to avoid colliding with animals difficult to see in these periods of poor light. All threatened or endangered wildlife sighted within or adjacent to the permit area will be reported to the appropriate state and / or federal agency.

The location and construction of the haulage road, as well as measures for the protection of surface hydrology, from sedimentation, including the sedimentation pond and other drainage control structures, are discussed in Chapter 7, Hydrology.

Any waters discharged from the facility will be monitored in accordance with UPDES Permit No.UTG040024. Major disturbances will be scheduled to avoid deer / antelope fawning times.

No use of pesticides or chemicals that have serious consequences to plants or wildlife will be used on the

permit area, unless recommended by a regulatory agency and under their direction.

Prevention of fires and their spreading outside the permit area will be accomplished through; water sprays, and fire extinguishers located at all facilities . Wild fires will be addressed by the appropriate state and federal agencies. Operation and reclamation activities will be done in compliance with the Endangered Species Act of 1973. As instructed by the Bureau of land Management and the Utah Division of Wildlife Resources, fencing will be removed when DOGM determines that all reclamation standards have been met. Further measures taken to enhance wildlife habitat during reclamation are discussed under the "Reclamation Plans" section of this chapter.

The interim reseeding of small areas will provide some small amounts of additional forage and seed. Reseeding will particularly benefit rodents and passerine birds seeking seeds in this sparse vegetative type. The seeding of sediment pond slopes usually provides a bonus crop of seeds as the plants are watered by intermittent runoff.

Within the disturbed area, there are areas of undisturbed ground such as in topsoil storage areas. These areas will be posted so as to preclude trespass by vehicles and/or mine equipment. In addition, dust control will be practiced throughout the life of the mine to minimize impacts from blowing dust .

The sediment pond on the disturbed area will hold water during short periods and will provide some additional surface water for wildlife. The stored water may prolong use of that portion of the winter range by deer because water is often the limiting factor on dry winter ranges. Migrating small birds and mourning doves will also utilize this water to recuperate during their flights, as well as a small indigenous flock of chukkers. In the event the water in the pond were to contain any material which would be hazardous to wildlife (ex: oil, grease), the material would be removed

by the use of petroleum selected filtration material. The filtration material will be used when an apparent sheen is visible on the pond. The pond will be monitored visually daily by surface personnel for signs of oil and grease.

340. Reclamation Plan.

341. A reclamation plan for final revegetation is presented below.

341.100. TABLE 3-3 is a timetable of reclamation activities upon cessation of operation. The tentative life of a mine is twenty years depending on market and mining conditions. As such, the time table is generic and no set year will be specified for the cessation and abandonment of operations.

341.200. This section is addressed in 341.210.

341.210. TABLE 3-4 indicates the species and amounts per acre of seeds to be used in revegetation.

The seed mixture used to revegetate the disturbed areas at Lila Canyon Mine is given on TABLE 3-4, along with the rates of application. The seed mixture was developed for the disturbed area with respect to a number of considerations. Climatic conditions of area and the availability of water were reviewed to assess the need for drought-tolerant species. The vegetation information was evaluated to determine the seed mixture needs corresponding to productivity, cover and diversity requirements. Data was gleaned from the soils report to select species adapted to the physical and chemical characteristics of the potential seedbed.

341.220. The disturbed area will be reclaimed after all operations have ceased at the mine site and all

pertinent structures have been removed. The coal will be loaded out and the surface will be left relatively free of debris. The area will be recontoured to approximate pre-mine configurations. The soil will then be ripped to a depth of 16 -18 inches.

The previously salvaged top soil will then be redistributed over the total disturbed area. Soil depth and soil cover are addressed in Chapter 2.

The seedbed will be prepared by completing the final grading and again ripping the area to a depth of 6-18 inches or to bedrock. Ripping the soil will be completed at a speed that maximizes the action of the ripper shanks and promotes spoil material disruption to the required depth.

During the final ripping process, seedbed material will be collected and sent to a laboratory for analysis to determine fertilizer requirements. The fertilizer recommendations will be added to the soil at the specified rate of application. Seed and fertilizer will be distributed utilizing a hydroseeder.

The final gouging will be done with the contour to help reduce the potential for erosion and act to trap moisture.

Hydroseeding operations will not be conducted when wind velocities would interfere with the even distribution of the material. All efforts will be made to attain an even distribution of seed. (See Appendix 5.8)

Once Hydroseeding is complete, the area will be hydromulched, see Appendix 5-8 and Section 341.230.

The area will be seeded and fertilized with the recommended species (see TABLE 3-4), and

nutrients at the specified rate of application. At present a general recommendation indicates that 100 pounds per acre of 16-16-8 will need to be added as a nutrient.

All efforts will be made to insure the quality of materials purchased for reclamation activities are maintained throughout all work. Commercially purchased seed will have the seed names, lot number, percentages of purity, germination, hard seed and percentage of maximum weed seed count clearly marked on each container. No seed will be accepted if they contain seeds of a state-recognized noxious weed species. Sources for "common" seed should be those with climatic and elevational characteristics as close to site characteristics as possible. Legume seed will be inoculated with the correct Rhizobium.

341.230. The site will be hydro-mulched with 2000 lbs. per acre wood fiber mulch in combination with 100 lbs. per acre of a dry based tacifying agent.

341.240. There will be no irrigation or supplementary water used during or after the revegetation of the area. There are no planned pest or disease control measures for the mine site reclamation. Pest or disease control measures may be included in this plan if results from the test plot and / or reference area indicate a need. The measures will be consistent with proper rangeland and wildlife management.

TABLE 3.4/3.5

INTERIM AND FINAL RECLAMATION SEED MIX

Recommended Seed Mix for Lila Canyon Mine

	Pounds PLS/Acre
Needle and Thread Grass	**2**
Indian Ricegrass	**2**
Basin Wild Rye	**1**
Galleta	**1**
Bluebunch Wheatgrass	**1**
Slender Wheatgrass	**2**
Blue grama	**1**
FORBS	
Blue Flax	**1**
Palmer Penstemon	**0.25**
Globemallow (*Sphaeralcea ambigua*)	**0.5**
Indian Paintbrush (*Castilleja liniaeriaefolia*)	**0.1**
Fringed Sage	**0.1**
SHRUBS	
Wyoming Big Sage	**0.25**
Green Rabbitbrush	**0.5**
Fourwing Saltbush	**3**
Winterfat	**1**
Shadscale	**1**
Cliffrose	**1**
Black Sage	**0.25**

341.250. A reference area for the mine site disturbance was established adjacent to the proposed facilities during the summer of 2003 (Figure 1, Appendix 3-1). The reference area was chosen in an area which represents the natural premining conditions of the permit area. This reference area will facilitate the determination of successful revegetation and the resultant final bond release for the Applicant.

Comparisons of the revegetated area and the reference area will be made using the data obtained from the ninth and tenth year sampling. This data will be used to obtain statistical information that will show the site meets the requirements for bond release.

341.300. The methods outlined have a proven performance based on the successful reclamation of the Horse Canyon Mine in the immediate drainage to the north (less than two miles) in like habitat and aspect.

342. Fish and Wildlife. A fish and wildlife plan follows:

342.100. The sediment pond will be maintained through the life of the operation and will be removed when effluent criteria is met following reclamation.

342.200. Rangeland for domestic stock is the secondary intended postmining land use with wildlife habitat as the primary land use. Plant species appropriate for enhancing the wildlife habitat were selected on the basis of known wildlife requirements including nutritional value for fish and wildlife, use as cover for fish and wildlife and ability to support and enhance fish and wildlife habitat. The Pinyon/Juniper area will be enhanced and reclaimed to the Grass/Shrub community type. The habitat type provides excellent winter range for big game, as well as, an increase in rodent populations which in turn are beneficial to raptors The Lila Canyon EA has stipulated that in excess of 70

acres of wildlife habitat will be enhanced to offset negative impacts associated with the disturbance created by the mine-through the life of the mine and until such time as the site is fully reclaimed.

342.210. This section is addressed in 342.200.

342.220. This section is addressed in 342.200.

342.230. This section is addressed in 342.200.

342.300. This section is not applicable.

342.400. This section is not applicable.

350. Performance Standards

351. All coal mining and reclamation operations will be carried out according to plans provided under R645-301-330 through R645-301-340.

352. Lila Canyon Mine will implement contemporaneous reclamation on all areas that are disturbed through construction or in the course of mining that will not be utilized for future activity that constitutes continued disturbance.

353. General Requirements. The Permittee will establish on regraded areas and on all other disturbed areas a vegetative cover that is in accordance with the approved permit and reclamation plan. The first available season following abandonment / completion the area will be seeded and mulch in accordance with the approved reclamation plan.

353.100 The contemporaneous seed mix TABLE 3-5 is capable of self-regeneration.

The seed mix in Table 3-5 is designed to be compatible with native plant species and beneficial to the animals indigenous to the area for both forage and cover.

All seed used in contemporaneous revegetation will be certified and in compliance with all state and federal laws governing seeding.

353.130. The vegetative cover will be at least equal in extent of cover to the natural vegetation of the area; and

353.140. Capable of stabilizing the soil surface from erosion.

353.200. The reestablished plant species will:

353.210. Be compatible with the approved postmining land use:

353.220. Have the same seasonal characteristics of growth as the original vegetation:

353.230. Be capable of self-regeneration and plant succession:

353.240. Be compatible with the plant and animal species of the area; and:

353.250. Meet the requirements of applicable Utah and federal seed, poisonous and noxious plant; and introduced species laws or regulations.

353.300. The Division may grant exception to the requirements of 353.220 and 353.230 when the species are necessary to achieve a quick-growing, temporary, stabilizing cover, and measures to establish permanent vegetation are included in the approved permit and reclamation plan.

353.400. There are no prime farm lands within the permit area or anticipated crop lands.

354. Timing: Seeding will occur between September 30 and may proceed

up until March 30 depending on snow and frost condition

DOGM has expressed a concern over the fall planting of the warm season species, Blue grama and Galleta. Both of these species are in evidence at the Horse Canyon Site, which was reclaimed in the fall of 1991. However, UEI is committed to use these species in the interim seed mix, adjacent to the sediment pond. Area 1, the Southeast corner, and Area 4 the Northwest corner of the pond disturbance, will be seeded mid summer (July) following the construction. Area 2, the Southwest quarter and Area 3 the Northeast quarter of the disturbance, will be seeded late fall (October) following construction. The line separating the four areas will be staked on the ground. Ocular estimates of the success of the reclamation will be implemented each fall for 3 years following the reclamation. In year 4, if there appears to be an apparent difference in success, a quantitative sample will be taken. The sample will identify both species composition as well as overall vegetative cover for both areas.

If in the event a conclusion as to the timing of planting results in a significant degree of success, the reclamation plan can be modified during the 5 year renewal process.

355. Mulch will be applied on the same bases as indicated for permanent reclamation.

356. Standards for Success:

356.100 Success of revegetation will be judged on the effectiveness of the vegetation for the approved postmining land use, the extent of cover compared to the extent of cover of the reference area.

356.110. Standards for success, statistically valid sampling techniques for measuring success, and approved methods are identified in the Division's "Vegetation Information Guidelines, were followed closely. (See "Lila Canyon Vegetation Inventory" found in Appendix 3-1)

356.120. Standards for success recommended in the "Vegetation Information Guidelines" were followed closely. (See "Lila Canyon Vegetation Inventory" found in Appendix 3-1)

356.200. Standards for success will be applied in accordance with the approved postmining land use of wildlife and incidental use by domestic stock.

356.210. This Section does not apply since the area is post mining wildlife habitat, with incidental use by domestic stock.

356.220. This Section does not apply since there are no agriculture lands within the permit area and no prime farm lands. See Chapter 2, Appendix 2-1 (Prime Farmland Letter).

356.230. Success of vegetation will be determined on the basis of tree and shrub stocking and vegetative ground cover. Such parameters are described as follows:

> The requirements for cover, productivity and woody plant density are, at least 90% of the cover, woody plant density and productivity of the reference area with 90% statistical adequacy. The site will be sampled in a manner similar to the method used to sample the reference area.

Diversity will be determined with the following method:

1) All species encountered with at least a 20% frequency in the vegetation sampling will be categorized into life forms. The life form categories that will be used are native grass, native broadleaf forbs, native shrub, desirable introduced, and undesirable. Undesirable species are

those generally classified as weeds or that are poisonous to livestock. If there is any question whether a species should be considered undesirable, the Division and UtahAmerican will consult with the Emery County Weed Department.

2) The standard will be that the reclaimed area must have at least as many native grass, native broadleaf forbs, and native shrub species occurring at 20% or greater frequency as the reference area. For example, if the reference area has 3 native shrub species occurring at 20% or greater frequency, the reclaimed area must also have this many species. The species do not need to be the same.

Essentially the same method would be used to judge seasonality, but the only categories would be warm and cool season.

Erosion control relative to both vegetation density and species composition would be based on effluent standards as committed in the UDPES permit. All drainages leading away from the permit area will be sampled as often as practical. When effluent standards are met, the vegetation will have demonstrated its erosion control effectiveness. Woody plant density for the entire area will be established with 1,500 plants per acre, unless the Divisions consultation with area agencies determines a different density.

356.231. (See Section 256.230)

356.232. Tree stocking / woody plant density will meet or exceed UDOGM guidelines for bond release.

356.233. Success standards for vegetative ground cover: (See Section 256.230)

356.240. This Section does not apply since no portion of the permit area will be used for industrial, commercial or residential use.

356.250. No pre-law mining occurred on the Lila Canyon Permit area.

356.300. Lila Canyon Mine is committed to maintain siltation structures until vegetative cover is adequate to allow runoff to meet affluent limits as directed by UDOGM at a minimum two years following vegetation establishment.

356.400. Lila Canyon Mine will have all disturbance associated with removal of siltation structures seeded and mulch in accordance with the approved revegetation plan.

357. Revegetation: Extended Responsibility Period.

357.100. The period of extended responsibility for successful vegetation will begin after the last year of seeding, fertilization, irrigation, or other work, excluding approved husbandry practices.

357.200. Vegetation parameters will equal or exceed the approved success standard during the growing seasons for the last two years of the responsibility period. The period of extended responsibility will continue for five or ten years based on precipitation data.

357.210. Since Lila Canyon has an average annual precipitation of less than 26.0 inches this section is not applicable.

357.220. The mine plan area averages nine inches at the lowest elevation (area of greatest

disturbance) to fourteen to sixteen inches at the highest elevation. Lila Canyon Mine will assume the ten year bond liability period.

357.300. Husbandry Practices - General Information

357.301. Lila Canyon Mine would like to reserve the right to apply for augmentation of reclaimed area extending the bond liability period on a site specific case scenario.

357.310. Reestablishing trees and shrubs

357.311. Trees or shrubs may be replanted or reseeded at a rate of up to a cumulative total of 20% of the required stocking rate through 40% of the extended responsibility period.

357.312. Lila Canyon Mine has incorporated wood plant / tree seeding into the seed mix (see TABLE 3-4). If after two years following seeding and mulching it is apparent that woody plant density / tree cover appear to be insufficient for bond release; the mine may elect to re-enter selected areas and augment the direct seeding with either / or containerized or bare root seedlings, this determination will need to be made on a site specific bases. The goal for bond release is the establishment of 1500 woody plants per acre.

357.320. Based on similar reclamation projects in adjacent areas, the need to control weeds other than by selected removal is unlikely. In the unlikely event that weed control is required by chemical means, R645-357357.321 will be followed. In the unlikely event that weed control is required by Biological means, R645-357.323 will be followed. In the unlikely event that weed

control is required by mechanical means, R645-357.322 will be followed.

357.321. In the unlikely event that weed control is required by Chemical means, R645-357.321 will be followed by mine personnel.

357.322. In the unlikely event that weed control is required by Mechanical means, R645-357.322 will be followed by mine personnel.

357.323. In the unlikely event that weed control is required by Biological means, R645-357.323 will be followed by mine personnel.

357.324. In the unlikely event that weed control practices damage desirable vegetation, R645-357.324 will be followed by mine personnel.

357.330. Wildlife habitat is the priority post mining land use. As such, control of wildlife is not anticipated.

357.331. Wildlife habitat is the priority post mining land use. As such, control of wildlife is not anticipated.

357.332. Mine personnel do not anticipate a need to implement control measures for small mammals or insects. However, in the unlikely event that control is necessary, R645-357.332 will be followed. The Division must approved

animal control methods sited in R645-357.332.

357.340. Natural Disasters and Illegal Activities Occurring After Phase II Bond Release. Where necessitated by a natural disaster, excluding climatic variation, or illegal activities, such as vandalism, not caused by any lack of planning, design, or implementation of the mining and reclamation plan on the part of the Permittee, the seeding and planting of the entire area which is significantly affected by the disaster or illegal activities will be allowed as an accepted husbandry practice and thus will not restart the extended responsibility period. Appendix C of the Division's "Vegetation Information Guidelines" references publications that show methods used to revegetate damaged land. Examples of natural disasters that may necessitate reseeding which will not restart the extended responsibility period include wildfires, earthquakes, and mass movements originating outside the disturbed area.

357.341. The extent of the area where seeding and planting will be allowed will be determined by the Division in cooperation with the Permittee.

357.342. All applicable revegetation success standards will be achieved on areas reseeded following a disaster, including R645-301-356.232 for areas with a designated postmining land use of forestry or wildlife.

357.343. Seeding and planting after natural disasters or illegal activities will

only be allowed in areas where Phase II bond release has been granted.

357.350. No Irrigation is anticipated.

357.360. Rills and gullies in excess of eight inches width and / or depth will be repaired on a seasonal bases. Repairs will be made in such manner that minimizes additional disturbance and yet is cost effective based on site specific conditions.

357.361. After the first 20% of the extended responsibility period but prior to the end of the first 60% of the responsibility period or until Phase II bond release, whichever comes first, highly erodible area and rill and gully repair will be considered augmentative, and will thus restart the responsibility period, if the area to be repaired is greater than 3% of the total disturbed area or if a continuous area is larger than one acre.

357.362. The extent of the affected area will be determined by the Division in cooperation with the Permittee.

357.363. The area affected by the repair of highly erodible areas and rills and gullies is defined as any area that is reseeded as a result of the repair. Also included in the affected areas are interspacial areas of thirty feet or less between repaired rills and gullies. Highly erodible areas are those areas which cannot usually be stabilized by ordinary conservation treatments and if left untreated can

cause severe erosion or sediment *damage.*

357.364. The repair and/or treatment of rills and gullies which result from a deficient surface water control or grading plan, as defined by the recurrence of rills and gullies, will be considered an augmentative practice and will thus restart the extended responsibility period.

357.365. The areas of concern on the initial reclamation are those natural drainage channels which will be reconstructed during the earth moving phase of reclamation. Specific design and specifications are included in Chapter 7 (Drainage Design). All regraded areas in excess of three percent slope will be sacrificed to aid in the retention of moisture and minimize erosion. Areas in excess of 3:1 slopes will receive additional mulch and tac to facilitate vegetation establishment.

358. Protection of Fish, Wildlife Values: Mine personnel will be trained annually on environmental awareness, a portion of the training will deal with wildlife concerns, such as avoidance during stress periods, caution in driving to and from work during peak usage periods, recognition of any threatened and endangered species etc. Speed limits will be posted to minimize vehicular / wildlife accidents. In addition, all suitable water encountered during mining will be discharged in such a manner to make it available to wildlife.

358.100. Appendix 3-3 is a letter from U.S. Fish and Wildlife Service identifying all threatened and endangered species that could occur in the permit area or within a

one-half mile proximity. All mine personnel will be trained to identify these species and instructed to notify the environmental coordinator at the mine. The environmental coordinator will confirm, if possible, the identification, notify the Division, and then take what ever actions are necessary to safeguard both the species and it's habitat.

In addition, a threatened and endangered species inventory will be conducted prior to any disturbance. Historical as well as current threatened and endangered inventories are included in Appendix 3-4.

Prior to any disturbance a raptor inventory will be conducted to ensure that no raptors or their nests or young would be adversely impacted through any mining or mine related activity. A copy of historical raptor data as well as current survey results are attached as Appendix 3-5.

A one-half mile buffer zone of no disturbance during critical nesting periods will be maintained during that portion of the year that the nest sites are active.

358.200. No coal mining and reclamation operations will be conducted in a manner which would result in the unlawful taking of a bald or golden eagle, its nests, or any of the eggs.

358.300. This section is addressed in 358.200.

358.400. There are no wetlands and / or riparian areas within the area of potential disturbance.

358.500. Each operator will, to the extent possible using the best technology currently available:

358.510. All power and transmission lines will be designed with the best technology available to safeguard raptors.

358.520. All structures; fences, conveyors etc., will be designed to allow free movement of

large mammals except in those areas where it is necessary to preclude large animals for their own safety; example: power substations, oil storage area etc.

358.530. All structures; fences, conveyors etc., will be designed to allow free movement of large mammals except in those areas where it is necessary to preclude large animals for their own safety; example: power substations, oil storage area etc.

Lila Canyon Vegetation Survey - 2003

Submitted by

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January 2004

Abstract

A vegetation inventory was conducted at site of the proposed Lila Canyon Extension to the Horse Canyon Mine property between June and September 2003. A reference area was selected close to the proposed mine site and data were collected regarding percent cover and shrub density for the proposed Reference Area and proposed Disturbance Site. The Reference Area and Disturbance Site were compared to determine similarity. Sites were similar with respect to species composition, percent cover of vegetation, and woody plant density.

Table of Contents

Page Number

Abstract 2

Table of Contents 3

Introduction 4

Materials and Methods 4

Results 7

- Cover 8
- Woody Plant Density 9
- Species Diversity 10
- Productivity 14
- Similarity 14

Appendices 17

- Appendix 1- Maps 18
- Appendix 2 - Cover Data Sheets 19
- Appendix 3 - Woody Plant Density Data Sheets 20
- Appendix 4 - NRCS Productivity Letter 21
- Appendix 5 - Similarity Table 22
- Appendix 6 - Lila Canyon Revegetation Seed Mix 24
- Appendix 7 - Presence of Plant Species of Concern 26
- Appendix 8 - Photographs 27
- Appendix 9 - References 30

Introduction

In June of 2003, Dr. Mike King was contacted by UtahAmerican Energy about conducting a vegetation survey on the proposed site for the Lila Canyon extension of the Horse Canyon mine site located in eastern Emery county. Meetings were held between Dr. King and Utah American Energy and the Utah Division of Oil, Gas and Mining to discuss and determine the scope of the project. Fieldwork was initiated in July and continued through August 2003. The purpose of the study was to inventory vegetation on the proposed disturbed site, establish a reference area, inventory the reference site and compare the Reference area and the disturbance site and determine the level of similarity of the 2 sites. This baseline data is to be used in assisting with preparation of premining documents.

Data collection was to include percent cover, percent cover by species, woody plant density, species diversity, and productivity for each site as well as a simnilarity comparison between the 2 areas. The information below includes summary and analyses of these vegetation surveys.

Materials and Methods

Vegetation surveys were conducted in 2 areas. One site was included the area designated for disturbance when mining activities begin. The other was a reference area to be used for future vegetation comparisons after mining activities are initiated. The reference area was selected based on similarities to the proposed disturbed sites with respect to slope, aspect, and general topographic characteristics. On July 2, 2003 Dr. Jerriann Ernsten, DOGM Biologist, accompanied Jay Marshall, Lila Canyon Project Engineer, and Dr. Mike King, Principal Investigator to select the reference area for the Lila Canyon project. Dr. Ernsten also worked with Dr. King on July 9 in collecting cover data for the reference site.

The Reference Area that was selected and approved is located approximately .10 miles in a generally southwestern direction from the disturbance site. It is approximately 100 m^2 or roughly 2 acres in size. Maps of Reference Area and Disturbance Site including transect locations is in Appendix 1. See photographs of the 2 areas in Appendix 8.

Vegetation Surveys were carried out according to the Division of Oil, Gas and Mining (DOGM) vegetation sampling methods (February 1992 Revised DOGM Vegetation Information Guidelines). Data collected during the surveys were used to determine ground cover, cover by species, species diversity, and woody plant density. A comparison of the Reference area and the disturbed site was made to determine similarity of the 2 areas.

Mr. Marshall, also requested that we conduct cursory surveys in the Lila Canyon area to determine the presence of 3 plant species of concern. The plants of concern were: 1) Creutzfeldt-flower (*Cryptantha creuzfeldtii* Welsh) a member of the Boraginacae family, 2) Coal-cliffs Sweet Vetch (*Hedysarum occidentale* var. *canone*) a member of the Fabaceae family, and 3) Horse Canyon Stickleaf (*Mentzeliea multicaulis* var. *librina* Thorne & F.G. Sm.). The results of these surveys are reported in Appendix 7.

Percent Cover

The point-intercept method was used to sample cover. A total of 15 - 100 ft sampling transects were run at each revegetation site to determine percent cover. Transects were located using coordinates selected from a random number table. Coordinates were paced off and a compass direction was selected using the random number table as well. Once transect start point and compass direction were established, investigators laid out a 100 ft tape in the appropriate direction and then walked the length of the tape to record vegetation. Investigators took samples at 2ft intervals along the length of the tape. A total of 50 points were recorded for each transect. Similar methods were used in the reference area.

Cover categories included: 1) Physical Features including a) bare ground (rock or soil material less < 12 inches in diameter), b) litter (dead plant material lying on ground surface), c) rock (rock material >12 inches in diameter), 2) Cryptobiotic Soil, 3) Vegetation including a) shrubs b) forbs and succulents (cactus species), c) grasses, and d) trees. When possible, plants were identified to species level. Points were selected by viewing the transect at 2 foot intervals with an ocular viewing device with cross hairs. When there was an overhead canopy, verticle projections were made above the 100 ft tape to include the highest level of vegetation in the sample.

Adequacy of sample size was determined as per DOGM guidelines (DOGM 1992); see Table 1. Sample adequacy for cover was met at the 90% confidence level with a 10% change in the mean as required by DOGM. For cover, 30 transects were run in the Disturbance Site (a total of 1500 points) and 20 samples (a total of 1000 points) were collected in the Reference Area.

Table 1. Minimum sample sizes (based on 15 samples)				
	Disturbance Site		**Reference Area**	
	Cover	**Woody Plant Density**	**Cover**	**Woody Plant Density**
Mean	50.67	32.87	43.60	24.13
Standard Deviation	15.60	14.07	11.01	12.81
Minimum sample size	29.38	56.84	19.78	87.39

Woody Plant Density

Woody plant densities were estimated using the belt transect method (DOGM 1992). A total of 15 - 100 ft X 10ft transects were run in each area to determine woody plant density. Transects were located using coordinates selected from a random number table. Coordinates were paced off and a compass direction was selected using the random number table as well. Once transect start point and compass direction were established, investigators walked the length of the transect and recorded species of all individual shrubs rooted in each belt. Total number of plants per acre was calculated using DOGM guidelines (plants counted in the plot X 43,560 / 1000 sq. ft.). Minimum sample sizes were not followed for determining woody plant density. Minimum sample sizes were 57 and 87 respectively for Disturbance Site and Reference Area respectively. These numbers, particularly for the Reference Area, are high. Eighty-seven samples in a $100m^2$ area had the potential to be very disturbing to the plant community. Based on these considerations, 15 samples were taken to determine woody plant density for the 2 sites. These numbers were consistent with previous vegetation surveys done in the area.

Species Diversity

Species diversity lists were compiled based on data collected during cover sampling. Lists include total number of species and percent cover of each species.

Productivity

Productivity for the areas was determined through consultation with Natural Resources Conservation Service (NRCS) Biologists as per DOGM Guidelines

(DOGM 1992). A visit was made by Mr. Dean Stacy, NRCS Biologist, on August 21, 2003 to determine Productivity. Ocular estimates were used to determine productivity for the 2 areas as per NRCS procedures.

Similarity

Similarity of the proposed Disturbance Site and the Reference Area with respect to species composition was determined using both the Jaccard's Community Coefficient and the Sorensen's Community Coefficient (DOGM 1992). Data was collected while inventorying the 2 sites for cover. Comparisons were also made between the 2 areas with respect to average percent cover and woody plant density. These parameters were tested statistically using the Two-tailed t Test.

Results

The proposed Lila Canyon Extension of the Horse Canyon Mine is located in an area dominated by Pinyon-Juniper (*Pinus edulis, Juniperus osteosperma*) and Grass-Shrub (especially Salina Wild Rye , *Elymus salinus* and Shadscale, *Atriplex confertifolia*) communities. All areas also have significant numbers of Snakeweed, *Gutierrezia sarothrae*, and Cheatgrass, *Bromus tectorum*, both invasive species.

The survey was conducted during a very dry year. Annual precipitation at the Sunnyside City Center weather station (approximately 10 miles north of Lila Canyon) and the Price Warehouses weather station (approximately 35 miles west of Lila Canyon) was below long-term averages for both sites. The precipitation for the 2003 water year (Oct 1, 2002-Sept 31,2003) was 10.53 inches compared to the 30 year average of 13.87 inches. Similarly annual precipitation for the Price Warehouses station for the 2003 water year was 5.96 inches compared to a 25 year average of 9.3 inches (See Table 2 - Utah Climate Center records, Utah State University, Logan, Utah).

Table 2. Precipitation by Month for Price Warehouses and Sunnyside City Center Weather Stations

Station	Precipitation in Inches (2003 Water Year)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Price	.50	.63	.51	.13	.48	.96	.28	.56	.12	.60	.78	.40	5.96
Sunnyside	.84	.94	.59	.18	1.40	1.20	.74	1.15	.71	1.07	1.34	.37	10.53

This pattern is typical of most regions in Utah due to several years of drought

throughout the state. This prolonged period of reduced moisture has no doubt had an effect on plant production and survival throughout the state and the eastern Utah area.

Though plant growth was likely limited during the year, there were no signs of disease or insect damage and plants generally appeared to be in fair health. NRCS biologist, Mr. Dean Stacey, indicated that there area signs of decline in vigor of some of the bunch grass species in the area due to build up of litter and old growth at the base of the plants or near the soil surface (see NRCS report, Appendix 3). Both areas have no doubt been affected by the drought that has prevailed in Utah for the last several years, however, there was no evidence of a major vegetation die-off, particularly with sagebrush (*Artemisia tridentata*) as has been experienced in the Price, UT area approximately 35 miles to the west.

Evidence of livestock (cattle) from previous years was found in both the Disturbance Site and the Reference Area. Use of the area appeared to be minimal with plants showing no signs of overgrazing. Both areas were burned by a wild fire several years ago and evidence of dead or scarred Pinyon Pine (*Pinus edulis*) and Utah Juniper trees (*Juniperus osteosperma*). Mule deer sign was also observed in both areas. Moderate numbers of Mormon Crickets were observed in areas on the mountain above the mine site, but none were observed in either the Reference Area or the Disturbance Site proper.

Percent Cover

Reference Area

Cover data for the Lila Canyon reference area are included in Table 3 (percent cover data and relative vegetative cover by species for each transect are included in Appendix 2). The average vegetation cover for the Reference area was 45.33%. The vegetative component was comprised of 16.80% shrubs, 11.20% forbs and succulents, 67.63% grasses, and 4.36% trees.

Table 3. Lila Canyon Average Cover Summary

Cover Type	Area	
	Reference Area	Disturbance Site
Shrubs	8.10	5.00
Forbs	5.40	1.93

Grasses	32.60	29.33
Trees	2.10	8.87
Total Vegetation	48.20	45.13
90% Confidence Interval	7.33	5.39
Cryptobiotic	14.50	7.13
Physical Features	37.10	47.49

Disturbance Site

The average vegetation cover for the Disturbance Site was 45.13% (Table 3). The vegetative component was comprised of 11.08% shrubs, 4.28% forbs and succulents, and 64.99% grasses, and 19.65% trees (Appendix 2).

Woody Plant Density

Woody plant density data for the Horse Canyon reference area are included in Table 4 (data for each transect are included in Appendix 3).

Table 4. Lila Canyon Woody Plant Densities

Area	Average	Std. Deviation	90% Confidence Interval	Interval Range
Reference	1051.25	558.05	237.00	814.25 - 1288.25
Disturbance Site	1248.34	473.09	200.92	1047.42 - 1449.26

Reference Area

The Reference Area, including tree species, had an average stems/acre of 1051.25 (Table 4; for complete data for each transect refer to Appendix 3). The number of

stems/acre ranged from 304.92 to 2003.76. The site was dominated by Shadscale (*Atriplex confertifolia* - 476.26, 45.00%), Snakeweed (*Gutierrezia sarothrae* - 235.22 stems/acre, 22.00%), Fourwing saltbush (*Atriplex canescens* - 101.64 stems/acre, 10.00%), and Utah Juniper (*Juniperus osteosperma* - 60.98 stems/acre, 7.00%), Four Wing Saltbush (*Atriplex canescens* - 662.11 stems/acre, 33.8%), and Douglas Rabbitbrush (*Chrysothamnus viscidiflorus* - 482.06 stems/acre, 6.00%).

Disturbance Site

Woody stems/acre in the Disturbance Site, including tree species, ranged from 522.72 to 2134.44, with an average of 1248.72 (Table 4; for complete data for each transect refer to Appendix 3). The most predominant woody plants in the Disturbance Site were Snakeweed (*Gutierrezia sarothrae* - 534.34 stems/acre, 43.00%), Fourwing saltbush (*Atriplex canescens* - 165.53 stems/acre, 13.30%), Shadscale (*Atriplex confertifolia* - 191.66 stems/acre, 15.30%), Winterfat (*Ceratoides lanata* - 177.14 stems/acre, 14.20%), and Utah Juniper (*Juniperus osteosperma* - 92.93 stems/acre, 7.40%),

Species Diversity

A species list for the Lila Canyon Reference Area and the Disturbance Site are detailed in Table 5. These data are based on cover sampling done in both sites.

Table 5. Species Lists for Lila Canyon Inventory Area

Species	Common Name	Site	
		Reference Area	Disturbance Site
Shrubs			
Artemisia spinescens	Budsage	x	
Artemisia tridentata	Wyoming sagebrush	x	x
Atriplex canescens	Fourwing saltbush	x	x
Atriplex confertifolia	Shadscale	x	x
Ceratoides lanata	Winterfat	x	x
Chrysothamnus nauseosus	Big rabbitbrush	x	x

Chrysothamnus albidus (unconfirmed)	Rabbitbrush	x	
Ephedra viridis	Green Ephedra	x	x
Gutierrezia sarothrae	Snakeweed	x	x
Sarcobatus vermiculatus	Greasewood	x	x
Leptodactylon pungens	Prickly gilia		x
Forbs & Succulents			
Cryptantha confertifolia	Yellow Cryptantha	x	x
Echinocereus triglochidiatus	Hedgehog cactus	x	x
Lygodesmia juncea	Skeleton weed	x	x
Machaeranthera canescens	Purple aster	x	
Opuntia compressa	Prickly pear cactus	x	x
Plantago patagonica	Indian wheat		x
Sphaeralcia coccinea	Scarlet globe mallow	x	x
Phacelia crenulata	Scorpion weed	x	
Euphorbia fendleri	Fendler spurge		x
Grasses			
Aristida logiseta	Three awn	x	x
Bouteloua gracilis	Blue gramma	x	x

Elymus salinus	Salina wild rye	x	x
Hilaria jamesii	Galleta	x	x
Oryzopsis hymenoides	Indian rice grass	x	x
Sitanion hystrix	Suirreltail	x	x
Sporobolus cryptandrus	Sand drop seed		x
Stipa comata	Needle and thread	x	x
Vulpia octaflora	Six weeks fescue	x	x
Trees			
Juniperus osteosperma	Utah juniper	x	x
Pinus edulis	Pinyon pine		x
Total Species in each area		27	28

The Reference Area had a total of 27 species with 3 species, Salina wild rye (*Elymus salinus* - (11.30%), Cheat grass (*Bromus tectorum* - 6.30%), and Galleta grass (*Hilaria jamesii* - 5.60%) with percent cover greater than 5%. See Table 6 for complete listing of percent cover for species in Reference Area and Disturbance Site.

The Disturbance Site had a total of 28 species with 4 species, Salina wild rye (*Elymus salinus* - 9.42%), Cheat grass (*Bromus tectorum* - 9.29%), Utah juniper (Juniperus osteosperma - 7.68%, and Galleta grass (*Hilaria jamesii* - 6.01%) with percent cover greater than 5%.

Table 6. Plant Species and Percent Cover Summary Table for the Reference Area and Disturbance Site

Reference Area		Disturbance Site	
	Species (% cover)		**Species (% cover)**
10 - 20%	*Elymus salinus (11.30)*	10 - 20%	
5 - 10 %	*Bromus tectorum (6.30)*	5 - 10 %	*Elymus salinus (9.42)*
	Hilaria jamesii (5.60)		*Bromus tectorum (9.29)*
			Juniperus osteosperma (7.68)
			Hilaria jamesii (6.01)
1 - 5%	*Atriplex confertifolia (4.40)*	1 - 5%	*Gutierrezia sarothrae (2.0)*
	Sphaeralcia coccinea (3.20)		*Stipa comata (1.54)*
	Stipa comata (2.90)		*Oryzopsis hymenoides (1.27)*
	Vulpia octaflora (2.40)		*Pinus edulis (1.20)*
	Juniperus osteosperma (2.20)		*Atriplex canescens (1.07)*
	Sitanion hystrix (2.00)		
	Oryzopsis hymenoides (1.80)		
	Atriplex canescens (1.30)		
< 1%	*Gutierrezia sarothrae (0.90)*	< 1%	*Vulpia octaflora (0.73)*
	Artemisia tridentata (0.60)		*Opuntia compressa (0.67)*
	Cryptantha flava (0.50)		*Sphaeralcia coccinea (0.67)*
	Opuntia compressa (0.40)		*Atriplex confertifolia (0.60)*
	Aristida longiseta (0.30)		*Ceratoides lanata (0.47)*
	Lygodesmia juncea (0.30)		*Sporobolus cryptandrus (0.47)*
	Machaeranthera canescens *(0.30)*		*Sitanion hystrix (0.33)*
	Artemisia spinescens (0.20)		*Sarcobatus vermiculatus (0.33)*
	Epehdra viridis (0.20)		*Leptodactylon pungens (0.27)*
	Echinocereus triglochidiatus (0.20)		*Euphoriba fendleri (0.27)*
	Bouteloua gracilis (0.20)		*Bouteloua gracilis (0.27)*

	Chrysothamnus nauseosus (0.10)		*Artemisia tridentata (0.13)*
	Sarcobatus vermiculatus (0.10)		*Echinocereus triglochidiatus (0.13)*
	Phacelia crenulata (0.10)		*Chrysothamnus nauseosus (0.07)*
	Ceratoides lanata (0.10)		*Epehdra viridis (0.07)*
	Chrysothamnus albidus (0.10) unconfirmed		*Cryptantha flava (0.07)*
			Plantago patagonica (0.07)
			Lygodesmia juncea (0.07)
			Aristida longiseta (0.07)

Productivity

Productivity for the areas was estimated by Mr. Dean Stacy, NRCS biologist on August 21, 2003 per DOGM guidelines and NRCS procedures (See Appendix 4). Based on ocular estimates, Mr. Stacy estimated the productivity of the areas. He indicated that the overall productivity of the Disturbance Site and the Reference Area was lower than in previous years due to the drought conditions prevalent in the general area.

He estimated that productivity in the Disturbance Site to be approximately 350 pounds per acre (mid seral) in areas dominated by grasses and shrubs and approximately 250 pounds per acre (mid seral) in areas dominated by Pinyon-Juniper vegetation. The estimated productivity for the Reference Area was approximately 450 pounds per acre (high seral) in grass/shrub areas and approximately 250 pounds per acre (mid seral) for areas of Pinyon-Juniper.

Similarity

Species Comparisons

Comparisons of similarity with respect to plant species were made between the Reference Area and the Disturbance Site using Jaccard's and Sorensen's coefficients based on cover data. In the Reference Area, there were a total of 27 species, whereas in the Disturbance Site there were a total of 28 species. There were 23 species common to both areas (Table 5).

Jaccard's Coefficient is calculated by:

$SI = C/(A + B - C) * 100$

Sorensen's Coefficient is calculated by:

$SI = (2C/A + B) * 100$

where: A = number of species in the Reference Area
B = number of species in the Disturbance Site
C = number of species common to both sites

The Jaccard's Similarity Coefficient was 71.9 (Table 7) and Sorensen's coefficient value was 83.6, both exceeding the required index value of 70. These data indicate that the communities are sufficiently similar, and that the proposed Reference Area should be acceptable.

Table 7. Species Similarity Comparison (based on cover data)

Site	Number of Species Present	Number of Species Common to Both	Jaccard's Coefficient	Sorensen's Coefficient
Reference Area	27			
Disturbance Site	28	23	**71.9**	**83.6**

Percent Cover and Woody Plant Density Comparisons

Statistical comparisons of vegetative cover were made between the Disturbance Site and the Reference area using the Two-tailed t Test (DOGM 1992). DOGM guidelines suggest that mean vegetative cover and woody plant density of the Reference Area and Disturbance Site should be equal with a 90% confidence. Calculations for these parameters are presented below.

For a 90% Confidence Interval:

$t(Std)/n^{1/2} \leq \mathbf{X_0} \leq t(Std)/n^{1/2}$

Percent Vegetative Cover

Disturbance Site	Reference Area
Mean = X_0 = 45.13 %	Mean = X_0 = 48.20 %
Std = 17.26	
n = 30	
df = 29	
t = 1.699 (from t distribution table, a=0.1, df = n -1)	

Cover as a %: 39.98 $\leq$ **48.20** $\leq$ 50.68

Since X_0 of Percent Vegetative Cover is 48.20 and can be found between 39.98 and 50.68, it can be concluded that the Disturbance Site and the Reference Area are equal with 90% confidence.

Woody Plant Density

Disturbance Site	Reference Area
Mean = X_0 = 1248.72 stems/acre	Mean = X_0 = 1051.25 %
Std = 473.09	
n = 15	
df = 14	
t = 1.761 (from t distribution table, a=0.1, df = n-1)	

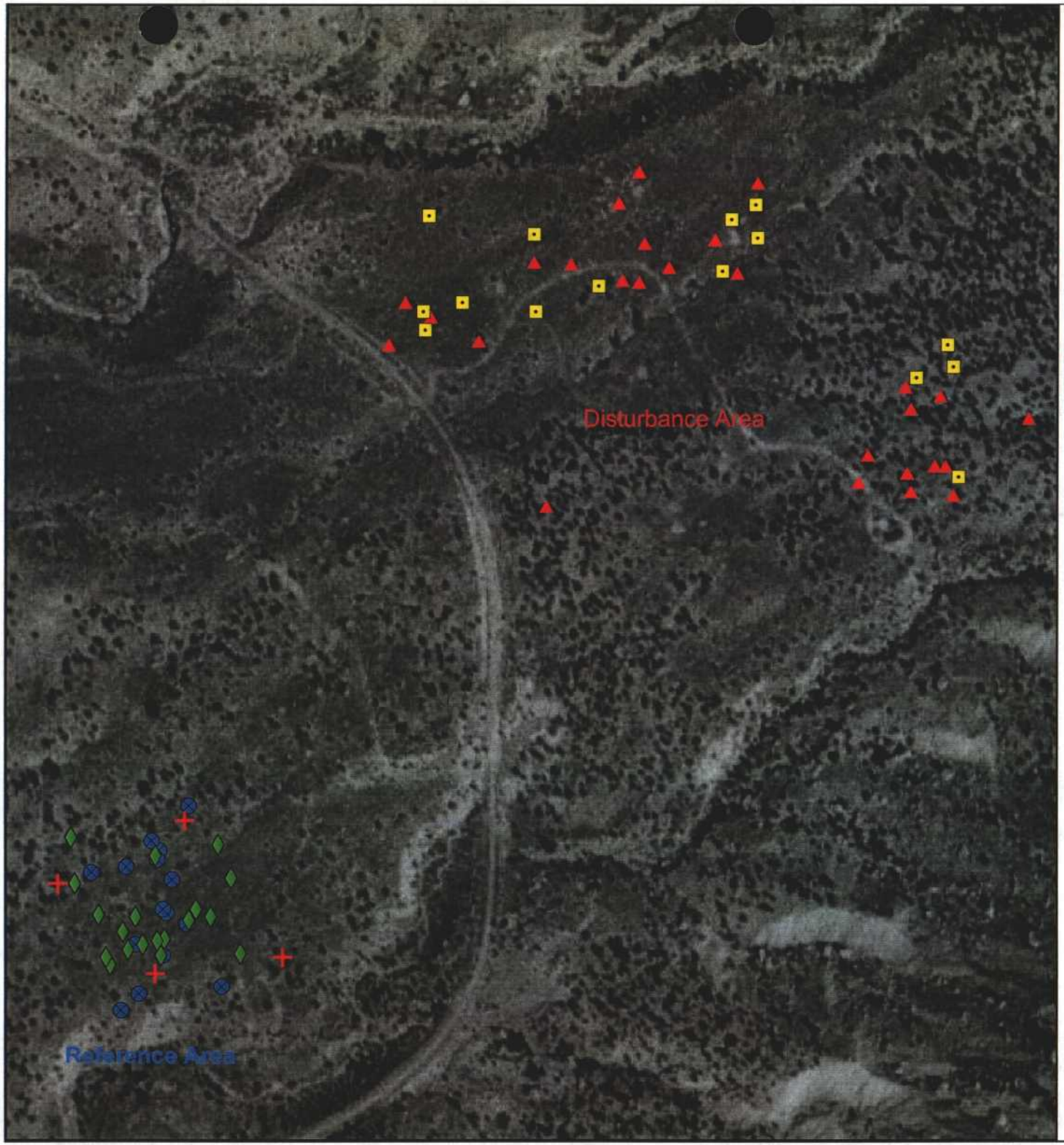
Woody plant density: 1033.61 $\leq$ **1051.25** $\leq$ 1463.82

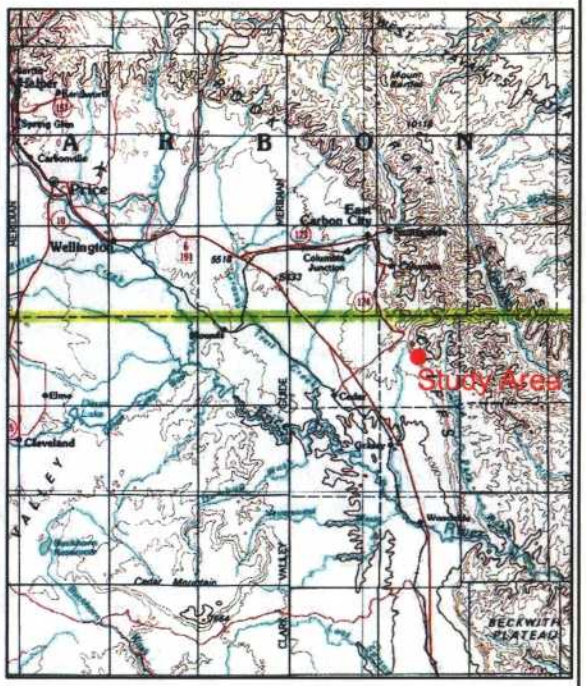
Since X_0 of Woody Plant Density is 1051.25 and can be found between 1033.61 and 1463.82, it can be concluded that the Disturbance Site and the Reference Area are equal with 90% confidence.

Appendix 1

Lila Canyon Maps

Lila Canyon Mine
Reference and Disturbance Sites





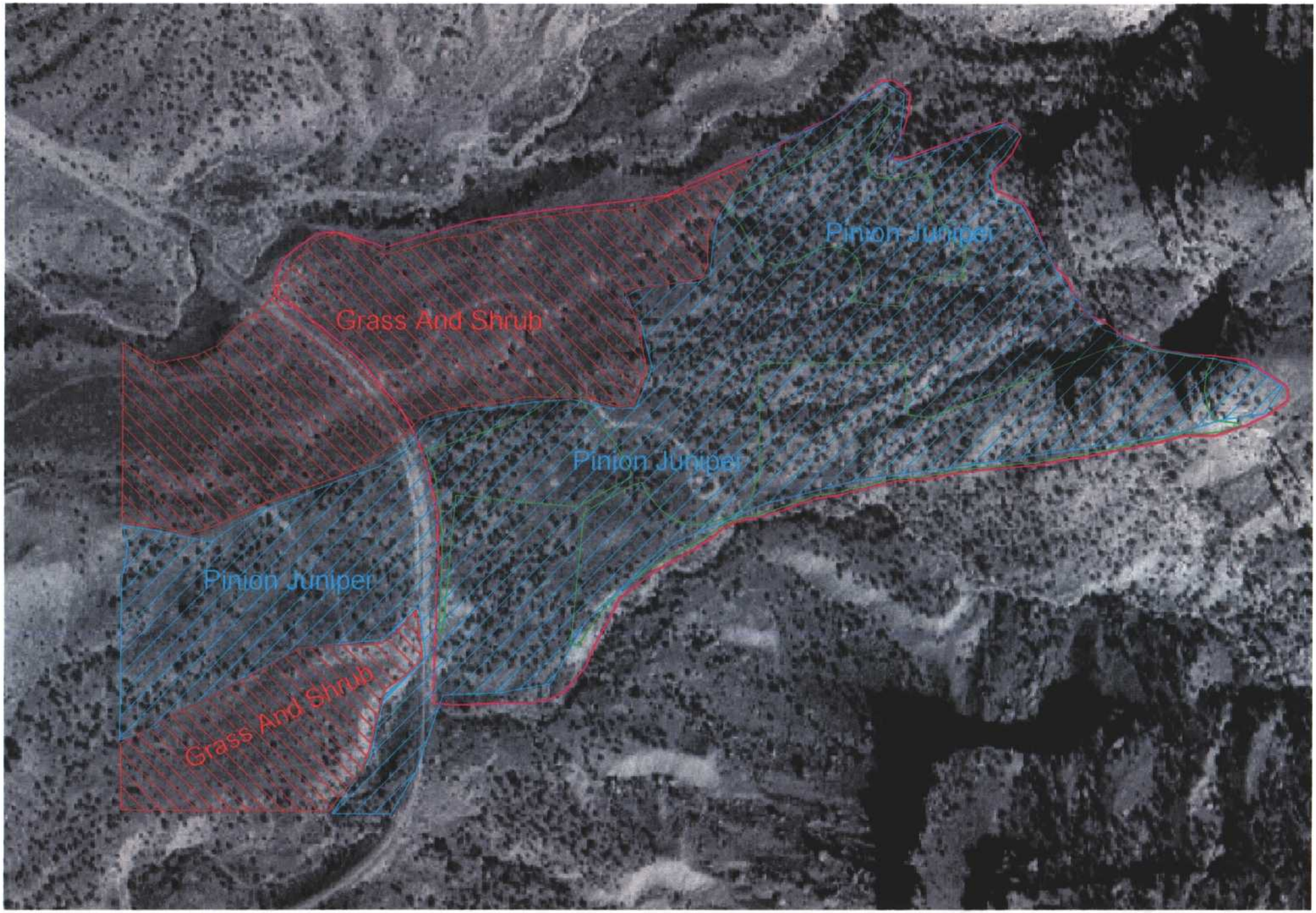
Legend

- Reference Corners
- Reference Cover
- Reference Area Shrub Density
- Disturbance Area Shrub Density
- Disturbance Cover

0 50 100 200 300 400 500 Feet

1:3,000

Mike King/CJC Feb 18, 2004


Grass And Shrub
Pinion Juniper
Pinion Juniper
Pinion Juniper
Grass And Shrub

Appendix 2

Lila Canyon Cover Data

Reference Cover Type Summary

Cover Type	Transect #														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Shrubs	2	8	6	4	6	20	0	2	12	10	0	4	8	2	14
Forbs	2	6	6	2	4	4	0	20	6	6	0	8	4	24	10
Grasses	24	40	36	24	18	18	26	22	18	44	22	26	40	36	16
Trees	2	0	0	2	10	0	0	0	0	0	22	0	6	0	2
Total Vegetation	30	54	48	32	38	42	26	44	36	60	44	38	58	62	42
Cryptobiotic	22	24	18	18	20	12	16	36	20	6	12	20	6	14	10
Physical Features	48	22	34	50	42	46	58	20	44	34	44	42	36	24	48

Cover Type	Transect #					Site Ave.	Relative Veg. Cover	Std. Dev.
	16	17	18	19	20			
Shrubs	14	10	8	10	22	8.10	16.80	6.14
Forbs	0	0	0	4	2	5.40	11.20	6.39
Grasses	46	54	56	44	42	32.60	67.63	12.65
Trees	0	0	0	0	0	2.10	4.36	5.31
Total Vegetation	60	64	64	58	66	48.20	100.00	12.70
Cryptobiotic	10	10	6	4	6	14.50		7.94
Physical Features	30	26	30	38	28	37.10		10.47

Lila Canyon Species Cover Summary

Reference A

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total	Percent Cover	Relative Vegetative Cove
Shrubs																							
Atriplex canescens		3		2						2			4				2	1			14	1.40	2.90
Atriplex confertifolia	1		2		3	6			6	2		1		1	5	4	3	1	3	6	44	4.40	9.13
Artemisia tridentata tridentata						1														5	6	0.60	1.24
Artemisia spinescens						2															2	0.20	0.41
Chrysothamnus nauseosus		1																			1	0.10	0.21
Ceratoides lanata										1											1	0.10	0.21
Ephedra viridis								1							1						2	0.20	0.41
Sarcobatus vermiculatus			1																		1	0.10	0.21
Guterrezia sarothrae						1									1	3		2	2		9	0.90	1.87
Chrysothamnus albidus												1									1	0.10	0.21
Total Shrubs Cover	1	4	3	2	3	10	0	1	6	5	0	2	4	1	7	7	5	4	5	11	81	8.10	16.80
Forbs & Succulents																							
Cryptantha flava					1			1						1	2						5	0.50	1.04
Machaeranthera canescens		3																			3	0.30	0.62
Sphaeralcia coccinea	1		1			1		9	2	3		2	2	8	2				1		32	3.20	6.64
Echinocereus triglochidiatus			2																		2	0.20	0.41
Opuntia compressa				1	1														1	1	4	0.40	0.83
Lygodesmia juncea														3							3	0.30	0.62
Phacelia crenulata						1			1			2			1						5	0.50	1.04
Total Forb Cover	1	3	3	1	2	2	0	10	3	3	0	4	2	12	5	0	0	0	2	1	54	5.40	11.20
Grasses																							
Aristida longiseta		1										1			1						3	0.30	0.62
Bouteloua gracilis																			2		2	0.20	0.41
Bromus tectorum		9	8			2		1		6		2	11	8			2	2	6	6	63	6.30	13.07
Elymus salinus	8			12	7		12	4	2	11	11	2	6			7	12	14	1	4	113	11.30	23.44
Hilaria jamesii	2	3	5		2	2	1		2			2	2	2	4	8	5	8	4	2	54	5.40	11.20
Oryzopsis hymenoides						1		6		1		2		1		1	2		1	3	18	1.80	3.73
Sitanion hystrix		2	4			1				2		2				3	1	1	2	2	20	2.00	4.15
Stipa comata		5	1			2			3					5	3	2	1	2	2	3	29	2.90	6.02
Vulpia octaflora	2					1			2	2		2	1	2		2	4	1	4	1	24	2.40	4.98
Total Grass Cover	12	20	18	12	9	9	13	11	9	22	11	13	20	18	8	23	27	28	22	21	326	32.6	67.63
Trees																							
Juniper	1			1	5						10		3		1						20	2.00	4.15
Pinon											1										1	0.10	0.21
Total Tree Cover	1	0	0	1	5	0	0	0	0	0	11	0	3	0	1	0	0	0	0	0	21	2.10	4.36
Total Vegetation Cover	15	27	24	16	19	21	13	22	18	30	22	19	29	31	21	30	32	32	29	33	482	48.20	100.00
Criptobiotic	11	12	9	9	10	6	8	18	10	3	6	10	3	7	5	5	5	3	2	3	145	14.50	
Physical Features																							
Litter	5	7	8	6	5	10	4		6	2	1	15	6	10	10	2	3	1	3	2	106	10.60	
Rock	3			4	2		2	6	1	6	6				1		3		1	2	37	3.70	
Bare Ground	16	4	9	15	14	13	23	4	15	8	15	6	12	2	13	13	7	14	15	10	228	22.80	
Total Physical Features	24	11	17	25	21	23	29	10	22	16	22	21	18	12	24	15	13	15	19	14	371	37.10	
Comments:	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	1000		

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:1 | UTM:555814/4364018 | Heading:5 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Reletive Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia	1																																																			1	2.00	6.67
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	6.67
																																																					0.00
Forbs & Succulents																																																					0.00
Machaeranthera canescens																																																				0	0.00	0.00
Sphaeralcia coccinea																						1																														1	2.00	6.67
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	6.67
Graminoid																																																						
Bromus tectorum																																																				0	0.00	0.00
Elymus Salinus													1	1				1																												1	1	1	1	1	8	16.00	53.33
Hilaria Jamesii					1					1																																										2	4.00	13.33
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				0	0.00	0.00
Vulpia octaflora									1																																			1							2	4.00	13.33
Total Graminoid Cover	0	0	0	0	1	0	0	0	1	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	12	24.00	80.00
Trees																																																						
Juniperus osteosperma															1																																					1	2.00	6.67
Pinus edulison																																																				0	0.00	0.00
																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	6.67
Total Vegetation Cover	1	0	0	0	1	0	0	0	1	1	0	0	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	15	30.00	100.00
cryptobiotic		1		1																1	1						1			1	1				1		1	1			1										11	22.00	
Physical Features																																																						
Litter						1	1	1																	1									1																	5	10.00	
Rock												1							1					1								1																			3	6.00	
Bare Ground			1								1					1	1						1			1		1	1			1	1			1			1	1		1	1		1						16	32.00	
Total Physical Features	0	0	1	0	0	1	1	1	0	0	1	1	0	0	0	1	1	0	1	0	0	0	1	1	1	1	0	1	1	0	0	1	1	1	0	1	0	0	1	1	0	1	1	0	1	0	0	0	0	0	24	48.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:2 | UTM:5558896/4364014 | Heading:47 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens											1		1							1																																3	6.00	11.11
Atriplex confertifolia																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																										1										1	2.00	3.70
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
																																																					0.00	0.00
																																																					0.00	0.00
																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4	8.00	14.81
																																																					0.00	0.00
Forbs & Succulents																																																				0	0.00	0.00
Machaeranthera canescens																			1																													1		1	3	6.00	11.11
Sphaeralcia coccinea																																																				0	0.00	0.00
																																																					0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	3	6.00	11.11
																																																					0.00	0.00
Graminoid																																																				0	0.00	0.00
Aristida longiseta																																		1																		1	2.00	3.70
Bromus tectorum				1		1		1				1													1	1			1	1																	1				9	18.00	33.33
Elymus Salinus																																																				0	0.00	0.00
Hilaria Jamesii			1																					1																				1							3	6.00	11.11
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix															1													1																								2	4.00	7.41
Stipa comata																																								1	1			1	1				1		5	10.00	18.52
																																																				0	0.00	0.00
Total Graminoid Cover	0	0	1	1	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	1	0	0	0	0	0	1	1	0	1	1	1	0	1	0	1	0	20	40.00	74.07
																																																					0.00	0.00
Trees																																																				0	0.00	0.00
Juniperus osteosperma																																																				0	0.00	0.00
Pinus edulison																																																				0	0.00	0.00
																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
																																																					0.00	0.00
Total Vegetation Cover	0	0	1	1	0	1	0	1	0	0	1	1	1	0	1	0	0	0	1	1	0	0	0	1	1	1	0	1	1	1	0	0	0	1	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	27	54.00	100.00
																																																					0.00	
cryptobiotic		1							1	1						1						1	1										1		1	1	1		1							1					12	24.00	
																																																					0.00	
Physical Features																																																				0	0.00	
Litter					1									1			1	1			1						1										1													7	14.00	
Rock																																																				0	0.00	
Bare Ground	1						1																								1	1																				4	8.00	
																																																					0.00	
Total Physical Features	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	11	22.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:3 | UTM:555888/4364000 | Heading:76 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia												1			1																																				2	4.00	8.33
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																					1														1	2.00	4.17
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6.00	12.50
Forbs & Succulent																																																					
Opuntia compressa																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																									1																										1	2.00	4.17
Echinocereus triglochidiatus																																								1		1									2	4.00	8.33
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	3	6.00	12.50
Graminoid																																																					
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum		1			1	1	1		1					1		1										1																									8	16.00	33.33
Elymus salinus																																																			0	0.00	0.00
Hilaria jamesii	1																	1	1																													1		1	5	10.00	20.83
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																											1								1								1		1					4	8.00	16.67
Stipa comata			1																																																1	2.00	4.17
Total Graminoid Cover	1	1	1	0	1	1	1	0	1	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	18	36.00	75.00
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulison																																																			0	0.00	0.00
																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	0	1	1	1	0	1	0	0	1	0	1	1	1	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	1	0	1	0	0	1	0	1	24	48.00	100.00
cryptobiotic										1	1											1	1									1	1	1										1				1		9	18.00	
Physical Features																																																			0	0.00	
Litter				1				1									1				1							1	1												1					1				8	16.00	
Rock																																																			0	0.00	
Bare Ground													1							1				1						1	1					1		1	1								1			9	18.00	
Total Physical Features	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	1	1	0	0	1	0	0	0	1	1	1	1	0	0	0	0	1	0	1	1	0	1	0	0	0	0	1	1	0	0	0	17	34.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:4 | UTM:555858/4364033 | Heading:230 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																	1	1																	2	4.00	12.50
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	12.50
Forbs & Succulents																																																					
Opuntia compressa																																				1															1	2.00	6.25
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	6.25
Graminoid																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																			12	24.00	75.00
Elymus salinus	1					1									1	1		1						1	1	1	1											1							1		1			0	0.00	0.00
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																				0.00	0.00
Total Graminoid Cover	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	12	24.00	75.00
Trees																																																					
Juniperus osteosperma																																																		1	1	2.00	6.25
Pinus edulison																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2.00	6.25
Total Vegetation Cover	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	1	16	32.00	100.00
cryptobiotic		1	1							1				1			1																				1		1			1		1							9	18.00	
Physical Features																																																					
Litter					1																1											1			1												1		1		6	12.00	
Rock									1		1	1																	1																						4	8.00	
Bare Ground				1			1	1					1						1	1		1	1					1		1	1										1	1		1		1						15	30.00	
Total Physical Features	0	0	0	1	1	0	1	1	1	0	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	1	0	0	0	0	1	1	0	1	0	1	0	1	0	1	0	25	50.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:5 | UTM:555833/4363974 | Heading:13 | Coordinates:61/93

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia					1					1					1																																					3	6.00	15.79
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6.00	15.79
Forbs & Succulents																																																						
Opuntia compressa																	1																																			1	2.00	5.26
Cryptantha flava																									1																											1	2.00	5.26
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea																																																				0	0.00	0.00
Sphaeralcia coccinea																																																				0	0.00	0.00
Echinocereus triglochidiatus																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	10.53
Graminoid																																																						
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum																																																				0	0.00	0.00
Elymus salinus																																				1		1	1	1	1		1	1							7	14.00	36.84
Hilaria jamesii														1									1																													2	4.00	10.53
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				0	0.00	0.00
Total Graminoid Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	9	18.00	47.37
Trees																																																						
Juniperus osteosperma																										1	1	1																						1	1	5	10.00	26.32
Pinus edulisen																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	10.00	26.32
Total Vegetation Cover	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	19	38.00	100.00
cryptobiotic						1					1	1									1	1							1	1			1	1														1				10	20.00	
Physical Features																																																						
Litter							1		1							1								1																			1								5	10.00	
Rock																																1			1																2	4.00	
Bare Ground	1	1	1	1				1					1					1	1	1											1						1									1	1		1			14	28.00	
Total Physical Features	1	1	1	1	0	0	1	1	1	0	0	0	1	0	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	1	0	0	1	1	0	1	0	0	21	42.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:6 | UTM:555851/4363985 | Heading:37 | Coordinates:28/80

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																	1												1															1	1	1	1				6	12.00	28.57
Artemisia spineusis																																				1			1												2	4.00	9.52
Artemisia tridentata tridentata															1																																				1	2.00	4.76
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																						1																													1	2.00	4.76
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	1	1	0	0	0	10	20.00	47.62
Forbs & Succulents																																																					
Opuntia compressa																																																			0	0.00	0.00
Cryptantha flava																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																			1																																1	2.00	4.76
Phacelia crenulata																				1																															1	2.00	4.76
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	9.52
Graminoid																																																					
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																1																								1										2	4.00	9.52
Elymus salinus																																																			0	0.00	0.00
Hilaria jamesii			1						1																																										2	4.00	9.52
Oryzopsis hymenoides	1																																																		1	2.00	4.76
Sitanion hystrix							1																																												1	2.00	4.76
Stipa comata																														1			1																		2	4.00	9.52
Vulpia octaflora																																																		1	1	2.00	4.76
Total Graminoid Cover	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	9	18.00	42.86
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulison																																																			0	0.00	0.00
																																																					0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	0	1	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0	0	0	1	1	1	1	0	0	1	21	42.00	100.00
cryptobiotic													1										1			1		1			1																	1			6	12.00	
Physical Features																																																					
Litter		1		1		1						1												1			1								1		1				1							1		10	20.00	
Rock																																																				0	0.00	
Bare Ground					1			1		1	1			1				1			1				1							1		1				1				1	1							13	26.00	
Total Physical Features	0	1	0	1	1	1	0	1	0	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	0	1	0	1	1	0	1	1	0	0	1	1	1	0	0	0	0	0	1	0	23	46.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Cow dung is present																																																					

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:10 | UTM:555861/4363779 | Heading:16 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																			1															1																		2	4.00	6.67
Atriplex confertifolia							1									1																																				2	4.00	6.67
Artemisia spineusis																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata						1																																														1	2.00	3.33
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10.00	16.67
Forbs & Succulents																																																						
Opuntia compressa																																																				0	0.00	0.00
Cryptantha flava																																																				0	0.00	0.00
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea																																																				0	0.00	0.00
Sphaeralcia coccinea								1																																						1		1				3	6.00	10.00
Sisymbrium altissimum																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	3	6.00	10.00
Graminoid																																																						
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum		1	1	1								1																1																1						6	12.00	20.00
Elymus salinus													1	1	1										1		1			1	1					1	1			1		1								11	22.00	36.67
Hilaria jamesii																																																				0	0.00	0.00
Oryzopsis hymenoides																																													1						1	2.00	3.33
Sitanion hystrix																																															1			1	2	4.00	6.67
Stipa comata																																																				0	0.00	0.00
Vulpia octoflora																		1		1																																2	4.00	6.67
Total Graminoid Cover	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	1	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0	1	1	0	0	1	0	1	0	1	1	0	1	0	0	1	22	44.00	73.33
Trees																																																						
Juniperus osteosperma																																																				0	0.00	0.00
Pinus edulison																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	0	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	0	1	1	1	0	0	0	0	1	0	1	1	0	1	1	0	0	1	0	1	1	0	0	1	0	1	0	1	1	1	1	1	0	1	30	60.00	100.00
cryptobiotic	1				1				1																																											3	6.00	
Physical Features																																																						
Litter											1						1												1			1			1							1							1		2	4.00	
Rock																						1	1																													6	12.00	
Bare Ground										1											1			1		1							1					1	1				1								8	16.00	
Total Physical Features	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	0	1	0	0	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	0	0	0	0	0	1	0	16	32.00	
																																																					0.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Prickly gilia present

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:11 | UTM:555876/4363998 | Heading:304 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia spineusis																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Forbs & Succulents																																																					
Opuntia compressa																																																			0	0.00	0.00
Cryptantha flava																																																			0	0.00	0.00
Globe Mallow																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Sisymbrium altissimum																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Graminoid																																																					
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus		1	1		1	1		1				1							1	1					1	1																								1	11	22.00	50.00
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
																																																			0	0.00	0.00
Total Graminoid Cover	0	1	1	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11	22.00	50.00
Trees																																																					
Juniperus osteosperma																															1	1	1	1	1	1	1	1						1	1						10	20.00	45.45
Pinus edulison																																														1						1	2.00	4.55
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	11	22.00	50.00
Total Vegetation Cover	0	1	1	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	0	1	22	44.00	100.00
cryptobiotic	1								1										1			1						1	1																							6	12.00	
Physical Features																																																					
Litter																																															1						1	2.00	
Rock															1	1	1	1												1														1								6	12.00	
Bare Ground				1			1			1	1		1										1	1	1			1											1	1	1	1						1	1		15	30.00	
Total Physical Features	0	0	0	1	0	0	1	0	0	1	1	0	1	1	1	1	1	0	0	0	0	1	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	0	22	44.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:12 | UTM:555859/4363987 | Heading:112 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia						1																																														1	2.00	5.26
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Chrysothamnus albidus								1																																												1	2.00	5.26
Total Shrubs Cover	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	10.53
Forbs & Succulents																																																						
Opuntia compressa																																																				0	0.00	0.00
Cryptantha flava																																																				0	0.00	0.00
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea																																																				0	0.00	0.00
Sphaeralcia coccinea									1				1																																							2	4.00	10.53
Phacelia crenulata																	1																			1																2	4.00	10.53
Total Forb Cover	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8.00	21.05
Graminoid																																																						
Aristida longiseta																								1																												1	2.00	5.26
Bromus tectorum																										1		1																								2	4.00	10.53
Elymus salinus																													1																				1		2	4.00	10.53
Hilaria jamesii												1																					1																		2	4.00	10.53
Oryzopsis hymenoides											1																																				1				2	4.00	10.53
Sitanion hystrix		1																																				1													2	4.00	10.53
Stipa comata																																																				0	0.00	0.00
Vulpia octaflora																							1								1																					2	4.00	10.53
Total Graminoid Cover	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	13	26.00	68.42
Trees																																																						
Juniperus osteosperma																																																				0	0.00	0.00
Pinus edulison																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	0	1	0	0	0	1	0	1	1	0	1	1	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	19	38.00	100.00
cryptobiotic										1				1		1				1		1			1					1					1				1									1			10	20.00	
Physical Features																																																						
Litter	1		1	1	1		1												1													1		1			1				1	1	1		1	1				1	15	30.00	
Rock																																																				0	0.00	
Bare Ground															1			1			1						1													1				1							6	12.00	
Total Physical Features	1	0	1	1	1	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	0	0	0	1	21	42.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:13 | UTM:555880/4364004 | Heading:347 | Coordinates:

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens														1	1						1	1																														4	8.00	13.79
Atriplex confertifolia																																																				0	0.00	0.00
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8.00	13.79
Forbs & Succulents																																																				0	0.00	0.00
Opuntia compressa																																																				0	0.00	0.00
Cryptantha confertifolia																																																				0	0.00	0.00
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea																																																				2	4.00	6.90
Sphaeralcia coccinea		1														1																																				0	0.00	0.00
Sleymbrium altissimum																																																						
Total Forb Cover	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	6.90
Graminoid																																																				0	0.00	0.00
Aristida																																																				11	22.00	37.93
Bromus tectorum	1					1	1	1				1	1						1				1				1	1		1																					6	12.00	20.69
Elymus salinus																																	1	1	1	1		1	1												2	4.00	6.90
Hilaria jamesii				1						1																																										0	0.00	0.00
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				1	2.00	3.45
Vulpia octaflora																									1																												
Total Graminoid Cover	1	0	0	1	0	1	1	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	1	0	1	0	1	1	0	1	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	20	40.00	68.97
Trees																																																				3	6.00	10.34
Juniperus osteosperma																																													1	1	1					0	0.00	0.00
Pinus edulison																																																						
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	3	6.00	10.34
Total Vegetation Cover	1	1	0	1	0	1	1	1	0	1	0	1	1	1	1	1	0	0	1	0	1	1	1	0	1	0	1	1	0	1	0	0	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	0	0	0	29	58.00	100.00
cryptobiotic																																					1					1							1		3	6.00	
Physical Features																																																						
Litter			1						1		1						1							1																	1										6	12.00	
Rock																																																				0	0.00	
Bare Ground					1													1		1						1			1		1	1							1			1	1				1		1	12	24.00	
Total Physical Features	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	1	1	0	1	0	0	0	1	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	1	0	1	18	36.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Skeleton weed																																																					

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:14 | UTM:555831/4363978 | Heading:42 | Coordinates:9/96

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia																										1																										1	2.00	3.23
Artemisia spinesus																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	3.23
Forbs & Succulents																																																						
Opuntia compressa																																																				0	0.00	0.00
Cryptantha flava																1																																				1	2.00	3.23
Sphaeralcea	1		1															1										1				1	1				1											1			8	16.00	25.81
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea		1			1			1																																												3	6.00	9.68
Total Forb Cover	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	12	24.00	38.71
Graminoid																																																						
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum										1	1	1		1	1					1			1							1																						8	16.00	25.81
Elymus salinus																																																				0	0.00	0.00
Hilaria jamesii																								1																										1		2	4.00	6.45
Oryzopsis hymenoides																															1																					1	2.00	3.23
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata						1	1						1																															1		1						5	10.00	16.13
Vulpia octaflora				1																									1																								2	4.00	6.45
Total Graminoid Cover	0	0	0	1	0	1	1	0	0	1	1	1	1	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	18	36.00	58.06
Trees																																																						
Juniperus osteosperma																																																				0	0.00	0.00
Pinus edulison																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	1	1	0	1	0	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0	1	1	0	31	62.00	100.00
cryptobiotic																	1								1		1											1		1	1							1				7	14.00	
Physical Features																																																						
Litter									1										1		1	1												1	1	1						1	1		1						10	20.00	
Rock																																																				0	0.00	
Bare Ground																																								1											1	2	4.00	
Total Physical Features	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1	1	0	1	0	0	0	0	1	12	24.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:15 | UTM:555827/4364001 | Heading:131 | Coordinates:48/82

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia														1								1							1	1																				1	5	10.00	23.81
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis						1																																													1	2.00	4.76
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																									1																										1	2.00	4.76
Total Shrubs Cover	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	14.00	33.33
Forbs & Succulents																																																					
Opuntia compressa																																																			0	0.00	0.00
Cryptantha flava																																							1		1										2	4.00	9.52
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																											1																	1						2	4.00	9.52
Sisymbrium altissimum																																																			0	0.00	0.00
Phacelia crenulata																																															1				1	2.00	4.76
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	1	0	0	0	5	10.00	23.81
Graminoid																																																					
Aristida longiseta																																											1								1	2.00	4.76
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus																																																			0	0.00	0.00
Hilaria jamesii								1			1																	1																				1			4	8.00	19.05
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata															1																		1				1														3	6.00	14.29
																																																				0	0.00	0.00
Total Graminoid Cover	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	8	16.00	38.10
																																																				0.00	0.00
Trees																																																					
Juniperus osteosperma			1																																																1	2.00	4.76
Pinus edulison																																																			0	0.00	0.00
Total Tree Cover	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	4.76
Total Vegetation Cover	0	0	1	0	0	1	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	1	1	1	1	0	0	1	0	0	0	1	0	1	0	1	0	1	1	0	0	1	1	0	1	21	42.00	100.00
cryptobiotic		1								1										1											1									1										5	10.00	
Physical Features																																																					
Litter												1				1		1						1								1		1	1			1						1				1		10	20.00	
Rock					1																																														1	2.00	
Bare Ground	1			1			1		1				1				1		1		1		1			1										1					1					1				13	26.00	
Total Physical Features	1	0	0	1	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0	0	1	1	0	0	1	0	24	48.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:16 | UTM:555904/4363980 | Heading:314

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia																																															1	1	1	1	4	8.00	13.33
Artemisia spinescis																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																												1	1	1					3	6.00	10.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	7	14.00	23.33
Forbs & Succulents																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Cryptantha flava																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Sisymbrium altissimum																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Graminoid																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																					1	1	1	1	1	1	1								7	14.00	23.33
Elymus salinus																													1	1	1	1	1	1	1	1															8	16.00	26.67
Hilaria jamesii																												1																								1	2.00	3.33
Oryzopsis hymenoides																									1	1	1																									3	6.00	10.00
Sitanion hystrix																							1	1																												2	4.00	6.67
Stipa comata																						1																														2	4.00	6.67
Vulpia octaflora																					1	1																															23	46.00	76.67
Total Graminoid Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0		0.00	0.00
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulison																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30	60.00	100.00
cryptobiotic	1	1	1	1	1																																														5	10.00	
Physical Features																																																					
Litter																				1	1																															2	4.00	
Rock																																																				0	0.00	
Bare Ground							1	1	1	1	1	1	1	1	1	1	1	1	1																															13	26.00	
Total Physical Features	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	30.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:17 | UTM:555904/4363980 | Heading:314

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																	1	1	2	4.00	6.25
Atriplex confertifolia	1																																												1			1			3	6.00	9.38
Artemisia spineusis																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	5	10.00	15.63
Forbs & Succulents																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Cryptantha flava																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Sisymbrium altissimum																																																			**Total Forb Cover**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Graminoid																																																			0	0.00	0.00
Aristida longiseta																																														1	1					2	4.00	6.25
Bromus tectorum																																	1	1	1	1	1	1	1	1	1	1	1	1							12	24.00	37.50
Elymus salinus																												1	1	1	1	1																			5	10.00	15.63
Hilaria jamesii																										1	1																								2	4.00	6.25
Oryzopsis hymenoides																									1																										1	2.00	3.13
Sitanion hystrix																								1																											1	2.00	3.13
Stipa comata																				1	1	1	1																												4	8.00	12.50
Vulpia octaflora																																																			**Total Graminoid Cover**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	27	54.00	84.38
																																																				0.00	0.00
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulison																																																			**Total Tree Cover**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	32	64.00	100.00
cryptobiotic									1	1	1	1	1																																						5	10.00	
Physical Features																																																					
Litter																	1	1	1																																3	6.00	
Rock														1	1	1																																			3	6.00	
Bare Ground		1	1	1	1	1	1	1																																										7	14.00	
Total Physical Features	0	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	26.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:18 | UTM:555899/4364021 | Heading:267

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens					1																																														1	2.00	3.13
Atriplex confertifolia												1																																							1	2.00	3.13
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																											1																1								2	4.00	6.25
Total Shrubs Cover	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4	8.00	12.50
Forbs & Succulents																																																				0	0.00	0.00
Opuntia compressa																																																				0	0.00	0.00
Cryptantha flava																																																				0	0.00	0.00
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea																																																				0	0.00	0.00
Sphaeralcia coccinea																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Graminoid																																																				0	0.00	0.00
Aristida longiseta																																																				2	4.00	6.25
Bromus tectorum		1	1																																																	14	28.00	43.75
Elymus salinus	1			1																								1	1				1	1	1	1	1	1				1		1	1					1	8	16.00	25.00
Hilaria jamesii										1	1		1	1					1	1					1	1																										0	0.00	0.00
Oryzopsis hymenoides																																																				1	2.00	3.13
Sitanion hystrix																						1																														2	4.00	6.25
Stipa comata																																																1	1			1	2.00	3.13
Vulpia octoflora																					1																																28	56.00	87.50
Total Graminoid Cover	1	1	1	1	1	0	0	0	0	0	1	1	0	1	1	0	0	0	0	1	1	1	1	0	0	1	1	0	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	1	1	0	0	1	1	1		0.00	0.00
Trees																																																				0	0.00	0.00
Juniperus osteosperma																																																				0	0.00	0.00
Pinus edulison																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	1	32	64.00	100.00
cryptobiotic																1							1																		1										3	6.00	
Physical Features																																																						
Litter									1																																											1	2.00	
Rock																																																				0	0.00	
Bare Ground						1	1	1							1		1	1						1						1	1	1							1	1						1	1				14	28.00	
Total Physical Features	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	0	15	30.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Ephedra																																																					

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:19 | UTM:555840/4363992 | Heading:93

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia				1																							1				1																					3	6.00	10.34
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae															1																													1							2	4.00	6.90
Total Shrubs Cover	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	10.00	17.24
Forbs & Succulents																																																						
Opuntia compressa																		1																																	1	2.00	3.45
Cryptantha flava																																																				0	0.00	0.00
Machaeranthera canescens																																																				0	0.00	0.00
Lygodesmia juncea																																																				0	0.00	0.00
Sphaeralcia coccinea																																																			1	1	2.00	3.45
Sisymbrium altissimum																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	4.00	6.90
Graminoid																																																						
Aristida longiseta																																																				0	0.00	0.00
Bouteloua gracilis																																					1	1														2	4.00	6.90
Bromus tectorum			1							1	1															1															1	1										6	12.00	20.69
Elymus salinus																																1																				1	2.00	3.45
Hilaria jamesii		1																										1	1	1																						4	8.00	13.79
Oryzopsis hymenoides																																		1																		1	2.00	3.45
Sitanion hystrix																					1																						1									2	4.00	6.90
Stipa comata	1																							1																												2	4.00	6.90
Vulpia octaflora																1	1		1	1																																4	8.00	13.79
Total Graminoid Cover	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	1	1	0	0	1	0	1	0	1	1	1	0	1	0	1	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	22	44.00	75.86
																																																					0.00	0.00
Trees																																																						
Juniperus osteosperma																																																				0	0.00	0.00
Pinus edulison																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	0	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	1	29	58.00	100.00
cryptobiotic														1																																			1		2	4.00	
Physical Features																																																						
Litter					1																																		1						1					3	6.00	
Rock								1																																											1	2.00	
Bare Ground						1	1	1				1	1									1	1		1								1		1	1				1				1	1		1			15	30.00	
Total Physical Features	0	0	0	0	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	1	1	0	0	0	0	1	1	1	1	0	0	19	38.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:07/09/2003 | Area:Ref | Transect:20 | UTM:555904/4363980 | Heading:314

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																	1	1	2	4.00	6.25
Atriplex canescens																																													1			1			3	6.00	9.38
Atriplex confertifolia	1																																																		0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	5	10.00	15.63
Forbs & Succulents																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Cryptantha flava																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Sisymbrium altissimum																																																			**Total Forb Cover**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Graminoid																																																			0	0.00	0.00
Aristida longiseta																																														1	1				2	4.00	6.25
Bromus tectorum																																	1	1	1	1	1	1	1	1	1	1	1	1						12	24.00	37.50
Elymus salinus																												1	1	1	1	1																		5	10.00	15.63
Hilaria jamesii																										1	1																							2	4.00	6.25
Oryzopsis hymenoides																									1																									1	2.00	3.13
Sitanion hystrix																								1																										1	2.00	3.13
Stipa comata																				1	1	1	1																											4	8.00	12.50
Vulpia octoflora																																																			**Total Graminoid Cover**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	0	27	54.00	84.38
																																																				0.00	0.00
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulisen																																																			**Total Tree Cover**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	32	64.00	100.00
cryptobiotic									1	1	1	1	1																																						5	10.00	
Physical Features																																																					
Litter																	1	1	1																																3	6.00	
Rock														1	1	1																																			3	6.00	
Bare Ground		1	1	1	1	1	1	1	1																																									7	14.00	
Total Physical Features	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	26.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Disturbance Site Cover Type Summary

Cover Type	Transect #														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Shrubs	4	0	22	2	4	2	6	2	2	2	12	12	8	10	0
Forbs	2	2	0	8	4	0	2	2	2	4	2	0	4	4	42
Grasses	58	52	60	68	66	40	42	40	46	54	48	34	44	28	0
Trees	0	8	0	0	0	0	4	4	0	4	0	0	0	4	50
Total Vegetation	64	62	82	78	74	42	54	48	50	64	62	46	56	46	10
Cryptobiotic	6	12	2	2	8	10	0	8	8	4	6	8	6	8	40
Physical Features	30	26	16	20	18	48	4	44	42	32	32	46	38	46	

Cover Type	Transect #															Site Ave.	Relative Veg. Cover	Std. Dev.
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
Shrubs	4	6	8	6	8	0	0	4	0	6	2	0	4	2	4	5.00	11.00	4.72
Forbs	2	0	0	0	4	4	2	0	0	2	12	0	0	0	2	1.93	4.00	1.96
Grasses	18	2	20	16	4	4	8	10	8	14	28	14	4	8	8	29.633	65.00	21.06
Trees	10	8	16	10	12	20	20	14	22	22	14	12	10	20	32	8.87	20.00	8.83
Total Vegetation	34	16	44	32	28	28	30	28	30	44	48	26	18	30	46	45.13	100.00	17.26
Cryptobiotic	12	0	6	4	8	10	12	14	4	8	4	16	12	8	0	7.27		4.16
Physical Features	54	60	50	64	64	54	58	58	66	48	48	58	70	62	54	47.49		14.68

Lila Canyon Species Cover Summary
Disturbance Area

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		Total	Percent C	Relative Vegetati
Shrubs																																		
Atriplex canescens			6		1						2		2			1				1	2					1						16	1.07	2.36
Atriplex confertifolia			1							1	2	1		3														1				9	0.60	1.33
Artemisia tridentata tridentata																										1				1		2	0.13	0.30
Chrysothamnus nauseosus															1																	1	0.07	0.15
Ceratoides lanata			2			1	1	1			1	1																				7	0.47	1.03
Ephedra																					1											1	0.07	0.15
Sarcobatus vermiculatus	2														3																	5	0.33	0.74
Gutierrezia sarothrae			2	1	1		2		1		1	4	2	2		1		2					1			2	2		4	2		30	2.00	4.43
Leptodactylon pungens																	1						1					2				4	0.27	0.59
Total Shrubs Cover	2	0	11	1	2	1	3	1	1	1	6	6	4	5	4	2	1	2	0	1	3	0	2	0	0	4	2	3	4	3	0	75	5.00	11.08
Forbs & Succulents																																		
Cryptantha flava																				1												1	0.07	0.15
Plantago patagonica	1																															1	0.07	0.15
Opuntia compressa		1		1	1		1	1								1				2						1	1					10	0.67	1.48
Sphaeralcia coccinea				3	1				1	1	1		2	1																		10	0.67	1.48
Echinocereus triglochidiatus										1											1											2	0.13	0.30
Lygodesmia juncea														1																		1	0.07	0.15
Euphorbia fendleri																								1	2	1						4	0.27	0.59
Total Forb Cover	1	1	0	4	2	0	1	1	1	2	1	0	2	2	0	1	0	0	0	3	1	0	0	1	2	2	1	0	0	0	0	29	1.93	4.28
Grass																																		
Aristida longiseta														1																		1	0.07	0.15
Boutelou gracilis										3				1																		4	0.27	0.59
Bromus tectorum	6	5	15	14	10	10	5	8	14	11	12	5	12	6	3	1													2			139	9.27	20.53
Elymus salinus	18	18	4	6	13	1		8		8		3	1	2	13	2	1		5	9	6	2	1	2	1	2	6	5	4			141	9.40	20.83
Hilaria jamesii	2	1	8	8	3	5	10	3	6	3	7	5	5	3	4		1	2	1	1		2	3	1	1		3	1	1			90	6.00	13.29
Oryzopsis hymenoides	1		1	1	2	1	1		2		5	1	2	1						1												19	1.27	2.81
Sitanion hystrix				1		2			1			1																				5	0.33	0.74
Stipa comata	1		1		5	1	5	1		1						1			1	2			1					2		1		23	1.53	3.40
Sporabolus cryptandrus			1	3						1			2																			7	0.47	1.03
Vulpia octaflora	1	2		1											1					1	1			1					3			11	0.73	1.62
Total Grass Cover	29	26	30	34	33	20	21	20	23	27	24	15	22	14	21	4	2	2	7	14	7	4	5	4	2	2	9	8	10	1	0	440	29.33	64.99
Trees																																		
Juniper		2						2		2				2		13	10	5	6	6	11	9	7	7	10	6	5	1	8	3		115	7.67	16.99
Pinon		2					2									3	0			1		2		3				4		1		18	1.20	2.66
Total Tree Cover	0	4	0	0	0	0	2	2	0	2	0	0	0	2	0	16	10	5	6	7	11	11	7	10	10	6	5	5	8	4	0	133	8.87	19.65
Total Vegetation Cover	32	31	41	39	37	21	27	24	25	32	31	21	28	23	25	23	13	9	13	25	22	15	14	15	14	14	17	16	22	8	0	677	45.13	100.00
Criptobiotic	3	6	1	1	4	6		4	4	2	3	4	3	4	5		4	6	8	2	4	2	7	6	5	4	6	2	3			109	7.27	
Physical Features																																		
Litter	3	1	1	1	1	0	3	1	3	2	3		1	2	1	0	2	1	1		2	0	2	4	1	1	3	2	2	4		48	3.20	
Rock	5	5	5	7	2	6	5	12	3	6	1	3	2	11	9	12	13	13	7	6	7	6	10	9	3	6	3	11	7	8		203	13.53	
Bare Ground	7	7	2	2	6	18	15	9	15	8	12	20	16	10	10	15	16	21	21	17	15	27	17	16	27	25	21	19	16	30		460	30.73	
Total Physical Features	15	13	8	10	9	24	23	22	21	16	16	23	19	23	20	27	31	35	29	23	24	33	29	29	31	32	27	32	25	42	0	711	47.49	
	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	1500	100	

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:1 | UTM:0556121/4364405 | Heading:48

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																	1	1																	2	4.00	6.25
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	6.25
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																										1									1	2.00	3.13
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.00	3.13
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																																																			0	0.00	0.00
Bromus tectorum											1	1		1	1											1									1															6	12.00	18.75
Elymus salinus		1	1		1		1	1		1												1	1	1	1			1	1								1	1	1				1					1		1	18	36.00	56.25
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii																	1															1																			2	4.00	6.25
Oryzopsis hymenoides																																																	1		1	2.00	3.13
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																									1										1	2.00	3.13
Sporabolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																				1															1	2.00	3.13
Total Grass Cover	0	1	1	0	1	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	1	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	1	1	0	1	0	1	0	0	0	0	1	1	1	29	58.00	90.63
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	0	1	1	0	1	0	1	1	0	1	1	1	0	1	1	0	1	0	0	0	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	0	1	1	1	32	64.00	100.00
cryptobiotic																																													1	1	1				3	6.00	
Physical Features																																																					
Litter				1																1										1																					3	6.00	
Rock									1									1	1		1						1																								5	10.00	
Bare Ground	1					1							1			1															1								1					1							7	14.00	
Total Physical Featuers	1	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	15	30.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Lygodesmia juncea present																																																					

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:2 | UTM:0556174/4364350 | Heading:65

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																1																			1	2.00	3.23
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	3.23
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Grass																																																					
																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																																																			5	10.00	16.13
Bromus tectorum				1	1	1		1													1																				1	1					1	1	1	1	18	36.00	58.06
Elymus salinus	1	1	1				1			1							1	1							1	1					1			1	1																0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																	1																		1	2.00	3.23
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Sporobolus cryptandrus																												1																							2	4.00	6.45
Vulpia octaflora																1																																			26	52.00	83.87
Total Grass Cover	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	1	1	1	0	0	1	0	0	0	1	1	1	0	0	0	1	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1			
Trees																																																			2	4.00	6.45
Juniperus osteosperma																							1	1																												2	4.00	6.45
Pinus edulis											1	1																																							4	8.00	12.90
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Vegetation Cover	1	1	1	1	1	1	1	1	0	1	1	1	0	0	0	1	1	1	0	0	1	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	31	62.00	100.00
cryptobiotic															1				1	1		1								1																	1				6	12.00	
Physical Features																																																			1	2.00	
Litter									1																				1	1								1			1			1						5	10.00	
Rock																																				1		1	1						1	1					7	14.00	
Bare Ground													1	1																																							
Total Physical Features	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	13	26.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:3 | UTM:05561221/4364345 | Heading:89

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																		1	1			1			1				1						1																6	12.00	14.63
Atriplex confertifolia								1																																											1	2.00	2.44
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Cerstoides lanata			1				1																																												2	4.00	4.88
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae									1																					1																					2	4.00	4.88
Total Shrubs Cover	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	22.00	26.83
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																																																			0	0.00	0.00
Bromus tectorum		1				1				1	1			1			1			1				1		1							1	1					1					1	1		1			15	30.00	36.59
Elymus salinus	1																																			1	1							1							4	8.00	9.76
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii												1	1		1						1		1									1						1												1	8	16.00	19.51
Oryzopsis hymenoides				1																																															1	2.00	2.44
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																															1				1	2.00	2.44
Sporobolus cryptandrus																																																	1		1	2.00	2.44
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	1	1	0	1	0	1	0	0	0	1	1	1	1	1	1	0	1	0	0	1	1	0	1	1	0	1	0	0	0	0	0	1	1	1	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	30	60.00	73.17
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	41	82.00	100.00
cryptobiotic																												1																							1	2.00	
Physical Features																																																					
Litter																															1																				1	2.00	
Rock					1																																				1	1	1	1							5	10.00	
Bare Ground																1											1																								2	4.00	
Total Physical Features	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	8	16.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Sphaeralcia parviflora present																																																					
coccinea present																																																					

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:4 | UTM:0556185/4364399 | Heading:292

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																										1									1	2.00	2.56
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.00	2.56
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																												1																							1	2.00	2.56
Sphaeralcia coccinea	1															1	1																																		3	6.00	7.69
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8.00	10.26
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Boutelou gracilis																																																			0	0.00	0.00
Bromus tectorum		1	1	1						1		1	1	1										1								1				1	1						1	1				1			14	28.00	35.90
Elymus salinus																													1	1	1				1						1				1						6	12.00	15.38
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii																		1	1	1	1		1		1	1	1																								8	16.00	20.51
Oryzopsis hymenoides															1																																				1	2.00	2.56
Sitanion hystrix																																																	1	1	2.00	2.56
Stipa comata																																																			0	0.00	0.00
Sporabolus cryptandrus					1	1			1																																										3	6.00	7.69
Vulpia octaflora																																							1												1	2.00	2.56
Total Grass Cover	0	1	1	1	1	1	0	0	1	1	0	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	0	1	0	1	0	1	1	1	0	0	1	1	0	34	68.00	87.18
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	0	0	1	1	0	39	78.00	100.00
cryptobiotic																																	1																		1	2.00	
Physical Features																																																					
Litter								1																																											1	2.00	
Rock											1											1												1					1						1	1			1	7	14.00	
Bare Ground							1																															1												2	4.00	
Total Physical Features	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	1	10	20.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:5 | UTM:0556162/4364368 | Heading:137

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																			1	1	2.00	2.70
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																									1										1	2.00	2.70
Gutierrezia sarothrae																																									1	0	0	0	0	0	0	0	0	1	2	4.00	5.41
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0													
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			1	2.00	2.70
Opuntia compressa																			1																																1	2.00	2.70
Sphaeralcia coccinea																					1																														0	0.00	0.00
Echinocereus triglochidiatus																																																			2	4.00	5.41
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Boutelou gracilis																																				1	1			1						1	1	1		10	20.00	27.03
Bromus tectorum	1	1	1	1																																									1	1					13	26.00	35.14
Elymus salinus										1		1	1							1		1				1				1	1	1			1			1												0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			3	6.00	8.11
Hilaria jamesii									1															1		1																									2	4.00	5.41
Oryzopsis hymenoides																			1																				1												0	0.00	0.00
Sitanion hystrix																																																			5	10.00	13.51
Stipa comata					1						1					1	1								1																									0	0.00	0.00
Sporabolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																																			33	66.00	89.19
Total Grass Cover	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0		0.00	0.00
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Vegetation Cover	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	37	74.00	100.00
cryptobiotic															1														1				1	1																	4	8.00	
Physical Features																																																					
Litter																																											1								1	2.00	
Rock																												1														1								2	4.00	
Bare Ground						1	1	1						1													1																	1						6	12.00	
Total Physical Features	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	9	18.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:6 | UTM:0556110/4364388 | Heading:161

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																										1																									1	2.00	4.76
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			1	2.00	4.76
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																																							1					1						1	10	20.00	47.62
Bromus tectorum			1	1	1			1	1			1															1																								1	2.00	4.76
Elymus salinus		1																																																	0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																												1													1			1					1		5	10.00	23.81
Hilaria jameseii						1																																													1	2.00	4.76
Oryzopsis hymenoides																						1																													2	4.00	9.52
Sitanion hystrix																									1													1													1	2.00	4.76
Stipa comata							1																																												0	0.00	0.00
Sporobolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	1	1	20	40.00	95.24
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Vegetation Cover	0	1	1	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	1	1	21	42.00	100.00
cryptobiotic																		1																							1	1					1	1			5	10.00	
Physical Features																																																			0	0.00	
Litter																									1												1	1													6	12.00	
Rock	1												1	1																1	1	1	1	1	1	1										1	1				18	36.00	
Bare Ground										1	1				1	1			1	1	1	1		1																													
Total Physical Features	1	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	0	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	24	48.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:7 | UTM:0556084/4364355 | Heading:3

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			1	2.00	3.70
Ceratoides lanata											1																																								0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			2	4.00	7.41
Gutierrezia sarothrae															1				1																																3	6.00	11.11
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			1	2.00	3.70
Opuntia compressa												1																																							0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			1	2.00	3.70
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																1																	1							1	1			1							5	10.00	18.52
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			10	20.00	37.04
Hilaria jameesii							1		1	1			1												1	1	1							1												1	1				1	0.00	3.70
Oryzopsis hymenoides																												1																							0	0.00	0.00
Sitanion hystrix																																																			5	10.00	18.52
Stipa comata																	1			1	1	1	1																												0	0.00	0.00
Sporabolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																																			21	42.00	77.78
Total Grass Cover	0	0	0	0	0	0	1	0	1	1	0	0	1	0	0	1	1	0	0	1	1	1	1	0	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0			
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			2	4.00	7.41
Pinus edulis	1	1																																																	2	4.00	7.41
Total Tree Cover	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Vegetation Cover	1	1	0	0	0	0	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	1	0	1	1	0	0	0	27	54.00	100.00
cryptobiotic																																																			0	0.00	
Physical Features																																																					
Litter						1																																1											1		3	6.00	
Rock			1					1																												1	1		1												5	10.00	
Bare Ground				1	1									1				1						1					1	1	1	1			1							1	1		1			1		1	15	30.00	
Total Physical Features	0	0	1	1	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	0	1	1	0	1	0	0	1	1	1	23	46.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:8 | UTM:0556137/4364353 | Heading:304

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			1	2.00	4.17
Ceratoides lanata											1																																								0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			1	2.00	4.17
	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Shrubs Cover																																																					
																																																			0	0.00	0.00
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			1	2.00	4.17
Opuntia compressa							1																																												0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			1	2.00	4.17
Total Forb Cover	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis								1				1	1				1	1	1	1											1																				8	16.00	33.33
Bromus tectorum																										1	1						1			1					1				1	1				1	8	16.00	33.33
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous					1											1												1																							3	6.00	12.50
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix															1																																				1	2.00	4.17
Stipa comata																																																			0	0.00	0.00
Sporobolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																																			20	40.00	83.33
Total Grass Cover	0	0	0	0	1	0	0	1	0	0	0	1	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	1	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	1			
Trees																																																			2	4.00	8.33
Juniperus osteosperma																														1		1																			0	0.00	0.00
Pinus edulis																																																			2	4.00	8.33
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Vegetation Cover	0	0	0	0	1	0	1	1	0	0	1	1	1	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	1	1	1	1	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	1	24	48.00	100.00
cryptobiotic																																		1	1		1					1									4	8.00	
Physical Features																																																					
Litter																							1																												1	2.00	
Rock	1					1			1	1				1											1													1	1	1			1	1					1	12	24.00	
Bare Ground		1	1	1																		1	1		1				1																		1	1			9	18.00	
Total Physical Features	1	1	1	1	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	0	0	1	1	1	0	22	44.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:9 | UTM:0556124/4364366 | Heading:79

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																									1																										1	2.00	4.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	4.00
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea										1																																									1	2.00	4.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	4.00
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																																																			0	0.00	0.00
Bromus tectorum		1	1						1									1	1	1										1			1	1	1	1				1	1	1								14	28.00	56.00
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii						1															1								1														1		1	1					6	12.00	24.00
Oryzopsis hymenoides							1																																					1							2	4.00	8.00
Sitanion hystrix																																					1														1	2.00	4.00
Stipa comata																																																			0	0.00	0.00
Sporabolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	23	46.00	92.00
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	0	1	1	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	25	50.00	100.00
cryptobiotic					1																										1	1																		1		4	8.00	
Physical Features																																																					
Litter												1	1																																					1	3	6.00	
Rock	1														1	1																																			3	6.00	
Bare Ground				1				1			1			1			1					1	1	1		1	1	1										1	1							1	1			15	30.00	
Total Physical Features	1	0	0	1	0	0	0	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	1	21	42.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:10 | UTM:0556112/4364346 | Heading:296

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																									1										1	2.00	3.13
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2.00	3.13
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea	1																																																		1	2.00	3.13
Echinocereus triglochidiatus																																													1						1	2.00	3.13
Total Forb Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	4.00	6.25
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Boutelou gracilis														1	1	1																																			3	6.00	9.38
Bromus tectorum					1		1	1				1					1				1	1	1	1			1	1																							11	22.00	34.38
Elymus salinus																													1						1				1	1		1	1			1		1			8	16.00	25.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii				1									1							1																															3	6.00	9.38
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																									1																										1	2.00	3.13
Sporabolus cryptandrus						1																																													1	2.00	3.13
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	0	1	1	0	0	1	0	1	0	0	27	54.00	84.38
Trees																																																					
Juniperus osteosperma																																																	1	1	2	4.00	6.25
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	4.00	6.25
Total Vegetation Cover	1	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	1	0	1	1	1	32	64.00	100.00
cryptobiotic																																					1										1				2	4.00	
Physical Features																																																					
Litter																																1	1																		2	4.00	
Rock										1	1								1															1				1						1						6	12.00	
Bare Ground		1	1						1									1								1				1	1					1														8	16.00	
Total Physical Features	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	16	32.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:0555985/4364311 | UTM: | Heading:60

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																									1		1								2	4.00	6.45
Atriplex confertifolia												1																1																							2	4.00	6.45
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																	1																																		1	2.00	3.23
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																						1													1	2.00	3.23
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	6	12.00	19.35
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																	1		1	2.00	3.23
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2.00	3.23
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Boutelou gracilis																																																			0	0.00	0.00
Bromus tectorum	1					1				1						1		1	1	1							1										1					1					1		1		12	24.00	38.71
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jameseii			1	1				1	1														1	1						1																					7	14.00	22.58
Oryzopsis hymenoides		1									1		1																				1			1															5	10.00	16.13
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Sporabolus cryptandrus																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	1	1	1	1	0	1	0	1	1	1	1	0	1	0	0	1	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	1	0	24	48.00	77.42
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	1	1	0	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	0	0	1	1	0	0	1	1	0	1	0	0	1	0	0	1	1	1	0	0	1	1	1	0	0	0	1	0	1	1	31	62.00	100.00
cryptobiotic																																			1										1			1			3	6.00	
Physical Features																																																					
Litter						1																												1					1											3	6.00	
Rock																							1																												1	2.00	
Bare Ground							1								1	1						1				1	1			1		1	1								1				1		1				12	24.00	
Total Physical Features	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0	0	1	1	0	0	1	0	1	1	0	1	0	0	0	0	1	1	0	0	0	1	0	1	0	0	0	0	16	32.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:12 | UTM:0556034/4364313 | Heading:319

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																					
Atriplex confertifolia	1																																																				
Artemisia nova																																																					
Artemisia tridentata tridentata																																																					
Chrysothamnus nauseosus																																																					
Chrysothamnus viscidiflorus																																																					
Cowania mexicana																																																					
Cerastoides lanata									1																																												
Ephedra viridis																																																					
Sarcobatus vermiculatus																																																					
Gutierrezia sarothrae																													1	1	1	1																						
Total Shrubs Cover	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	12.00	26.09
Forbs & Succulents																																																					
Machaeranthera canescens																																																					
Plantago patagonica																																																					
Penstemon palmeri																																																					
Opuntia compressa																																																					
Sphaeralcia coccinea																																																					
Echinocereus triglochidiatus																																																					
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																					
Agropyron smithii																																																					
Agropyron spicatum																																																					
Agropyron cristatum																																																					
Agropyron trachycaulum																																																					
Aristida longiseta																		1	1																																		
Bouteloua gracilis																																																					
Bromus tectorum				1																													1			1	1														1		
Elymus salinus																									1	1	1																										
Elymus cinereus																																																					
Elymus giganteous																																																					
Hilaria jamesii		1															1			1			1	1																												
Oryzopsis hymenoides										1																																											
Sitanion hystrix						1																																															
Stipa comata																																																					
Sporabolus cryptandrus																																																					
Vulpia octaflora																																																					
Total Grass Cover	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	17	34.00	73.91
Trees																																																					
Juniperus osteosperma																																																					
Pinus edulis																																																					
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	0	1	0	1	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	23	46.00	100.00
cryptobiotic							1									1																							1	1											4	8.00	
Physical Features																																																					
Litter																																																				0	0.00	
Rock																													1															1	1						3	6.00	
Bare Ground			1		1			1			1	1	1	1	1							1	1							1	1				1			1	1	1			1	1	1	1				20	40.00	
Total Physical Features	0	0	1	0	1	0	0	1	0	0	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	1	1	0	23	46.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:13 | UTM:0556064/4364356 | Heading:236

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																							1	1											2	4.00	7.14
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae										1										1																															2	4.00	7.14
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	4	8.00	14.29
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea									1																		1																								2	4.00	7.14
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	7.14
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bouteloua gracilis																																																			0	0.00	0.00
Bromus tectorum	1	1						1			1	1	1								1	1						1						1							1									12	24.00	42.86
Elymus salinus																			1																															1	2.00	3.57
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii					1	1																	1										1																	1	5	10.00	17.86
Oryzopsis hymenoides																		1																																	2	4.00	7.14
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Sporobolus cryptandrus				1																									1																						2	4.00	7.14
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	1	1	0	1	1	1	0	1	0	0	1	1	1	0	0	0	0	1	1	0	1	1	1	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	22	44.00	78.57
Trees																																																					
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	1	0	1	1	1	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	1	28	56.00	100.00
cryptobiotic																	1									1						1																		3	6.00	
Physical Features																																																					
Litter																																						1													1	2.00	
Rock																																												1	1						2	4.00	
Bare Ground			1				1							1	1	1								1	1					1	1				1	1	1					1	1				1	1		16	32.00	
Total Physical Features	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	1	1	1	1	0	0	0	1	1	1	1	0	0	1	1	0	19	38.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:14 | UTM:0556008/4364326 | Heading:275

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																					
Atriplex confertifolia	1																									1										1																3	6.00	13.04
Artemisia nova																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																									1																							1				2	4.00	8.70
Total Shrubs Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	10.00	21.74
Forbs & Succulents																																																					
Machaeranthera canescens																																																				0	0.00	0.00
Plantago patagonica																																																				0	0.00	0.00
Penstemon palmeri																																																				0	0.00	0.00
Opuntia compressa																																																				0	0.00	0.00
Sphaeralcia coccinea																															1																					1	2.00	4.35
Leptodactylon juncea					1																																															1	2.00	4.35
Echinocereus triglochidiatus																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	8.70
Grass																																																				0	0.00	0.00
Agropyron smithii																																																				0	0.00	0.00
Agropyron spicatum																																																				0	0.00	0.00
Agropyron cristatum																																																				0	0.00	0.00
Agropyron trachycaulum																																																				0	0.00	0.00
Aristida longiseta																																									1											1	2.00	4.35
Bouteloua gracilis																																1																				1	2.00	4.35
Bromus tectorum				1																							1	1	1	1																	1				6	12.00	26.09
Elymus salinus												1	1																																						2	4.00	8.70
Elymus cinereus																																																				0	0.00	0.00
Elymus giganteous																																																				0	0.00	0.00
Hilaria jamesii							1	1	1																																										3	6.00	13.04
Oryzopsis hymenoides																																							1												1	2.00	4.35
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				0	0.00	0.00
Sporabolus cryptandrus																																																				0	0.00	0.00
Vulpia octaflora																																																				0	0.00	0.00
Total Grass Cover	0	0	0	1	0	0	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	14	28.00	60.87
Trees																																																					
Juniperus osteosperma																		1	1																																2	4.00	8.70
Pinus edulis																																																				0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	8.70
Total Vegetation Cover	1	0	0	1	1	0	1	1	1	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0	1	1	0	0	23	46.00	100.00
cryptobiotic						1					1											1	1																												4	8.00	
Physical Features																																																					
Litter																																			1								1							2	4.00	
Rock		1	1											1	1	1																					1			1			1		1	1	1				11	22.00	
Bare Ground										1							1			1	1			1									1	1				1											1	1	10	20.00	
Total Physical Features	0	1	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	1	1	1	1	0	0	1	1	23	46.00	
																																																				50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Tally Sheet

Date:7/15/03 | Disturbance Site | Transect:15 | UTM:0555994/4364334 | Heading:200

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																		1	1	2.00	4.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cliff Rose																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra																																																			0	0.00	0.00
Sarcobatus vermiculatus	1																											1	1																						3	6.00	12.00
Snake Weed																																																			0	0.00	0.00
Total Shrubs Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	8.00	16.00
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Plantago patagonica																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Boutelou gracilis																																																			3	6.00	12.00
Bromus tectorum				1	1	1														1	1	1			1	1	1			1	1					1	1	1						1			1				13	26.00	52.00
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			4	8.00	16.00
Hilaria jamesii							1			1									1																													1				0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Sporabolus cryptandrus																																																			1	2.00	4.00
Vulpia octaflora																		1																																	21	42.00	84.00
Total Grass Cover	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	1	1	0	0	1	1	0	0	0	0	1	1	1	0	0	0	0	0	1	0	1	1	0	0	0			
Trees																																																			0	0.00	0.00
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Total Vegetation Cover	1	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	1	0	1	1	0	0	1	25	50.00	100.00
cryptobiotic			1										1	1	1	1																																			5	10.00	
Physical Features																																																						
Litter																																										1									1	2.00	
Rock																								1									1	1	1				1	1	1		1		1					9	18.00	
Bare Ground		1						1	1		1	1					1								1							1																1	1		10	20.00	
Total Physical Features	0	1	0	0	0	0	0	1	1	0	1	1	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	0	1	0	0	1	1	0	20	40.00	
																																																			50	100.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:16 | UTM:556071/4364223 | Heading:120

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																														1																					1	2.00	12.50
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Leptodactylon pungens																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																													1								1														2	4.00	25.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6.00	37.50
																																																					0.00	0.00
Forbs & Succulents																																																			0	0.00	0.00
Cryptantha flava																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Lygodesmia juncea																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
																																																					0.00	0.00
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus gigenteous																																																			0	0.00	0.00
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																	1		1	2.00	12.50
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2.00	12.50
																																																					0.00	0.00
Trees																																																			0	0.00	0.00
Juniperus osteosperma																			1																								1	1							3	6.00	37.50
Pinus edulis																		1																																	1	2.00	12.50
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	4	8.00	50.00
																																																					0.00	0.00
Total Vegetation Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	8	16.00	100.00
cryptobiotic																																																			0	0.00	
																																																				0.00	
Physical Features																																																			0	0.00	
Litter																								1								1													1	1					4	8.00	
Rock											1	1													1						1		1					1					1						1	8	16.00	
Bare Ground	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1			1	1	1	1			1	1	1						1	1	1			1	1	1						1		1	30	60.00	
																																																				0.00	
Total Physical Features	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	0	1	1	42	84.00	
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Comments:

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:17 | UTM:556266/4364241 | Heading:30

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																									1	1					1						1														4	8.00	18.18
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8.00	18.18
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum				1	1																																														2	4.00	9.09
Elymus salinus																				1	1											1	1																			4	8.00	18.18
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii																													1																						1	2.00	4.55
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora	1												1											1																												3	6.00	13.64
Total Grass Cover	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	20.00	45.45
Trees																																																					
Juniperus osteosperma															1																					1		1	1	1	1								1	1	8	16.00	36.36
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	1	8	16.00	36.36
Total Vegetation Cover	1	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	0	0	1	1	1	0	0	1	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	22	44.00	100.00
cryptobiotic								1						1					1																																3	6.00	
Physical Features																																																					
Litter									1																									1																	2	4.00	
Rock		1	1													1	1					1	1																			1									7	14.00	
Bare Ground						1	1			1	1	1						1									1	1		1					1								1	1	1	1	1	1			16	32.00	
Total Physical Features	0	1	1	0	0	1	1	0	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	25	50.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	
Machaeranthe present																																																					

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:18 | UTM:556332/4364271 | Heading:288

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia	1																																																		1	2.00	6.25
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Leptodactylon pungens		1							1																																										2	4.00	12.50
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	6.00	18.75
Forbs & Succulents																																																					
Opuntia compressa																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus																		1	1								1	1	1																						5	10.00	31.25
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii								1																																											1	2.00	6.25
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata										1					1																																				2	4.00	12.50
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	16.00	50.00
Trees																																																					
Juniperus osteosperma																1																																			1	2.00	6.25
Pinus edulis																														1	1	1																1			4	8.00	25.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5	10.00	31.25
Total Vegetation Cover	1	1	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	16	32.00	100.00
cryptobiotic				1																																			1												2	4.00	
Physical Features																																																					
Litter																	1						1																												2	4.00	
Rock					1		1							1										1									1	1							1	1	1	1	1					11	22.00	
Bare Ground			1			1					1	1	1							1	1	1			1	1									1	1	1	1		1						1	1		1	1	19	38.00	
Total Physical Features	0	0	1	0	1	1	1	0	0	0	1	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	32	64.00	
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	
Comments:																																																					
Euphorbia present																																																					

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:19 | UTM:556294/4364239 | Heading:278

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																1			2	4.00	11.76
Gutierrezia sarothrae	1																																																		2	4.00	11.76
Total Shrubs Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	4.00	11.76
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																										1									1	2.00	5.88
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2.00	5.88
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																					1	1			1		1		1		1				6	12.00	35.29
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																												1					1	1	3	6.00	17.65
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	1	0	1	0	1	1	9	18.00	52.94
Trees																																																			5	10.00	29.41
Juniperus osteosperma							1	1	1													1	1																													0	0.00	0.00
Pinus edulis																																																			5	10.00	29.41
Total Tree Cover	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10.00	29.41
Total Vegetation Cover	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	1	1	0	1	1	1	1	17	34.00	100.00
cryptobiotic				1																	1	1			1	1														1										6	12.00	
Physical Features																																																						
Litter													1	1															1																						3	6.00	
Rock		1			1													1																																	3	6.00	
Bare Ground			1							1	1	1	1			1	1	1		1					1			1		1	1	1	1	1	1	1				1						1				21	42.00	
Total Physical Features	0	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	27	54.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Single leaf ash present
prickly gilia present
6 weeks present
Sclerocactus present

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:20 | UTM:556281/4364245 | Heading:241

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																						1																													1	2.00	7.14
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																					1																														1	2.00	7.14
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			2	4.00	14.29
Gutierrezia sarothrae																			1											1																					4	8.00	28.57
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																													1						1	2.00	7.14
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																					1														1	2.00	7.14
Euphorbia fendleri																																					1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	4.00	14.29
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																	
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum										1		1																																							2	4.00	14.29
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																			2	4.00	14.29
Total Grass Cover	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Trees																																									1	1	1	1				1	1		6	12.00	42.86
Juniperus osteosperma																																																			0	0.00	0.00
Pinus edulis																																																			6	12.00	42.86
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	1	0			
Total Vegetation Cover	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	0	1	1	0	14	28.00	100.00
cryptobiotic																			1										1						1																4	8.00	
Physical Features																																																					
Litter																				1																															1	2.00	
Rock																														1					1	1				1						1	1			6	12.00	
Bare Ground	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1						1	1	1	1	1				1	1	1						1	1											25	50.00	
Total Physical Features	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	0	0	1	0	0	1	1	1	1	1	0	1	0	1	1	1	0	1	1	0	1	1	1	0	0	0	0	0	1	1	0	0	0	32	64.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:21 | UTM:556271/436293 | Heading:66

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia																																																				0	0.00	0.00
Atriplex cuneata																																																				0	0.00	0.00
Artemisia nova																																																				0	0.00	0.00
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Forbs & Succulents																																																						
Machaeranthera canescens																																																				0	0.00	0.00
Echinocereus triglochidiatus																																																				0	0.00	0.00
Penstemon palmeri																																																				0	0.00	0.00
Opuntia compressa																																																				0	0.00	0.00
Sphaeralcia coccinea																																																				0	0.00	0.00
Euphorbia fendleri																			1																														1			2	4.00	14.29
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	4.00	14.29
Grass																																																						
Agropyron smithii																																																				0	0.00	0.00
Agropyron spicatum																																																				0	0.00	0.00
Agropyron cristatum																																																				0	0.00	0.00
Agropyron trachycaulum																																																				0	0.00	0.00
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum																																																				0	0.00	0.00
Elymus salinus																																										1										1	2.00	7.14
Elymus cinereus																																																				0	0.00	0.00
Elymus giganteous																																																				0	0.00	0.00
Hilaria jamesii																																							1													1	2.00	7.14
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				0	0.00	0.00
Vulpia octaflora																																																				0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	2	4.00	14.29
Trees																																																						
Juniperus osteosperma	1	1																		1	1								1	1	1													1					1	1	10	20.00	71.43
Pinus edulis																																																				0	0.00	0.00
Total Tree Cover	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	10	20.00	71.43
Total Vegetation Cover	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	1	1	14	28.00	100.00
cryptobiotic																																				1				1	1				1	1						5	10.00	
Physical Features																																																						
Litter						1																																														1	2.00	
Rock																									1			1							1																3	6.00	
Bare Ground			1	1	1		1	1	1	1	1	1	1	1	1	1	1	1				1	1	1		1	1					1	1	1			1	1							1	1				27	54.00	
Total Physical Features	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	31	62.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Cryptantha present, Echinocereus present

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:22 | UTM:556268/4364278 | Heading:173

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																																				0	0.00	0.00
Atriplex confertifolia																																																				0	0.00	0.00
Atriplex cuneata																																																				0	0.00	0.00
Artemisia nova																																																				0	0.00	0.00
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Forbs & Succulents																																																						
Machaeranthera canescens																																																				0	0.00	0.00
Echinocereus triglochidiatus																																																				0	0.00	0.00
Penstemon palmeri																																																				0	0.00	0.00
Opuntia compressa																																																				0	0.00	0.00
Sphaeralcia coccinea																																																				0	0.00	0.00
Euphorbia fendleri												1																																								1	2.00	6.67
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	6.67
Grass																																																						
Agropyron smithii																																																						
Agropyron spicatum																																																				0	0.00	0.00
Agropyron cristatum																																																				0	0.00	0.00
Agropyron trachycaulum																																																				0	0.00	0.00
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum																																																				0	0.00	0.00
Elymus salinus													1																											1												2	4.00	13.33
Elymus cinereus																																																				0	0.00	0.00
Elymus gigenteous																																																				0	0.00	0.00
Hilaria jamesii						1																																														1	2.00	6.67
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				0	0.00	0.00
Vulpia octaflora																																												1								1	2.00	6.67
Total Grass Cover	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	4	8.00	26.67
Trees																																																						
Juniperus osteosperma				1	1																			1	1							1	1	1																	7	14.00	46.67
Pinus edulis	1																																																1	1	3	6.00	20.00
Total Tree Cover	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	10	20.00	66.67
Total Vegetation Cover	1	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	15	30.00	100.00
cryptobiotic																				1										1	1							1								1	1				6	12.00	
Physical Features																																																						
Litter											1															1	1													1											4	8.00	
Rock		1	1				1																					1							1	1					1	1	1								9	18.00	
Bare Ground								1	1	1				1	1	1	1	1	1		1	1	1						1								1							1			1			16	32.00	
Total Physical Features	0	1	1	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	0	0	0	0	0	1	1	1	0	1	0	1	1	1	0	1	0	0	1	0	0	29	58.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:23 | UTM:556240/4364236 | Heading:5

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																										1									1	2.00	7.14
Leptodactylon pungens																																																			0	0.00	0.00
Sarcobatus vermiculatus																																			1																1	2.00	7.14
Gutierrezia sarothrae																																																					
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	4.00	14.29
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																	1		1	2.00	7.14
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			3	6.00	21.43
Hilaria jamesii															1																					1	1														0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																1			1	2.00	7.14
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	5	10.00	35.71
Trees																																																			7	14.00	50.00
Juniperus osteosperma		1	1	1						1						1	1	1																																	0	0.00	0.00
Pinus edulis																																																			7	14.00	50.00
Total Tree Cover	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Total Vegetation Cover	0	1	1	1	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	1	1	0	14	28.00	100.00
cryptobiotic	1					1							1							1	1	1											1																		7	14.00	
Physical Features																																																					
Litter																													1																	1				2	4.00	
Rock									1					1														1		1	1	1						1						1			1			1	10	20.00	
Bare Ground					1		1	1			1	1											1	1	1	1	1	1						1					1	1	1		1		1					17	34.00	
Total Physical Features	0	0	0	0	1	0	1	1	1	0	1	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	29	58.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:24 | UTM:556287/4364245 | Heading:52

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																									1																						1				2	4.00	13.33
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																							1										1																		2	4.00	13.33
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	8.00	26.67
Trees																																																					
Juniperus osteosperma				1	1									1	1	1	1									1	1							1																	9	18.00	60.00
Pinus edulis													1																			1																				2	4.00	13.33
Total Tree Cover	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	22.00	73.33
Total Vegetation Cover	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	15	30.00	100.00
cryptobiotic																																																	1	1	2	4.00	
Physical Features																																																					
Litter																																																			0	0.00	
Rock												1						1			1	1						1			1																				6	12.00	
Bare Ground	1	1	1			1	1	1	1	1	1								1	1				1					1	1				1	1	1	1	1	1	1	1	1	1	1	1		1			27	54.00	
Total Physical Features	1	1	1	0	0	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	33	66.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Oryzopsis Hymenoides present

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:25 | UTM:556268/436431 | Heading:187

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																					1																										1				2	4.00	9.09
Atriplex confertifolia																																																				0	0.00	0.00
Atriplex cuneata																																																				0	0.00	0.00
Artemisia nova																																																				0	0.00	0.00
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis													1																																							1	2.00	4.55
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3	6.00	13.64
Forbs & Succulents																																																						
Machaeranthera canescens																																																				0	0.00	0.00
Echinocereus triglochidiatus																																		1																		1	2.00	4.55
Penstemon palmeri																																																				0	0.00	0.00
Opuntia compressa																																																				0	0.00	0.00
Sphaeralcia coccinea																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	4.55
Grass																																																						
Agropyron smithii																																																				0	0.00	0.00
Agropyron spicatum																																																				0	0.00	0.00
Agropyron cristatum																																																				0	0.00	0.00
Agropyron trachycaulum																																																				0	0.00	0.00
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum																																																				0	0.00	0.00
Elymus salinus																																			1	1	1	1							1	1					6	12.00	27.27
Elymus cinereus																																																				0	0.00	0.00
Elymus giganteous																																																				0	0.00	0.00
Hilaria jamesii																																																				0	0.00	0.00
Oryzopsis hymenoides																																																				0	0.00	0.00
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata																																																				0	0.00	0.00
Vulpia octaflora																1																																				1	2.00	4.55
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	7	14.00	31.82
Trees																																																						
Juniperus osteosperma		1	1	1	1	1	1										1			1		1	1																									1			11	22.00	50.00
Pinus edulis																																																				0	0.00	0.00
Total Tree Cover	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	11	22.00	50.00
Total Vegetation Cover	0	1	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	0	0	22	44.00	100.00
cryptobiotic																										1	1															1	1								4	8.00	
Physical Features																																																						
Litter																																1	1																		2	4.00	
Rock	1										1	1						1	1					1							1																				7	14.00	
Bare Ground								1	1	1				1	1										1			1	1	1									1	1	1			1					1	1	15	30.00	
Total Physical Features	1	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	0	1	1	0	0	0	0	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	1	1	24	48.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:26 | UTM:556265/4364288 | Heading:300

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																						
Atriplex canescens																																								1												1	2.00	4.17
Atriplex confertifolia																																																				0	0.00	0.00
Atriplex cuneata																																																				0	0.00	0.00
Artemisia nova																																																				0	0.00	0.00
Artemisia spinescens																																																				0	0.00	0.00
Artemisia tridentata tridentata																																																				0	0.00	0.00
Chrysothamnus nauseosus																																																				0	0.00	0.00
Chrysothamnus viscidiflorus																																																				0	0.00	0.00
Cowania mexicana																																																				0	0.00	0.00
Ceratoides lanata																																																				0	0.00	0.00
Ephedra viridis																																																				0	0.00	0.00
Sarcobatus vermiculatus																																																				0	0.00	0.00
Gutierrezia sarothrae																																																				0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2.00	4.17
Forbs & Succulents																																																						
Machaeranthera canescens																																																				0	0.00	0.00
Echinocereus triglochidiatus																																																				0	0.00	0.00
Penstemon palmeri																																																				0	0.00	0.00
Opuntia compressa															1																	1																				2	4.00	8.33
Sphaeralcia coccinea																																																				0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4.00	8.33
Grass																																																						
Agropyron smithii																																																				0	0.00	0.00
Agropyron spicatum																																																				0	0.00	0.00
Agropyron cristatum																																																				0	0.00	0.00
Agropyron trachycaulum																																																				0	0.00	0.00
Aristida longiseta																																																				0	0.00	0.00
Bromus tectorum																																																				0	0.00	0.00
Elymus salinus								1	1	1						1	1								1	1															1			1							9	18.00	37.50
Elymus cinereus																																																				0	0.00	0.00
Elymus giganteous																																																				0	0.00	0.00
Hilaria jamesii																											1																									1	2.00	4.17
Oryzopsis hymenoides																												1																								1	2.00	4.17
Sitanion hystrix																																																				0	0.00	0.00
Stipa comata											1	1																																								2	4.00	8.33
Vulpia octaflora							1																																													1	2.00	4.17
Total Grass Cover	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	14	28.00	58.33
Trees																																																						
Juniperus osteosperma	1																						1	1									1									1	1								6	12.00	25.00
Pinus edulis																																							1													1	2.00	4.17
Total Tree Cover	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	7	14.00	29.17
Total Vegetation Cover	1	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	24	48.00	100.00
cryptobiotic																						1	1																													2	4.00	
Physical Features																																																						
Litter																																																				0	0.00	
Rock			1	1	1								1	1				1																																	6	12.00	
Bare Ground		1				1													1	1									1	1	1			1	1	1	1	1							1	1	1	1	1	1	18	36.00	
Total Physical Features	0	1	1	1	1	1	0	0	0	0	0	0	1	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	24	48.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:27 | UTM:556885/4364329 | Heading:135

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus										1																		1	1													1	1								5	10.00	38.46
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii																																									1										1	2.00	7.69
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																														1																					1	2.00	7.69
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	7	14.00	53.85
Trees																																																					
Juniperus osteosperma	1	1	1																																									1	1	1					6	12.00	46.15
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	6	12.00	46.15
Total Vegetation Cover	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	13	26.00	100.00
cryptobiotic					1	1															1	1	1										1						1								1			8	16.00	
Physical Features																																																					
Litter				1																																															1	2.00	
Rock											1	1															1							1	1					1									1	7	14.00	
Bare Ground							1	1	1				1	1	1	1	1	1	1					1	1	1	1				1	1				1	1	1								1			1	21	42.00	
Total Physical Features	0	0	0	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	0	1	1	1	1	1	0	1	0	0	0	0	0	0	1	0	1	1	29	58.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	
Bud sage present																																																					

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:28 | UTM:556284/4364283 | Heading:91

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																								1																							1				2	4.00	22.22
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	4.00	22.22
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																																																			0	0.00	0.00
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous																																																			0	0.00	0.00
Hilaria jamesii																																										1						1			2	4.00	22.22
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	2	4.00	22.22
Trees																																																					
Juniperus osteosperma		1				1	1	1															1																												5	10.00	55.56
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10.00	55.56
Total Vegetation Cover	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	9	18.00	100.00
cryptobiotic									1	1											1	1																							1				1	6	12.00	
Physical Features																																																					
Litter																																					1														1	2.00	
Rock												1	1	1	1	1	1	1	1	1																			1	1	1					1				13	26.00	
Bare Ground	1		1	1	1						1														1	1	1	1	1	1	1	1	1	1	1	1					1		1	1				1			21	42.00	
Total Physical Features	1	0	1	1	1	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	0	0	1	0	35	70.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:29 | UTM:556245/4364251 | Heading:119

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens																																																			0	0.00	0.00
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Cerstoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Leptodactylon pungens									1																																										1	2.00	6.67
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																																			0	0.00	0.00
Total Shrubs Cover	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.00	6.67
Forbs & Succulents																																																			0	0.00	0.00
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																																			0	0.00	0.00
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Grass																																																			0	0.00	0.00
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																			1																																1	2.00	6.67
Elymus salinus																																																			0	0.00	0.00
Elymus cinereus																																																			0	0.00	0.00
Elymus giganteous														1																																	1			1	3	6.00	20.00
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																																																			0	0.00	0.00
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4	8.00	26.67
Trees																																																					
Juniperus osteosperma																		1			1	1								1	1	1	1									1	1	1							10	20.00	66.67
Pinus edulis																																																			0	0.00	0.00
Total Tree Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	10	20.00	66.67
Total Vegetation Cover	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1	15	30.00	100.00
cryptobiotic										1	1														1																1										4	8.00	
Physical Features																																																					
Litter																								1					1																						2	4.00	
Rock												1	1							1			1				1	1						1	1	1	1	1						1	1					13	26.00	
Bare Ground	1	1	1	1	1	1	1	1							1	1	1												1										1	1							1	1			16	32.00	
Total Physical Features	1	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	1	0	0	1	0	0	1	1	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	1	1	0	1	1	0	31	62.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	
Euphorbia present																																																					

Lila Canyon Cover Sheet

Date:09/05/2003 | Disturbance Site | Transect:30 | UTM:556291/4364229 | Heading:315

Plant Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Total	Percent Cover	Relative Vegetative Cover
Shrubs																																																					
Atriplex canescens											1																																								1	2.00	4.35
Atriplex confertifolia																																																			0	0.00	0.00
Atriplex cuneata																																																			0	0.00	0.00
Artemisia nova																																																			0	0.00	0.00
Artemisia spinescens																																																			0	0.00	0.00
Artemisia tridentata tridentata																																																			0	0.00	0.00
Chrysothamnus nauseosus																																																			0	0.00	0.00
Chrysothamnus viscidiflorus																																																			0	0.00	0.00
Cowania mexicana																																																			0	0.00	0.00
Ceratoides lanata																																																			0	0.00	0.00
Ephedra viridis																																																			0	0.00	0.00
Sarcobatus vermiculatus																																																			0	0.00	0.00
Gutierrezia sarothrae																																											1								1	2.00	4.35
Total Shrubs Cover	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	4.00	8.70
Forbs & Succulents																																																					
Machaeranthera canescens																																																			0	0.00	0.00
Echinocereus triglochidiatus																																																			0	0.00	0.00
Penstemon palmeri																																																			0	0.00	0.00
Opuntia compressa																																								1											1	2.00	4.35
Sphaeralcia coccinea																																																			0	0.00	0.00
Total Forb Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2.00	4.35
Grass																																																					
Agropyron smithii																																																			0	0.00	0.00
Agropyron spicatum																																																			0	0.00	0.00
Agropyron cristatum																																																			0	0.00	0.00
Agropyron trachycaulum																																																			0	0.00	0.00
Aristida longiseta																																																			0	0.00	0.00
Bromus tectorum																			1																																1	2.00	4.35
Elymus salinus																		1							1																										2	4.00	8.70
Elymus cinereus																																																			0	0.00	0.00
Hilaria jamesii																																																			0	0.00	0.00
Oryzopsis hymenoides																																																			0	0.00	0.00
Sitanion hystrix																																																			0	0.00	0.00
Stipa comata																					1																														1	2.00	4.35
Vulpia octaflora																																																			0	0.00	0.00
Total Grass Cover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	8.00	17.39
Trees																																																					
Juniperus osteosperma				1	1	1	1	1	1														1	1									1	1	1									1	1					13	26.00	56.52
Pinus edulis																																																1	1	1	3	6.00	13.04
Total Tree Cover	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	16	32.00	69.57
Total Vegetation Cover	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	1	0	1	1	0	1	1	1	23	46.00	100.00
cryptobiotic																																																			0	0.00	
Physical Factors																																																					
Litter																																																			0	0.00	
Rock												1	1	1	1							1				1	1	1	1	1	1								1											12	24.00	
Bare Ground	1	1	1							1						1	1			1												1				1	1	1			1	1		1			1				15	30.00	
Total Physical Features	1	1	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	1	0	1	0	0	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	0	1	0	0	1	0	0	0	27	54.00	
Comments:	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	50	100.00	

Appendix 3

Woody Plant Density Data

Table A. Lila Canyon Woody Plant Density

Reference Area Totals

Date:	7/18/2003-9/5/2003																	
Area:	**Reference**																	
Transect:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	Plants/acre by species	
UTM:	555760	555839	555859	555849	555864	555856	555823	555842	555876	555894	555847	555862	555867	555875	555862			
	4364046	4363949	4364031	4363958	4364002	4364041	4364024	4364027	4364060	4363962	4363985	4364004	4364020	4363996	4363979			
Heading:	216	302	307	34	248	42	131	81	139	237	1	94	246	257	5			
Shrubs																		
Atriplex canescens	1		2	5		3	2	5	5	2	1		3	5	1	35	101.64	
Atriplex confertifolia		17		8					7	17	32	33	1	26	23	164	476.26	
Artemisia tridentata tridentata												5				5	14.52	
Chrysothamnus nauseosus										2		2				4	11.62	
Ceratoides lanata		1				1	1	1					1			5	14.52	
Ephedra viridis		3											1			4	11.62	
Sarcobatus vermiculatus							4				3			4	3	14	40.66	
Gutierrezia sarothrae	2	4	6	1	5	3	13	6	2	3	4	4	11	2	15	81	235.22	
Artemisia spinescens	2	1	6	1	3						5			1		19	55.18	
Leptodactylon pungens					5				1							6	17.42	
Yucca harrimanae							2				1					3	8.71	
Total Shrubs Cover	5	26	14	15	13	7	22	12	15	24	46	44	17	38	42	340	987.36	
Trees																		
Juniper	1	2	4	1		3	1	3	3				2	1		21	60.98	
Pinyon	1															1	2.90	
Total Tree Cover	2	2	4	1	0	3	1	3	3	0	0	0	2	1	0	22	63.89	
Total Woody Plants	7	28	18	16	13	10	23	15	18	24	46	44	19	39	42	362	1051.25	
Plants/acre	304.92	1219.68	784.08	696.96	566.28	435.6	1001.88	653.4	784.08	1045.44	2003.76	1916.64	827.64	1698.84	1829.52			
Average Plants/acre	1051.25																	
Standard Deviation	558.05																	
90% Confidence Interval	237.00																	

Table A. Lila Canyon Woody Plant Density

Disturbance Site Totals

Date:	7/18/2003-9/5/2003																
Area:	**Disturbance**																
Transect:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total	Plants/acre by species
UTM:	556184	556171	556185	556064	556099	556007	556004	556005	556025	556291	556166	556294	556271	556266	565865		
	4364387	4364379	4364369	4364371	4364343	4364381	4364329	4364319	4364334	4364299	4364351	4364239	4364293	4364311	4364329		
Heading:	47	230	207	187	248	307	154	45	108	315	57	278	66	187	135		
Shrubs																	
Atriplex canescens	1	16	19	1			3	1		2	3	3		3	5	57	165.53
Atriplex confertifolia		1		9	13	9	17	10	6		1					66	191.66
Artemisia tridentata tridentata	1															1	2.90
Chrysothamnus nauseosus			1			4	5		1							11	31.94
Ceratoides lanata	6	9		5	5	9	17	8	2							61	177.14
Ephedra viridis				1											1	2	5.81
Gutierrezia sarothrae	19	3	2	14	24	27		30	28	5	4	20	5	1	2	184	534.34
Leptodactylon pungens										1	1			3	1	6	17.42
																0	
Total Shrubs Cover	27	29	22	30	42	49	42	49	37	8	9	23	5	7	9	388	1126.75
Trees																	
Juniper										7	2	2	8	7	6	32	92.93
Pinyon		1				1				3	1				2	8	23.23
Fraxinus anomala										1			1			2	5.81
Total Tree Cover	0	1	0	0	0	1	0	0	0	11	3	2	9	7	8	42	121.97
Total Woody Plants	27	30	22	30	42	50	42	49	37	19	12	25	14	14	17	430	1248.72
Plants/acre	1176.12	1306.8	958.32	1306.8	1829.52	2178	1829.52	2134.44	1611.72	827.64	522.72	1089	609.84	609.84	740.52		
Average Plants/acre	1248.72																
Standard Deviation	473.09																
90% Confidence Interval	200.92																

Appendix 4

NRCS Productivity Estimate Letter

Appendix 5

Similarity Table

Lila Canyon Similarity Comparisons - Reference Area & Disturbance Site

Reference Area			Disturbance Site		
Species	Frequency (per 20 transects)	% Cover (per 1000 points)	Species	Frequency (per 30 transects)	% Cover (per 1500 points)
Salina wild rye	15	11.30	Salina wild rye	25	9.42
Cheat grass	12	6.30	Cheat grass	16	9.29
Galleta grass	16	5.30	Galleta grass	26	6.01
Shadscale	14	4.40	Shadscale	6	0.60
Globe mallow	11	3.20	Globe mallow	7	0.67
Needle and Thread	11	2.90	Needle and Thread	13	1.54
Six weeks fescue	12	2.40	Six weeks fescue	9	0.73
Utah juniper	6	2.10	Utah juniper	19	7.68
Squirreltail	10	2.00	Squirreltail	4	0.33
Indian rice grass	9	1.80	Indian rice grass	12	1.27
Fourwing saltbush	6	1.30	Fourwing saltbush	8	1.07
Snakeweed	5	0.90	Snakeweed	16	2.00
Big sagebrush	2	0.60	Big sagebrush	2	0.13
Yellow cryptantha	4	0.50	Yellow cryptantha	1	0.07
Prickly pear cactus	4	0.40	Prickly pear cactus	9	0.67
Three awn	3	0.30	Three awn	1	0.07
Skeleton weed	1	0.30	Skeleton weed	1	0.07
Purple aster	1	0.30			
Budsage	1	0.20			
Green Ephedra	2	0.20	Green Ephedra	1	0.07
Hedgehog cactus	2	0.20	Hedgehog cactus	2	0.13
Blue gramma	1	0.20	Blue gramma	2	0.27
Winterfat	1	0.10	Winterfat	6	0.47
Big Rabbitbrush	1	0.10	Big Rabbitbrush	1	0.07
Greasewood	1	0.10	Greasewood	2	0.33

Scorpion weed	1	0.10			
Chrysothamnus albidus (unconfirmed)	1	0.10	Pinyon pine	8	1.20
			Prickly Gilia	3	0.27
			Sand dropseed	4	0.47
			Fendler spurge	3	0.27
			Plantago	1	0.07
27 Total species; 3 species >5% cover			28 total species; 4 species >5%		

Appendix 6

Recommended Revegetation Seed Mixture

Previous vegetation studies of the Lila Canyon area produced a vegetation reseeding mixture. After reviewing the list, and considering that the post-mining land use will be wildlife/grazing, I recommend the list previously generated be use in post-mining revegetation projects. See attached list.

INTERIM AND FINAL RECLAMATION SEED MIX

Recommended Seed Mix for Lila Canyon Mine

	Pounds PLS/Acre
GRASSES	
Needle and Thread Grass	2
Indian Ricegrass	2
Basin Wild Rye	1
Galleta	1
Bluebunch Wheatgrass	1
Slender Wheatgrass	2
Blue grama	1
FORBS	
Blue Flax	1
Palmer Penstemon	0.25
Globemallow (*Sphaeralcea ambigua*)	0.5
Indian Paintbrush (*Castilleja liniaeriaefolia*)	0.1
Fringed Sage	0.1
SHRUBS	
Wyoming Big Sage	0.25
Green Rabbitbrush	0.5
Fourwing Saltbush	3
Winterfat	1
Shadscale	1
Cliffrose	1
Black Sage	0.25

Appendix 7

Presence of Plant Species of Concern

During the sampling period Mr. Jay Marshall, UtahAmerican Energy, requested that we conduct cursory surveys in the Lila Canyon area to determine the presence of 3 plant species of concern. The plants of concern were: 1) Creutzfeldt-flower (*Cryptantha creuzfeldtii* Welsh) a member of the Boraginacae family, 2) Coal-cliffs Sweet Vetch (*Hedysarum occidentale* var. *canone*) a member of the Fabaceae family, and 3) Horse Canyon Stickleaf (*Mentzeliea multicaulis* var. *librina* Thorne & F.G. Sm.). See attached letter to Mr. Marshall and plant description sheets.

No evidence was found of any of the 3 species in question.

NRCS Natural Resources Conservation Service

NRCS Utah

United States Department of Agriculture

Natural Resources Conservation Service

Price F.O.
350 N. 400 E.
Price, UT
84501

Phone:
5-637-0041 x24

FAX
435-637-3146

August 22, 2003

Mr. Jay Marshall
UtahAmerican Energy, Inc.
375 S. Carbon Ave., #127
Price, UT 84501

Re: Productivity Estimate for Proposed Lila Canyon Mine

Dear Mr. Marshall,

Following our visit on August 21, 2003 to the proposed mine site in Lila Canyon I have the following determinations for vegetative production (dry weight) this year based on the existing physical characteristics of the landscape as well as climatic conditions of the area. The disturbed area has approximately 350 pounds per acre (mid seral) for the grass/shrub site while the pinyon-juniper sites on the disturbed area have approximately 250 (mid seral) pounds per acre (herbaceous/shrub). The grass/shrub site for the reference area has approximately 450 pounds per acre (high seral) and approximately 250 (mid seral) pounds per acre (herbaceous/shrub) in the pinyon-juniper area.

It is evident that the vegetation in the area is suffering from the effects of the current drought which is the reason for the lower production values we are experiencing. Many of the perennial bunchgrasses are declining in vigor due to the build up of litter/old growth at the base of the plant at or near the soil surface, ultimately affecting the plants productivity/vigor. It appears that the annual/perennial forbs as well as the shrub component are displaying the effects of the ongoing drought. The scattered pinyon-juniper trees within the area appear to be sustaining despite the drought conditions. Although the drought conditions appear to be affecting the vegetative productivity, it is apparent that the higher precipitation at this elevation allows for higher sustainability/productivity than the nearby valley floors. Furthermore, the area has experienced a high rate of cheatgrass invasion which may temporarily help increase ground cover and slightly increase vegetative biomass, but will ultimately decreases the overall health of the ecological site.

Please feel free to contact me at any time with any other questions or comments.

Respectfully yours,

M. Dean Stacy
Range Management Specialist

Cc: Dr. Mike King, CEU

Appendix 7

Presence of Plant Species of Concern

During the sampling period Mr. Jay Marshall, UtahAmerican Energy, requested that we conduct cursory surveys in the Lila Canyon area to determine the presence of 3 plant species of concern. The plants of concern were: 1) Creutzfeldt-flower (*Cryptantha creuzfeldtii* Welsh) a member of the Boraginacae family, 2) Coal-cliffs Sweet Vetch (*Hedysarum occidentale* var. *canone*) a member of the Fabaceae family, and 3) Horse Canyon Stickleaf (*Mentzeliea multicaulis* var. *librina* Thorne & F.G. Sm.). See attached letter to Mr. Marshall and plant description sheets.

No evidence was found of any of the 3 species in question.

MEMO

College of
Eastern
Utah

TO: **Jay Marshall**
Utah American Energy

FROM: Dr. Mike King

DATE: January 29, 2004

RE: Sensitive Species Surveys

As per your request, I conducted cursory surveys in the Lila Canyon area to determine the presence of 3 plant species of concern. The plants of concern were: 1) Creutzfeldt-flower (*Cryptantha creuzfeldtii* Welsh) a member of the Boraginacae family, 2) Coal-cliffs Sweet Vetch (*Hedysarum occidentale* var. *canone*) a member of the Fabaceae family, and 3) Horse Canyon Stickleaf (*Mentzeliea multicaulis* var. *librina* Thorne & F.G. Sm.). See attached plant description sheets.

Special efforts were made during the cover and woody plant density sampling efforts, July - September 2003, to detect the presence of these species. However, no individuals of any of the 3 were observed in the Reference Area during the collection of data from 35 transects, nor were the plants detected in any of 45 transects in the Disturbance Site. Also, none of the species were noted while traversing the study areas moving to and from transect locations.

Additionally, on July 18, 2003 a brief survey was conducted in the major drainage adjacent to the north boundary of the proposed disturbance area. I went up the drainage approximately 1 mile, but saw no evidence of any of the 3 species. I also spent approximately 2 hours walking through the Pinyon-Juniper area at the southeast edge of the Disturbance Site on September 5, 2003, but saw no evidence of any of the 3 species in question.

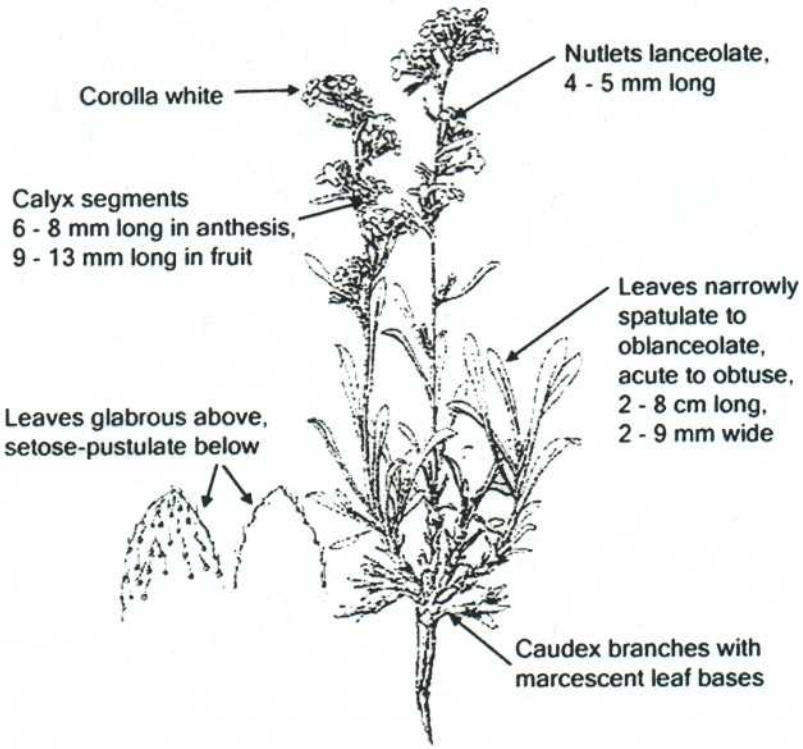
If you have questions, Please let me know.

Office of the Dean
Division of Arts & Sciences

Mike King, PhD

451 East 400 North
Price, Utah 84501

(435) 613-5232
Fax (435) 613-4102
E-Mail mking@ceu.edu



CRYPTANTHA CREUTZFELDTII

Scientific name: ***Cryptantha creutzfeldtii*** Welsh
(common name) Creutzfeldt-flower

Family: Boraginaceae
(common name) Borage family

Synonyms:
None

Global Distribution:
Endemic to central Utah in Carbon, Emery, and Sevier Counties

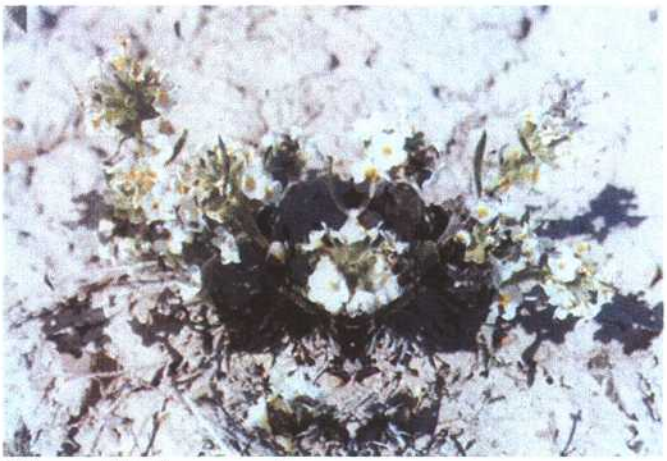
Land Ownership:
FS - Manti-LaSal NF, BLM - Price and Richfield Field Offices, and private

Habitat:
Shadscale and mat ***Atriplex*** communities on the Mancos Shale Formation between 5,250 and 6,500 feet elevation, late April - June.

Comments:
Close to ***C. jonesiana***, but with glabrous leaves above and the lower surface having mostly appressed, pustulate-based bristles, with few (or no) finer non-pustulate hairs, and basal leaves obtuse to acutish and more pointed, calyx 9 - 13 mm long in fruit, and nutlets 4 - 5 mm long.

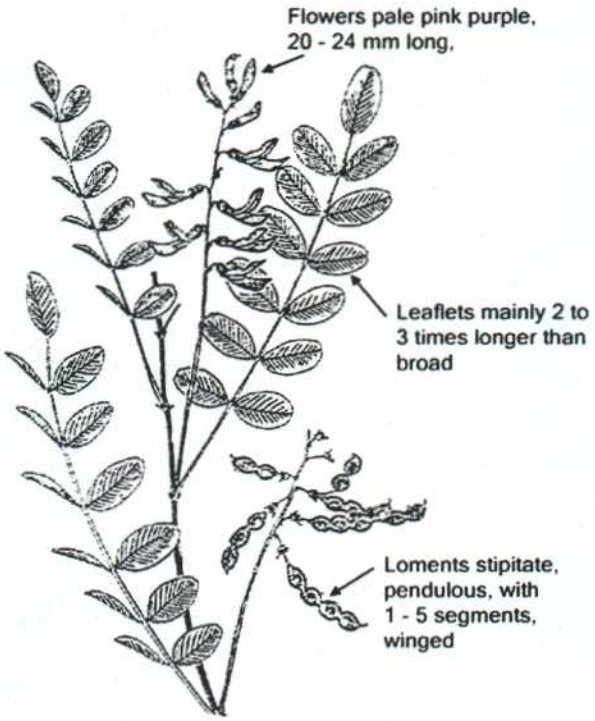
Cryptantha creutzfeldtii

Habitat (B. Thompson)



Closeup (B. Thompson)

Species Distribution



HEDYSARUM OCCIDENTALE VAR. *CANONE*

Scientific name: ***Hedysarum occidentale*** Greene var. ***canone*** Welsh
(common name) Coal-cliffs sweetvetch

Family: Fabaceae
(common name) Pea family

Synonyms:
None

Global Distribution:
Endemic to Carbon, Duchesne, and Emery Counties, Utah

Land Ownership:
FS - Manti LaSal NF, BLM - Price Field Office, State Land, and private

Habitat:
Pinyon-juniper, serviceberry, maple, mountain mahogany, and sagebrush communities between 6,400 and 8,300 feet elevation, late June - mid-August.

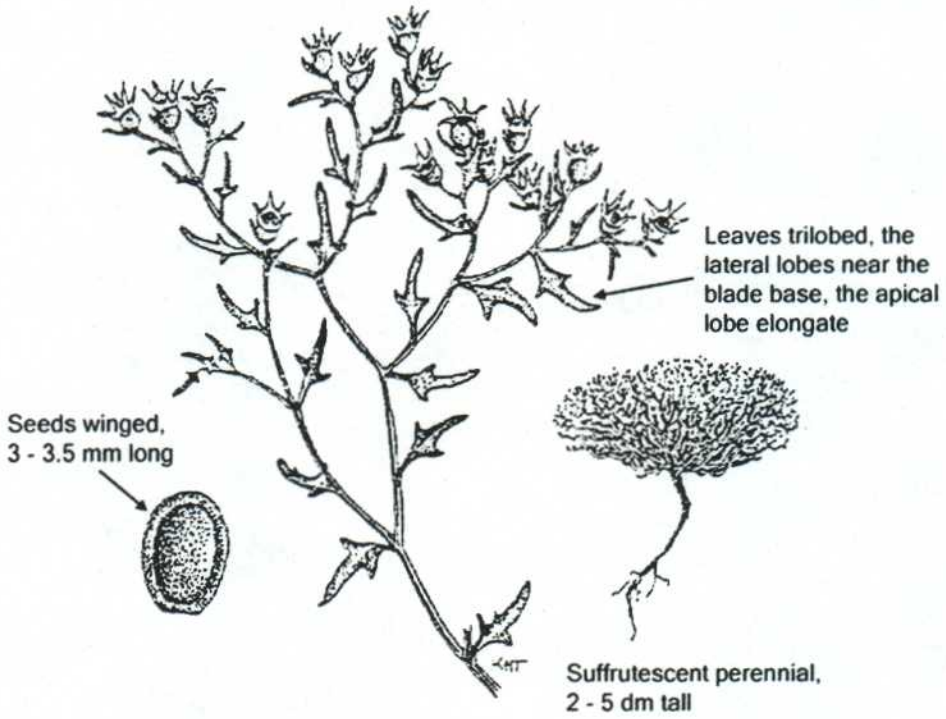
Comments:
Differs from var. ***occidentale*** in the broader leaflets, and pale flowers mainly 20 - 24 mm long, vs. dark pink purple flowers mainly less than 20 mm long..

Hedysarum occidentale var. *canone*

Habitat (C. Delmatier)

Closeup (C. Delmatier)

Species Distribution



MENTZELIA MULTICAULIS VAR. *LIBRINA*

Scientific name: ***Mentzelia multicaulis*** **(Osterh.) Darlington var.** ***librina*** **Thorne & & F.G. Sm.**
(common name) Horse Canyon stickleaf

Family: Loasaceae
(common name) Stickleaf family

Synonyms:
None

Global Distribution:
Carbon and Emery Counties, Utah; a Colorado Plateau endemic

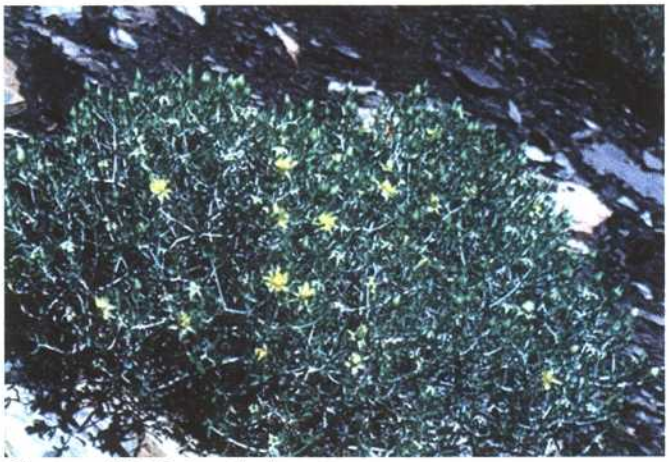
Land Ownership:
BLM - Price Field Office, State Lands, and private

Habitat:
Sagebrush, rabbitbrush, and pinyon-juniper communities at about 6,200 feet elevation, on the Mancos Shale and Price River Formations, July - September.

Comments:
This variety differs from var. ***multicaulis*** by the leaves that are trilobed, with the lateral lobes near the stem base and the apical lobe elongate.

Mentzelia multicaulis var. *librina*

Habitat (C. Delmatier)



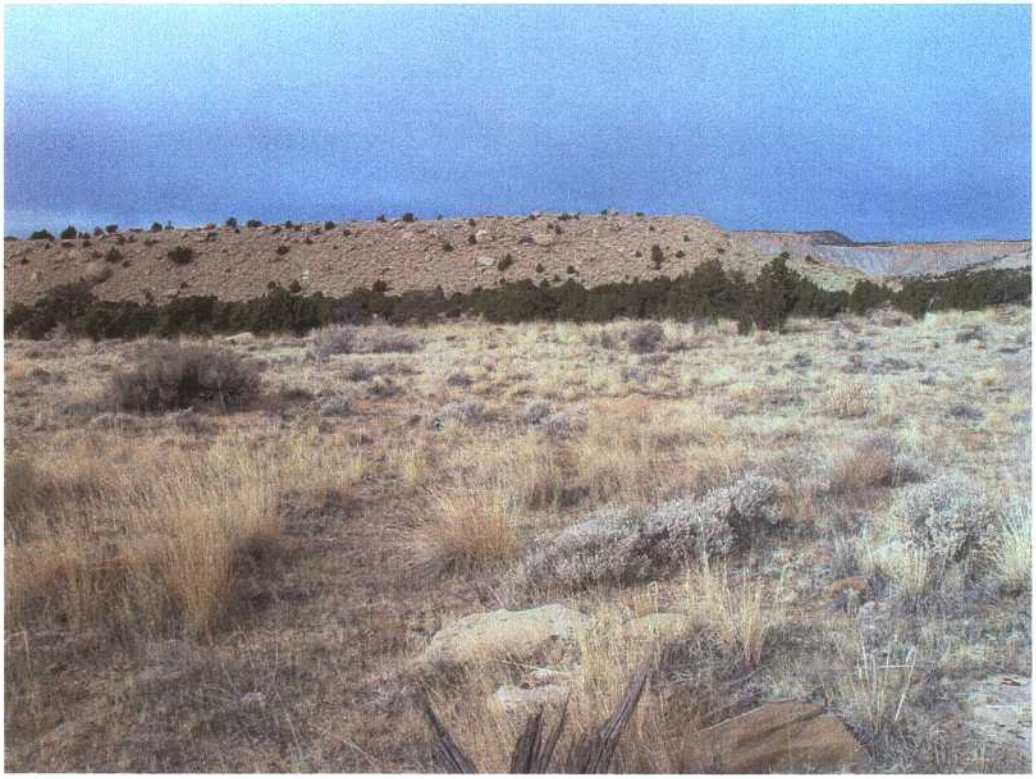
Closeup (C. Delmatier)

Species Distribution

Appendix 8

Lila Canyon Photographs

Reference Area



Disturbance Site

Appendix 9

References

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August 22, 2003

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It is evident that the vegetation in the area is suffering from the effects of the current drought which is the reason for the lower production values we are experiencing. Many of the perennial bunchgrasses are declining in vigor due to the build up of litter/old growth at the base of the plant at or near the soil surface, ultimately affecting the plants productivity/vigor. It appears that the annual/perennial forbs as well as the shrub component are displaying the effects of the ongoing drought. The scattered pinyon-juniper trees within the area appear to be sustaining despite the drought conditions. Although the drought conditions appear to be affecting the vegetative productivity, it is apparent that the higher precipitation at this elevation allows for higher sustainability/productivity than the nearby valley floors. Furthermore, the area has experienced a high rate of cheatgrass invasion which may temporarily help increase ground cover and slightly increase vegetative biomass, but will ultimately decreases the overall health of the ecological site.

Please feel free to contact me at any time with any other questions or comments.

Respectfully yours,

M. Dean Stacy
Range Management Specialist

Cc: Dr. Mike King, CEU

App 3.3

Subject: T&E species for Emery County
Date: Wed, 30 Apr 2003 10:46:48 -0600
From: Diana_Whittington@fws.gov
To: jaymarshall@sisna.com
CC: chriscolt@utah.gov

Here's the most current list, with notes.

EMERY

Barneby Reed-mustard	Schoenocrambe barnebyi		E
Jones Cycladenia	Cycladenia humilis var. jonesii		T
Last Chance Townsendia	Townsendia aprica	T	
Maguire Daisy	Erigeron maguirei		T
San Rafael Cactus	Pediocactus despainii		E
Winkler Cactus	Pediocactus winkleri	T	
Wright Fishhook Cactus	Sclerocactus wrightiae	E	
Bonytail4,10	Gila elegans	E	
Colorado Pikeminnow4,10	Ptychocheilus lucius		E
Humpback Chub4,10	Gila cypha	E	
Razorback Sucker4,10	Xyrauchen texanus		E
Bald Eagle1	Haliaeetus leucocephalus		T
Mexican Spotted Owl1,4	Strix occidentalis lucida		T
Western Yellow-billed Cuckoo	Coccyzus americanus occidentalis	C	
Black-footed Ferret6	Mustela nigripes		E

1 Nests in this county of Utah.
4 Critical habitat designated in this county.
6 Historical range.
10 Water depletions from any portion of the occupied drainage basin are considered to adversely affect or adversely modify the critical habitat of the endangered fish species, and must be evaluated with regard to the criteria described in the pertinent fish recovery programs.

There's also a Conservation Agreement Species:

EMERY

Colorado River Cutthroat Trout	Oncorhynchus clarki pleuriticus

Hope this is helpful. And I'd like to reiterate that you should feel free to call me when you have questions.

Diana M. Whittington
Fish and Wildlife Biologist, Energy
USFWS, Ecological Services
2369 West Orton Circle
West Valley City, UT 84119
ph: 801/975-3330 or
801/975-3337
fx: 801/975-3331
"In God we trust, all others need data".

Here's the most current list, with notes.

EMERY

Barneby Reed-mustard	Schoenocrambe barnebyi	E
Jones Cycladenia	Cycladenia humilis var. jonesii	T
Last Chance Townsendia	Townsendia aprica	T
Maguire Daisy	Erigeron maguirei	T
San Rafael Cactus	Pediocactus despainii	E
Winkler Cactus	Pediocactus winkleri	T
Wright Fishhook Cactus	Sclerocactus wrightiae	E
Bonytail4,10	Gila elegans	E
Colorado Pikeminnow4,10	Ptychocheilus lucius	E
Humpback Chub4,10	Gila cypha	E
Razorback Sucker4,10	Xyrauchen texanus	E
Bald Eagle1	Haliaeetus leucocephalus	T
Mexican Spotted Owl1,4	Strix occidentalis lucida	T
Western Yellow-billed Cuckoo	Coccyzus americanus occidentalis	C
Black-footed Ferret6	Mustela nigripes	E

1 Nests in this county of Utah.
4 Critical habitat designated in this county.
6 Historical range.
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There's also a Conservation Agreement Species:

EMERY

Colorado River Cutthroat Trout pleuriticus	Oncorhynchus clarki

Hope this is helpful. And I'd like to reiterate that you should feel free to call me when you have questions.

Diana M. Whittington
Fish and Wildlife Biologist, Energy
USFWS, Ecological Services
2369 West Orton Circle
West Valley City, UT 84119
ph: 801/975-3330 or
801/975-3337
fx: 801/975-3331
"In God we trust, all others need data".

APPENDIX 3-4

THREATENED AND ENDANGERED SPECIES INVENTORIES

Information for Appendix 3-4 is all hard copies no electronic copies exist.

Appendix 3-4

CANYON SWEETVETCH, CREUTZFELDT-FLOWER, LOGGERHEAD SHRIKE, AND BURROWING OWL INVENTORIES FOR THE LILA CANYON MINE PROPOSAL

CONDUCTED BY

EIS ENVIRONMENTAL CONSULTING

MAY 21st, 22nd, AND 26th (1999)

Introduction

UtahAmerican Energy, Price Utah, has proposed to build a mine facility located within Lila Canyon of the Book Cliffs/Roan Cliffs Plateau Physiographic Region. The proposed mine facility includes a transportation/utility corridor and a mining surface facility. The transportation/utility corridor will consist of an access road, rail line, power line, and utility line. Other proposed actions are a permit area and two borrow areas.

A ground inventory for loggerhead shrike, (*Lanius ludovicianus)*, creutzfeldt-flower, *(Cryptantha creutzfeldtii*,) burrowing owls, (*Athene cunicularia*,) and Canyon sweetvetch, *(Hedysarum occidentale* variety *canone),* dispain footcactus, (*Pediocactus despainii),* and Wright fishhook cactus *(Sclerocatus wrightiae),* was conducted on May 21, 22, and 26 by employees of EIS. The proposed access/utility corridor and surface facility were inventoried by walking linear transects over the entire area of concern.

Methodology

Loggerhead shrike - Burrowing owl

Inventories were conducted between sunrise and 10:00A.M., the period of highest bird activity, on May 21, 22, and 26th. Binoculars and spotting scopes were used to note shrike activities and the entire proposed area was searched for white-tailed prairie dog, (Cynomys leucurus) towns. Prairie dog towns are the preferred habitat of borrowing owls. If shrikes were observed, a thorough search of the site was conducted to identify the presence of a nest. Field personnel would also conduct a thorough search of identified prairie dog towns to reveal the presence of on-going or historic burrowing owl activities (scratchings, droppings, tracks, ect.). Habitat present in the proposed area was noted, as was the general topography, weather conditions and general mitigation suggestions.

Appendix S-9

ENVIRONMENTAL INDUSTRIAL SERVICES
435-472-3814 • 800-641-2927 • FAX 435-472-8780 • eisec@sisna.com • 31 NORTH MAIN STREET HELPER, UTAH 84526

July 17, 2003

R. Jay Marshall
Project Manager
UtahAmerican Energy, Inc.

Dear Jay:

As we discussed according to DOGM, the various TES inventories need clarification on who did what. The following should help.

The TES inventory conducted **May 21st, 22nd, and 26th of 1999** was planned and directed by Mel Coonrod. The data was collected by Mel Coonrod and David Steed. The report was written by Mel Coonrod and David Steed.

The **August 2000** Biological Assessment was prepared by David Steed. Mel Coonrod reviewed and approved the BA. No data collection was directly involved for the preparation of the BA.

The TES inventory conducted on **April 30th, 2002** was planned and directed by Mel Coonrod. The actual inventory was performed by Mel Coonrod and David Varner. The report was written by David Varner and approved by Mel Coonrod.

The **May 30, 2002** Follow Up TES inventory was planned and directed by Mel Coonrod. The individuals who participated are included in the Results section of the report include Mel Coonrod EIS, Dean Stacy EIS, Denise Chavez EIS, Wayne Ludington BLM, Mike Kaminski BLM, Mike Tweddell BLM. The report was written by Dean Stacy, M.S.

Should you have any questions or if DOGM has any concerns please let me know.

Sincerely,

Mel Coonrod
President and Owner
EIS/Environmental Consulting

Appendix 3-4

Assessing The Impact of Scale on the Performance of GIS Habitat Models For Mexican Spotted Owls In Utah

FINAL REPORT

Prepared By

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October 2002

Assessing The Impact of Scale on the Performance of GIS Habitat Models For Mexican Spotted Owls In Utah

INTRODUCTION

The Mexican spotted owl (*Strix occidentalis lucida*) was listed as threatened in March 1993 by the U.S. Fish and Wildlife Service (Cully and Austin 1993). The Mexican spotted owl occupies a variety of habitat types throughout the southwest United States including mixed conifer forests; riparian madrean woodland; riparian vegetation; and in Utah, arid canyonlands (USDI 1995, Willey 1995). Spotted owl populations may be declining in Arizona and New Mexico (Seamans et al. 1999) where the owl is strongly associated with montane forests susceptible to wildfire (Gutierrez et al. 1995). The population status of spotted owls in the canyonlands of Utah has not been determined and, in that region, most research has focused on habitat associations (Willey 1998), inventory of potential habitat (Johnson and Reynolds 2001), and informal territorial monitoring (Charlie Sheltz, NPS Biologist, Canyonlands National Park, pers. comm.). Due to potential conflicts between maintenance of appropriate nesting habitats and human-related activities, e.g., timber management, exploration for gas and oil, and livestock grazing, habitat planning tools are needed by wildlife and natural resource managers (e.g., see Fig. 1).

Using the ArcInfo geographic information system (GIS), Willey and Spotskey (1997, 2000) used spotted owl life history data and physical landscape features (e.g., geology, slope, aspect) to create predictive the extent of potential Mexican spotted owls breeding habitat in Utah (Figs 2 and 3). They produced GIS models that were designed to be used by wildlife managers at two different scales: 1) the 1997 model (Fig. 2) predicted the location of breeding habitat at the state-wide scale (1:500,000 map scale); and 2) the 2000 model (Fig. 3) was [both built at 100 m pixel scale - it's about intent of use] designed for planners to zoom in to a project-level scale ($\leq$ 1:100,000 map scales). The 2000 model was intended for detailed analysis of habitat features to support the design of field surveys or to designate important habitats for protection.

The *Recovery Plan for Mexican Spotted Owls* (USDI 1995) recommended protecting spotted owl territories by designing Protected Activity Centers (minimum 600 acre zone) around known owl nest and roost sites. Further, the plan strongly encouraged inventory of potential habitat that may be affected by human activities. GIS models can help support these recovery and management objectives by providing reasonable estimates of the distribution of vital habitat. This is particularly true when models are field tested. Although the 2000 model has been field tested and shown to be very effective (e.g., Willey and Spotskey 2000), standards for the application of the GIS models have not been developed, and planners are faced with a dilemma: where and when can the models be used appropriately? Misuse of GIS models could have important ramifications for management of habitat in Utah, therefore, the current study was designed to contrast the performance of the two spotted owl habitat models in Utah and provide recommendations for their use.

Relevant Background Information

Spotted owls *(Strix occidentalis)* are placed within the genus *Strix*, which includes the barred owl (*S. Varia*) and the great gray owl (*S. nebulosa*) in North America (AOU 1957:285). Although spotted owls and great gray owls are not considered close relatives, the barred and spotted owl have hybridized in the Pacific Northwest after approximately three decades of sympatry (Hamer et al. 1994). Both spotted and barred owls are considered forest adapted species and may be ecological replacements due to their broadly-similar habitat requirements (Haney 1997).

Three subspecies of spotted owl are recognized in North America: the Mexican spotted owl (*S. o. lucida*), the Northern spotted owl (*S. o. caurina*), and the California spotted owl (*S. o. occidentalis*). A recent genetic study found one major allelic difference between the coastal subspecies (i.e., *caurina* and *occidentalis*) and the Mexican subspecies (Barrowclough and Gutiérrez 1990). Regional genetic differences may also occur at the sub-population level for *lucida*, with spotted owls in Utah showing distinct genetic variation from populations south in Arizona and New Mexico (Barrowclough et al. 1999).

Spotted owls are distributed throughout the pacific northwest, California, and the southwest U.S. and northern Mexico and are typically associated with late seral forests with high crown closure (Forsman et al. 1984, Ganey and Balda 1989a,b,&1994, Bias and Gutieérrez 1992, Blakesley et al. 1992, Hunter et al. 1995, Forsman and Giese 1997, Grubb et al. 1997, LaHaye et al. 1997, Ripple et al. 1997). Because of perceived dependence on forest vegetation, spotted owls have been a focus of controversy over management of mature forests and canyonland habitats across the west (e.g., Anderson and Mahato 1995, Lamberson et al. 1997).

The Northern and Mexican spotted owls are listed as threatened under the Endangered Species Act (Gutierrez et al. 1995). Timber management practices and catastrophic wildlife have been recognized as the primary threats to the owls and their habitat (Smith 1990, Smith 1991, Cully and Austin 1993, USDI 1995). The breeding range of the Mexican spotted owl extends from the southern Rocky Mountains south to the end of the Mexican Plateau. Although widely distributed in forest habitats in the Southwest, the Mexican spotted owl also inhabits relatively open canyon country along the northwest edge of its range. For example, early published records from Utah date back to the 1920s and include places like Zion National Park (Hayward et al. 1976), Glen Canyon (Atwood et al. 1980), Capitol Reef and Canyonlands National Parks, and Dinosaur National Monument (Willey 1998). Rinkevich (1991) and Willey (1995) located numerous nesting pairs scattered across Utah's canyon country, and the owl is strongly associated with steep sandstone canyons. Vegetation in this region is dominated by Great Basin Desert Scrubland and Great Basin Conifer Woodland communities (Brown 1982).

PROJECT OBJECTIVES

The GIS habitat models for Utah identified large tracts of un-surveyed potential habitat on BLM lands surrounding the city of Price (Fig. 1). Land management in this region has traditionally included proposed BLM wilderness study areas (WSA), livestock grazing, active and proposed mineral and oil/gas resource development project areas, and non-wilderness recreation zones (David Mills, Wildlife

Biologist, Price BLM). Spotted owls have been located within the study area along the Green River in lower Desolation Canyon (Willey 1998). Overall, the goal of this analysis is to support spotted owl management in the region by evaluating the performance of the GIS models and discussing their appropriate scale and application.

This project had the following specific objectives:

1. To conduct helicopter over-flights within four project areas in the Price region to visually evaluate the performance of GIS models.

2. To conduct a contrast of the two GIS models using image overlays for these Project Areas: Barrett Project Area adjacent to 9-mile Canyon; the Pine Creek Project Area; the Little Park Wash Project Area; and the Drunkard Project Area.

3. To provide recommendations regarding the application and scope of the GIS models near Price, Utah.

METHODS

Study Areas

The BLM Price Field Office is located within the Colorado Plateau physiographic province of the southwestern United States (Thornbury 1965, Brown 1982). This region includes an important habitat concentration in Desolation Canyon (DESO), located approximately 40-km northeast of Price in east-central Utah. The four project areas are located nearby the city of Price in surrounding canyonlands. All four areas are characterized by entrenched canyonlands rimmed by high cliff faces, stair-step benchlands, numerous side-canyons, and high plateaus. The areas possess riparian and upland vegetation types along canyon bottoms, with montane vegetation present along the upper reaches of side-canyons, pinyon juniper habitat along mid-elevation slopes, and mixed conifer at the highest elevations. Vegetation included within riparian habitats is dominated by Fremont Cottonwood (*Populus fremontii*). Uplands are dominated by pinyon-juniper forest, often including blackbrush (*Coleogyne ramosissima*) and curl-leaf Mahogany (*Cercocarpus ledifolius*) with indian ricegrass (*Stipa hymenoides*) in the understory, and montane highlands are composed of mixed-conifer forest.

Model Evaluation

The 1997 and 2000 GIS models were used to identify potential spotted owl habitat within the four project areas (Figs 4, 5, 6, and 7). In the first phase of the this project, field maps were produced for each area using ArcView GIS and used for reference during helicopter overflights of each project area. During the flights, each project area was inspected from approximately 500 feet above-ground-level. At each project area, the extent of potential spotted owl breeding and roosting habitat was determined by visual inspection and traced on 7.5 minute USGS topographic quads. The extent of potential habitat was identified to the nearest 100 meters and outlined on the field maps for comparison with the GIS models. During the second phase of this work, the 1997 and 2000 model predictions were overlaid with the over-flight field maps using the ArcView 3.2 GIS. Performance of the GIS models was assessed by comparing the prediction of the GIS maps with the extent of habitat identified during the over-flights.

GIS Model Characteristics

The 1997 GIS model for spotted owl breeding habitat in Utah was designed to be used at a regional scale (i.e., >1:100,000 map scale) to identify landscapes with potential for spotted owl territories. The model identified regions that could be used for roosting and nesting by spotted owls and also identified landscapes that might be of marginal value during non-breeding months (e.g., October-February). Three habitat layers were depicted by the 1997 model: white pixels showed non-suitable habitat; yellow pixels showed marginal habitat; and green pixels identified potential breeding habitat (Fig 2). The 1997 GIS model used the following data themes, or layers (100-m pixel minimum mapping unit): slope, aspect, slope curvature (ruggedness) and vegetation . The 2000 GIS habitat model for spotted owl breeding habitat (Fig. 3) was designed as a multi-scale tool to operated across various map scales, e.g., from 1:24,000 and greater ("fine to coarse grains"). It was designed to allow managers to locate broad landscapes with habitat potential and then zoom to the fine grain to classify individual 100 meter by 100 meter pixels. Thus, the 2000 model was designed to work at various spatial scales to indicate broad landscapes as well as detailed patches where potential spotted owl breeding habitat could occur. Further, the 2000 model identified areas that could be used for roosting and nesting during the

breeding season (March-September). The 2000 model used a larger number of GIS data layers than the 1997 model, including: slope, aspect, slope curvature (ruggedness), vegetation (at the species level), surface geology, soil moisture, and an index to surface temperature. These themes provided the detail needed to identify habitat at a fine grain (Willey and Spotskey 2000).

RESULTS AND DISCUSSION

GIS Model Assessment and Recommendations: Pine Creek Project Area

The performance of the GIS models was evaluated within the Pine Creek project area. The 1997 model identified owl habitat throughout the project area (Fig.4). In contrast, the 2000 model identified 2 small isolated patches of habitat located on steep north-facing slopes located in the east portion of the project area. Following the aerial inspection during results of the over-flight, the 1997 model appeared to contain significant errors of "commission" (habitats were included that are not suitable for spotted owl nesting or roosting). For example, the 1997 model classified unsuitable low angle scree and talus slopes, and hot south-facing slopes, as suitable spotted owl nest and roost habitat. In contrast, the 2000 model omitted these unsuitable habitat types and correctly classified two steep canyon habitat patches that were present and identified during the field examination. In conclusion, the 1997 model incorrectly classified much of the project area as suitable (significant errors of commision). Overall, the Pine Creek project area represents unsuitable habitat for spotted owls because only two isolated roost habitat fragments, identified by the 2000 model, are included in the study site. The bulk of the project does not warrant surveys for Mexican Spotted Owls due to an overall lack of suitable habitat. However, new guidelines for use of the 2000 habitat model have been developed by the U.S. Fish and Wildlife Service. (Laura Romin, personal communication, December 2002). It is recommended that each 100 X 100- meter pixel identified by the 2000 model as suitable habitat within the Pine Creek Project Area receive a 0.5 mile circular buffer radius (i.e.,0.5 mile outward from the pixel center). All buffered areas require establishment of spotted owl calling stations designed for complete coverage of the buffered zone, with

each point called four times during two consecutive survey years following the standardized protocol for inventory of spotted owls (e.g., USDI 1991).

GIS Model Assessment and Recommendations: Dry Park Wash

The performance of the GIS models was evaluated within the Dry Park Wash (Lila Mine) project area (Fig. 5). The 1997 model identified breeding habitat throughout the main wash running North-South through the project area. In addition, the majority of remaining land with the project area outside of prime habitat was classified as marginal. In contrast, the 2000 model identified only four patches of suitable habitat on steep north-facing slopes located in the east portion of the project area adjacent to a BLM WSA boundary. Based on the overflight analysis, the 1997 model was consistently identifying unsuitable south-facing and low angled slopes as suitable habitat, and thus committing significant errors of commission. The 1997 model incorrectly classified much of the project area as suitable (green pixels) and the remainder of the area as marginal (Fig. 5). The 2000 model correctly classified several potential cliff faces as suitable roost and nesting habitat. Overall, the Dry Park Wash project area represents unsuitable habitat for spotted owls except for a few isolated habitat fragments identified in the east section, all of which were identified correctly by the 2000 model. Although it is likely that there is insufficient suitable roost and nest habitat within the project area for establishment of a breeding territory, most of the project are represents suitable mid-elevation winter habitat for migrating adults and dispersing juveniles (Willey 1998, Willey and Van Riper III 2000).

Management actions recommended for the Lila Mine project area include: 1) each 100 X 100-meter pixel identified by the 2000 model as suitable habitat within the Project Area receive a 0.5 mile circular buffer radius (i.e.,0.5 mile outward from the pixel center); 2) All buffered areas should include the establishment of spotted owl calling stations designed for "complete coverage" (as defined by the inventory protocol) of the buffered zone; 3) each called point should be surveyed four times a year during

two consecutive survey years; and 4) the survey design must follow the standardized protocol for inventory of spotted owls (e.g., USDI 1991, amended 2002).

GIS Model Assessment and Recommendation: Barrett Project Area

The performance of the GIS models was evaluated within the Bill Barrett project area. This area contains several premier sections of steep-walled rocky canyon habitat for spotted owl nesting and roosting located within sections of 9-mile Canyon, Dry Canyon, Cottonwood Canyon, and lower Jack's Canyon (Fig. 6). The lower reaches of these canyons represent some of the best rocky canyon habitat in the Price, Utah and Desolation Canyon region, and spotted owl territories have been located nearby the project area (Willey 1995, 1998).

The 2000 model identified large sections of suitable breeding habitat in the main canyon corridors throughout the project area. These habitats are characterized by parallel-sided vertical rocky cliffs that rim the canyons. As determined by comparison with maps produced during the aerial inspection using a helicopter, the 2000 GIS model correctly classified the steep cliff habitats that are present in the project area, and furthermore, the 2000 GIS model did not incorrectly classify suitable habitat (no obvious errors of omission or commission). In contrast, the 1997 model misclassified habitats, frequently including unsuitable low-angled terrain that was south-facing or less than vertical. The 1997 model incorrectly included pixels from within the low-slope Pinyon-Juniper uplands surrounding the canyons. These uplands are composed of open Pinyon-Juniper forests and open grasslands distributed across rolling hills and dry washes with virtually no vertical-walled suitable roosting or nesting habitat for spotted owls.

Management actions recommended for the Bill Barrett project area are suggested only for those areas identified by the 2000 GIS model that have not been surveyed for spotted owls. Furthermore, the following recommendations include only those pixels that are isolated from the canyon floor (e.g., pixels that are identified on the plateau uplands above the canyon rims). For these isolated pixels: 1) each 100 X 100- meter pixel identified by the 2000 model as suitable habitat must receive a 0.5 mile circular buffer

radius (i.e., 0.5 mile outward from the pixel center); 2) All buffered areas should include the establishment of spotted owl calling stations designed for "complete coverage" (as defined by the inventory protocol) of the buffered zone; 3) each called point should be surveyed four times a year during two consecutive survey years; and 4) the survey design must follow the standardized protocol for inventory of spotted owls (e.g., USDI 1991, amended 2002).

GIS Model Assessment and Recommendations: Drunkard Project Area

The performance of the GIS models was evaluated within the Drunkard project area (Fig. 7). It is important to note that this project area is dominated by lowland and mid-elevation Pinyon-Juniper forests and grass-shrublands dispersed among shallow washes, low hills and open valleys in the central and east portions of the project area. All of these lowland habitats are unsuitable for Mexican spotted owls and model output in these areas represents errors of commission by both habitat models, i.e., isolated small north-facing cliffs were erroneously included in the GIS models but do not represent suitable nest or roost habitat.

However, along the extreme western edge of the project area, several steep montane canyons do include sections of potential spotted owl nest and roost habitat and warrant further study. In particular, the upper reaches of these canyons do possess potential rocky canyon habitat for spotted owls. Furthermore, it should be noted that the upper one-third of north-facing slopes in these western canyon are covered by steep slope mixed-conifer forest habitat that are protected by the Recovery Plan for Mexican Spotted Owls (USDI 1995) and warrant survey work for spotted owls before habitat altering activities can be conducted. Overall, the 2000 habitat model identified numerous pixels of suitable breeding habitat in the upper reaches of canyons located along the west edge of the project area (Fig. 7).

The 2000 model also classified 3 suitable areas identified on north-facing cliffs in the eastern portion of the project area. The 2000 model incorrectly classified these north-facing cliffs as suitable and appeared to be biased by slope and aspect features, i.e., these cliffs are slope-aspect outliers that do

not represent suitable nesting habitat (Dan Spotskey, GIS specialist, Grand Canyon, pers. comm.). In contrast, the 1997 model identified unsuitable low-slope and moderate-slope terrain throughout the central and eastern valleys and dry washes of the project area and was clearly committing gross errors of commission. Based on the over-flight examination, the 1997 model was strongly misclassifying south-facing and low angled slopes as suitable breeding habitat.

The over-flight inspection and the 2000 habitat model identified several potential habitat areas in the west and extreme north-west corner of the Drunkard project area that warrant field surveys for spotted owls before habitat altering activities should proceed (Fig. 7). Management actions recommended for the project area include:

A) Do not survey for spotted owls in the eastern two-thirds of the entire project area.

B) For isolated pixels in the western one-third of the project area: 1) each 100 X 100- meter pixel identified by the 2000 model as suitable habitat within the Project Area receive a 0.5 mile circular buffer radius (i.e.,0.5 mile outward from the pixel center); 2) All buffered areas should include the establishment of spotted owl calling stations designed for "complete coverage" (as defined by the inventory protocol) of the buffered zone; 3) each called point should be surveyed four times a year during two consecutive survey years; and 4) the survey design must follow the standardized protocol for inventory of spotted owls (e.g., USDI 1991, amended 2002).

C) For major canyons (greater than 2-km long and not more than 2-km wide) with suitable habitat identified by the 2000 GIS model that are located in the western one-third of the project area: establish spotted owl calling stations designed for "complete coverage" (as defined by the inventory protocol) within all portions of suitable canyons; 3) each called point should be surveyed four times a year during two consecutive survey years; and 4) the survey design must follow the standardized protocol for inventory of spotted owls (e.g., USDI 1991, amended 2002). In additional, surveys for spotted owls area recommended within all steep-sloped (≥40% slope) mixed-conifer forest stands.

CONCLUSIONS AND ADDITIONAL RECOMMENDATIONS

The helicopter over-flights provided an efficient mechanism for inspecting spotted owl habitat in the Price region. All four project study areas were inspected visually from various altitudes and angles AND generated a detailed assessment of the distribution of potential spotted owl habitat in the project areas. In general, the 1997 model performed poorly at the fine grained scale within the project areas, but given it's original design, this was not an unexpected outcome. For example, the 1997 model consistently misclassified south-facing slopes as suitable spotted owl breeding habitat, thus the 1997 model does not perform well at the 1:24,000 map (fine grained) scale. However, the 1997 model is still a useful tool for managers and planners seeking information about broad distribution patterns of spotted owl habitat at regional scales (e.g., >1:100,000 map scale). The 1997 model can be used as a first approximation of the distribution and extent of habitat at state-wide scales to prioritize broad survey areas and alert managers that spotted owls may be present in their management region. The 1997 model should not be used at fine scales (i.e., less than 1:100,000) because of its high level of habitat misclassification.

The 2000 habitat model performed extremely well at all scales, but was particularly informative at the fine grain. The 2000 model consistently identified steep rocky canyon habitat that was present in four independent test areas in the Price region and matched the qualitative results of aerial over-flights. The 2000 model did not miss any key habitats for spotted owls in this region (no apparent errors of omission). Furthermore, because the 2000 model correctly identified habitat at the regional scale, it can serves as a scale-independent GIS model for land planners concerned with management of Mexican spotted owls in Utah. Managers and wildlife biologists are encouraged to use the 2000 GIS model for planning decisions that require resolution at scales <1:100,000. Inventory and clearance projects that rely on the 1997 model to identify the boundaries of project areas and locations of spotted owl calling points may greatly over-represent suitable spotted owl habitat and run the risk of misusing limited funds available for surveys.

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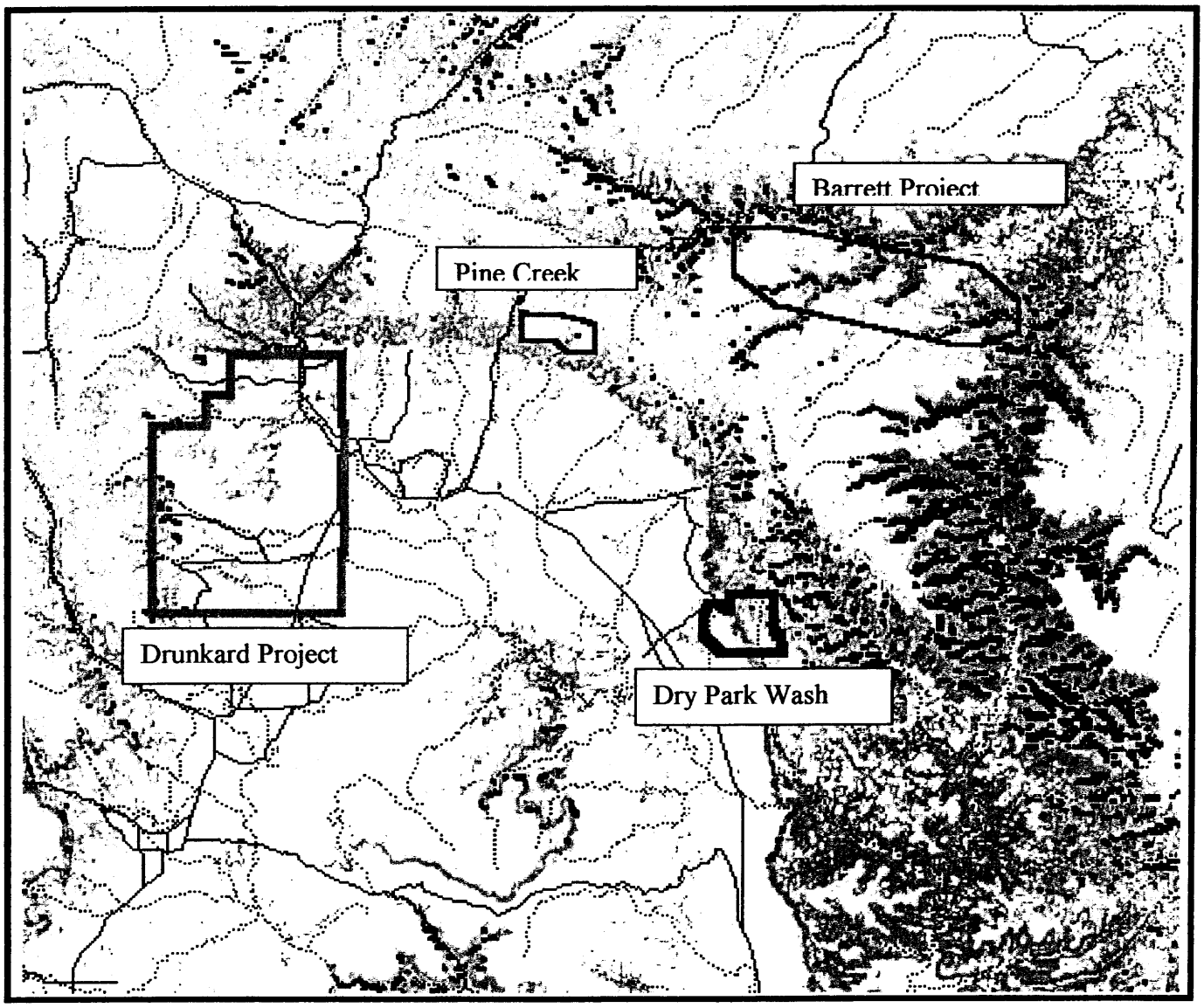


Figure 1. GIS Habitat predictions in the Price, Utah region, for Mexican Spotted owls. Black pixels show 2000 GIS model rocky canyon breeding habitat; Green pixels show 1997 breeding habitat; yellow pixels show 1997 marginal habitat. Study areas: Bill Barrett area outlined in red; Pine Creek outlined in pink; Dry Park Wash in blue; and the Drunkard project area outlined in purple. Also shown are roads (black lines) and watercourses (blue dashes).

Figure 2. Map showing the prediction of the 1997 GIS Mexican spotted owls habitat model. Green pixels show 1997 breeding habitat, yellow pixels represent marginal habitat; white pixels show habitat that is not predicted suitable for spotted owls in Utah.

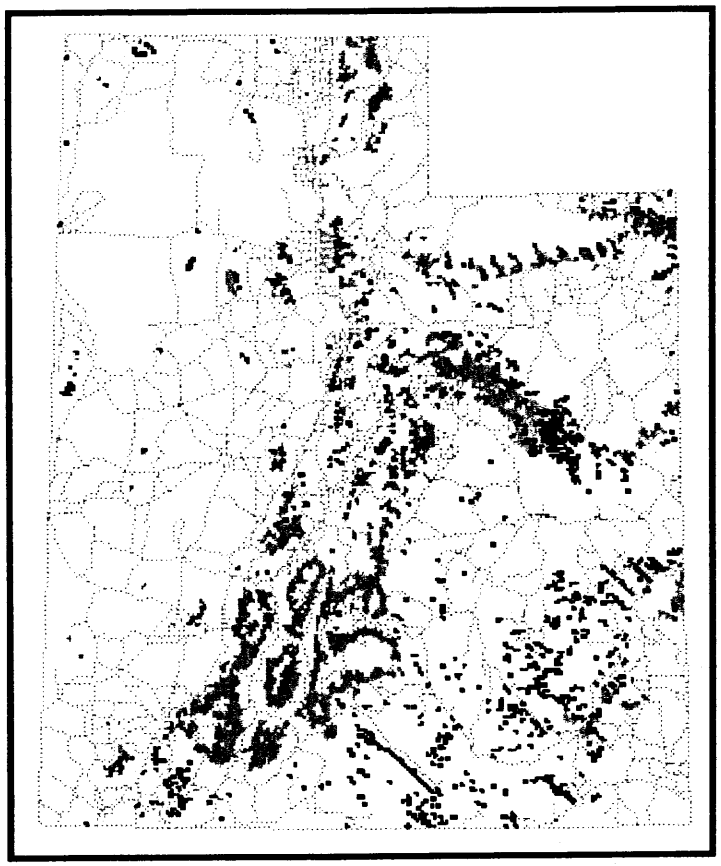


Figure 3. Map output showing the 2000 GIS Mexican spotted owl predicted breeding habitat. Black pixels show potential rocky canyon breeding habitat; green pixels show mixed-conifer forest breeding habitat defined by the Recovery Plan.

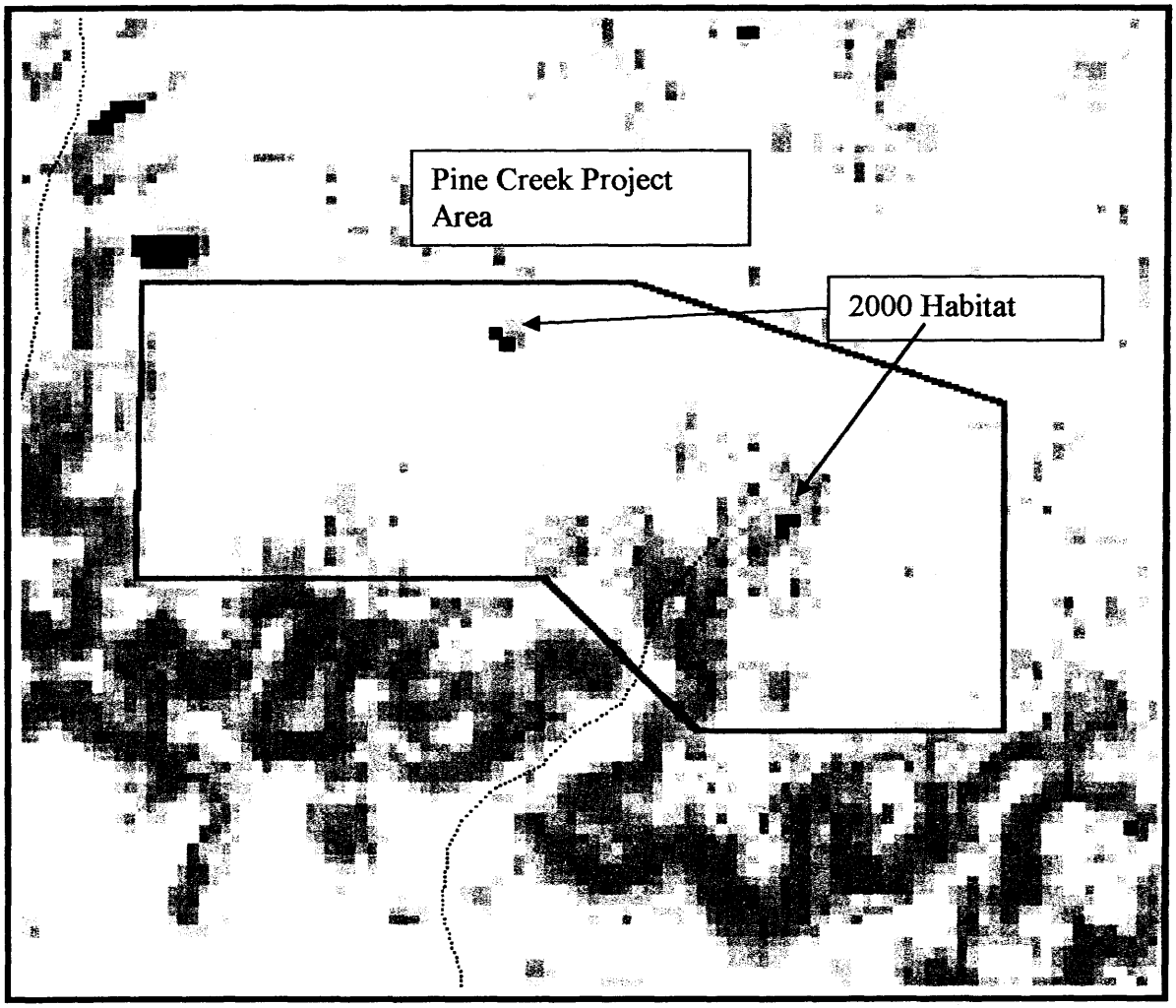


Figure 4. Pine Creek Project Area. Black pixels show 2000 GIS model predicted breeding habitat pixels. Green pixels show 1997 breeding habitat pixels, and yellow pixels represent marginal habitat.

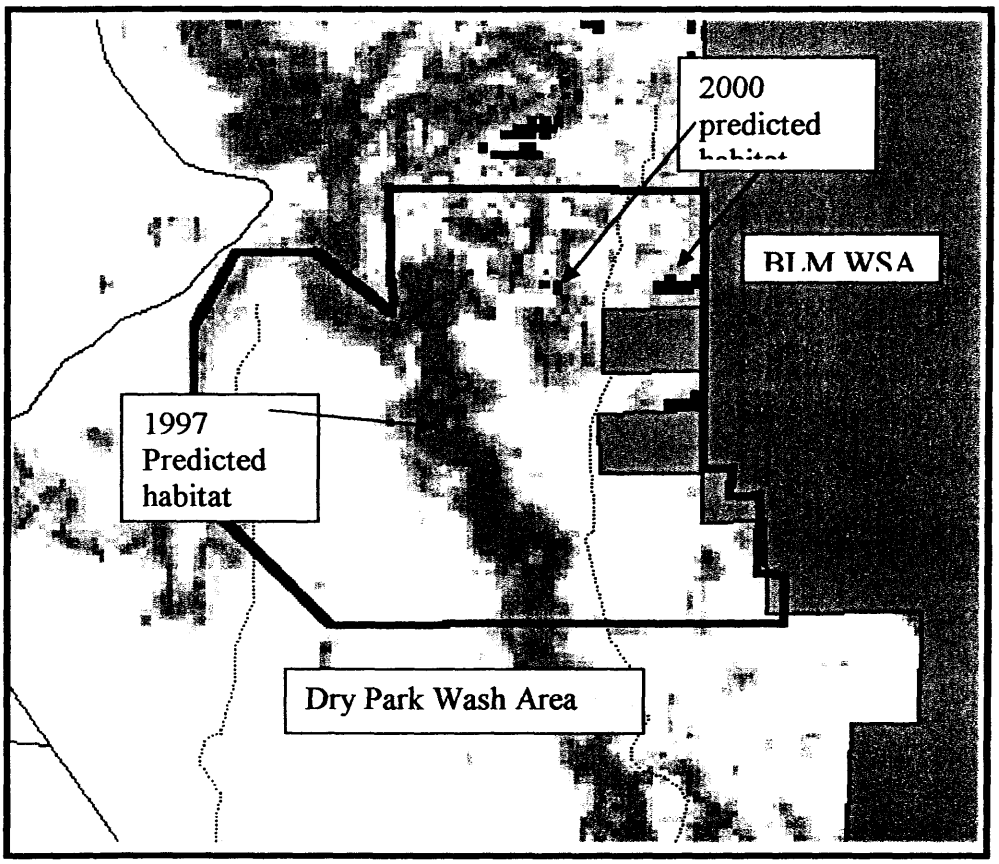


Figure 5. Dry Park Wash Project Area showing BLM Wilderness Study Area boundary; 2000 model prediction in black pixels; and the 1997 predictions in yellow and green pixels.

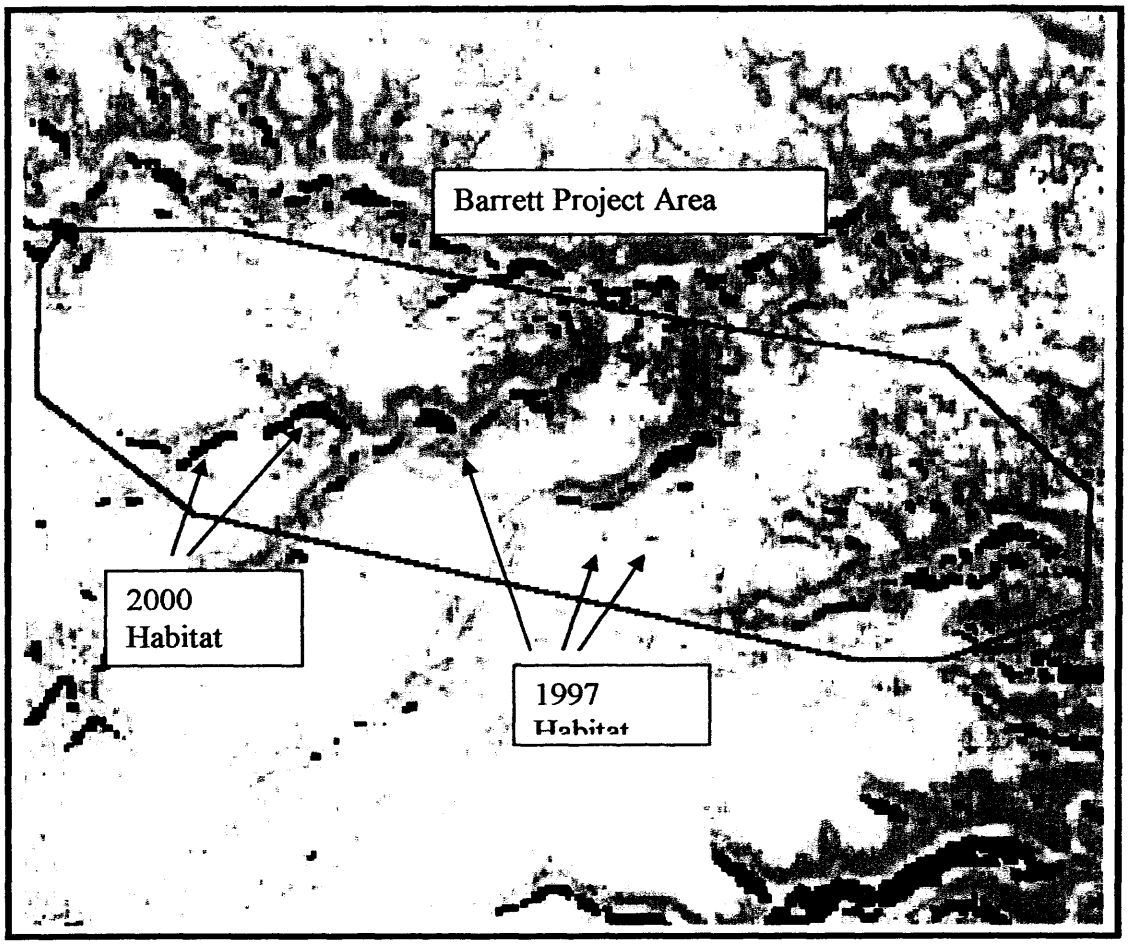


Figure 6. Barrett Project Area showing 2000 model and 1997 model predictions of potential spotted owl habitat.

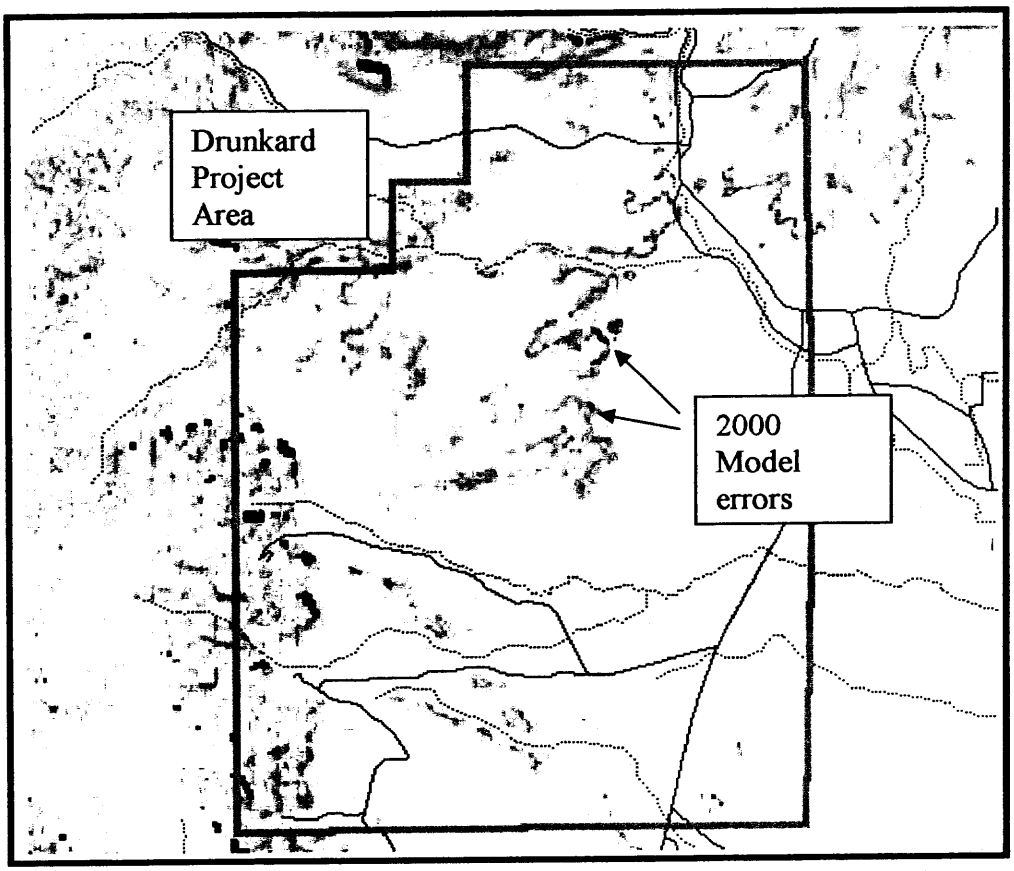


Figure 7. Drunkard Project Area southwest of Price, Utah, showing 1997 (green and yellow pixels) and 2000 (Black pixels) model predictions.

Appendix 5-9

Summary of Mexican Spotted Owl Habitat Survey
Within The Lila Canyon Coal Lease Area

The Lila Canyon Mine lies approximately 1.5 miles from an area designated as critical habitat for the Mexican Spotted Owl (*Strix occidentalis lucida*)(MSO). Even though the actual mine site surface facility area has been deemed unsuitable habitat by way of a cooperative survey by Frank Howe, Utah Division of Wildlife Resources (UDWR), Ms. Susan White, Utah Division of Oil, Gas and Mining (UDOGM) and M.A. Coonrod of the consulting firm EIS Environmental and Engineering Consulting (EIS).

In 2002 Dr. David W. Willey performed an overflight of the Lila Canyon Area. His results and management recommendations can be found in his Final Report dated October 2002. His study was completed in two phases.

> In the first phase, field maps were produced using ArcView GIS and used for reference during helicopter overflights. During the flight, the Lila Canyon Area (Dry Wash) was inspected from 500 feet above-ground-level. The extent of potential spotted owl breeding and roosting habitat was determined by visual inspection and traced on 7.5 minute USGS topographic quad map. The extent of potential habitat was identified to the nearest 100 meters and out lined on the field maps for comparison with the GIS models.
>
> During the second phase, the 1997 and 2000 model predications were overlaid with the over-flight field maps using the ArcView 3.2 GIS. Performance of the GIS models was assessed by comparing the prediction of the GIS maps with the extent of habitat identified during the over-flights.

Dr Willey's recommendations for Lila Canyon (Dry Wash) were:

1) each 100 x 100 meter pixel identified by the 2000 model as suitable habitat within the Project Area receive a .5 mile circular buffer radius (i.e., .5 mile outward from the pixel center);
2) All buffered areas should include the establishment of spotted owl calling stations designed for "complete coverage" (as defined by the inventory protocol) of the buffered zone;
3) each point should be surveyed four time a year during two consecutive survey years; and
4) the survey design must follow the standardized protocol for inventory of spotted owls (e.g., USDI 1991, amended 2002).

UtahAmerican Energy Will:

1) Preclude any surface disturbance within a 0.5 mile circular buffer radius of any 100 x 100 meter pixel identified by the 2000 model as shown on Figure 5 of Dr.

Willey's October 2002 final report. The buffer will remain in effect until the Formal MSO survey is completed..

2) Formal MSO surveys will commence two years prior to the potential occurrence of subsidence in areas described below:

   A) areas identified as potential habitat in the 2000 model and confirmed as potential habitat by Dr. Willey in his October 2002 report;
   B) and where cover in those areas is less than 1,000 feet,
   C) and those identified areas are within the area of influence from subsidence.

   UEI will establish spotted owl calling stations designed for "complete coverage" (as defined by the inventory protocol) of the buffered zone; each point will be surveyed four times a year during two consecutive survey years; and the survey design will follow the standardized protocol for inventory of spotted owls (e.g., USDI 1991, amended 2002) or any new subsequent protocol that may be effect at the time.

3) In areas where the identified potential habitat is located more than 1,000 feet above underground workings or outside the limit of projected subsidence, NO additional surveys will be required.

Any inventories and surveys that may be conducted will be submitted to DOGM, UDWR and USFWS for their comments and recommendations prior to and following all formal inventories and/or surveys.

Since the mine site and a 1 mile buffer zone has been determined not to be suitable habitat no additional inventories are warranted.

2003 Raptor Survey

Nest	Elev.	SPECIES	Statu 03	STATUS02	STATUS01	STATUS00	STATUS99	STATUS98
455	6700	Golden Eagle	inactive	Inactive	Dilapidated	Dilapidated	Dilapidated	Tended
456	6700	Golden Eagle	not found	Inactive	Inactive	Not Found	Active	Inactive
714	6700	Falcon	inactive	Inactive	Inactive	Inactive	Inactive	NA
715	5700	Raven	not observed	Active	Inactive	Active	Inactive	NA
716	5700	Golden Eagle	not observed	not found	Dilapidated	Dilapidated	Dilapidated	NA
717	5700	Golden Eagle	not obvserved	Inactive	Inactive	Inactive	Active	NA
719	7000	Golden Eagle	inactive	Dilapidated	Dilapidated	Inactive	Inactive	NA
946	6700	Golden Eagle	not found	inactive	Dilapidated	Dilapidated	NA	NA
947	6700	Golden Eagle	inactive	Inactive	Inactive	Inactive	NA	NA
948	6600	Raven	inactive	Inactive	Inactive	Active	NA	NA
949	6600	Raven	not found	Inactive	Unknown	Inactive	NA	NA
1280	6900	Unknown	not found	Inactive	NA	NA	NA	NA
1281	5500	Golden Eagle	not observed	Tended	NA	NA	NA	NA
1380		Raven	inactive	NA	NA	NA	NA	NA
1381		Raven	inactive	NA	NA	NA	NA	NA
1382		Raven	inactive	NA	NA	NA	NA	NA
1383		Raven	inactive	NA	NA	NA	NA	NA

TABLE OF CONTENTS

400 LAND USE AND AIR QUALITY . . . . . Page -2-
410. Premining and Postmining Land Use . . . . . Page -2-
411. Environmental Description . . . . . Page -2-
412. Reclamation Plan . . . . . Page -18-
413. Performance Standards . . . . . Page -19-
414. Premining Land use . . . . . Page -19-
420. Air Quality . . . . . Page -19-
421. Compliance with the Clean Air Act . . . . . Page -19-
422. Compliance Efforts . . . . . Page -19-

List of Tables

Table 4-1 Landowners
Table 4-2 Surface Ownership
Table 4-2A Coal Ownership
Table 4-3 Grazing Allotments

List of Plates

	Plate 4-1	Surface Ownership	1"=2000'
	Plate 4-2	Grazing Allotments	1"=2000'
CONFIDENTIAL	Plate 4-3	Cultural Resources	1"=2000'
	Plate 4-4	Area of Wilderness Character	1"=2000'

List of Appendixes

CONFIDENTIAL	Appendix 4-1	Cultural Resources Information
	Appendix 4-2	Zoning Information
	Appendix 4-3	Air Quality Permit

Table 4-1

ENTITY	OWNER	LAND USE
Federal Government	U.S. Bureau of Land Management	Range Valley Mountain Habitat Management Plan U-6-WHA-T4 Federal Coal Leases: U-0126947 U-014217 U-014218 SL-066145 SL-066490 SL-069291 *Federal Grazing Allotments*: Little Park Coon Spring Cove Icelander Range Creek *Areas of Wilderness Character* Turtle Canyon WSA
State Government	State of Utah	
County Government	Emery County*	
Private	Josiah and Etta Marie Eardley Intermountain Power Agency Robert K. Peper Brent Davies* William Marsing Livestock, Inc.*	

*Close proximity to permit area

Table 4-2A Continued
Coal Ownership Permit Area Both Horse Canyon and Lila Canyon

			U-0126947				120.00		
			U-014217				40.00		
		26	SL-066490				40		
			SL-069291				40.00		
16 S	15 E	19	U-0126947				110.00		
		30	U-0126947				190.00		
				State Acres		Federal Acres		Private Acres	
				A	B	A	B	A	B
SUB TOTAL				248.30	0.76	499.61	4663.56	579.84	0.00
Total "A" Horse Canyon				1327.75					
Total "B" Lila Canyon				4664.32					
GRAND TOTAL				5992.07					

Please note:
(1) UEI
(2) Eardley
(3) Peper

Federal coal leases relative to the Lila Canyon Mine permit area are depicted on Plate 5-4. There are six federal coal leases comprising the permit area, all of which are assigned to Utah American Energy, Inc. The acreage for each lease is presented on Table 1-1.

Grazing allotments in the Lila Canyon Mine permit area are depicted on Plate 4-2. These grazing allotments have remained unchanged for the past 10 years. The permit area is located primarily within the Little Park Allotment and to a lesser extent within the Cove Allotment. Table 4-3 , along with Plate 4-2, describes the allotments, owners, acreage, and animal unit month (AUM's).

The boundary of the Turtle Canyon Wilderness Study Area (WSA) in relation to the permit area is shown on Plate 4-4.

Water uses within the mine permit area are limited to stock watering, mining, and domestic uses at mine sites. Sources for water within and around the Mine Permit area include various springs, ephemeral washes, Little Park Wash, Horse Canyon Creek, and one underground water well historically used for sprinkling purposes for operation and maintenance of the mine. A water rights search was conducted for the mine permit area and is included within Table 7-2.

Due to topography, limited available water resources, soil types, limited access, and remote location, it is evident that the land within the mine permit area historically has not been capable of supporting a diversity of uses. The greatest variety of compatible uses for this land is a combination of recreation, wildlife habitat, grazing, and coal mining.

411.130 According to Bryant Anderson, administrator of Emery County Planning and Zoning (Anderson, 1998), all land within the Mine Reclamation Permit area is zoned M&G-1 for mining and grazing. Grazing is the most pervasive existing use of the land in the Lila Canyon area.

The BLM is the land manager for most of the area within the permit. The permit area consists of 5,992.07 acres of which the BLM manages 4256.37 of the acres. Within the permit area there are 1446.64 privately owned acres and 289.06 State owned acres. Refer to Plate 4-1 for ownership boundaries.

The Turtle Canyon Wilderness Study Area (WSA) overlaps a small portion of the permit area. No surface facilities or associated impacts will occur within the WSA.

411.140. Cultural and historical resources investigations have been performed in the vicinity of the permit area in the past. Significant studies include "An Archaeological/Historical Inventory of Kaiser Steel corporation Horse Canyon Mine Lease, East Carbon

County, Utah". This report was written in March 1986 by Don Southworth and Asa S. Nielson for the Mining and Reclamation Plan submitted to the Division by Intermountain Power Agency. A cultural Resource Inventory of the Kaiser Steel Corporation South Lease Mine Property and a Test Excavation (42EM1343 In Emery Col, East Central Utah. By Rebecca Rauch (1981). Additional inventories were conducted by Montgomery in 1998 and 1999.

The inventory of the various studies and reports within the Horse Canyon and Lila Canyon Extension areas located many cultural resource sites. The following sites lie within the bounds of the Horse Canyon and Lila Canyon Extension area and are historic sites. These sites are depicted on Plate 4-3.

42Em1121 The site is a small lithic scatter consisting primarily of debitage of red, grey and white chert material. In addition, a metate described as a flat slab with a pecked central depression was also noted on the site area. The site is located in a pinyon-juniper grove interspersed with small clearings of sagebrush. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1222 This site is a blazed tree, dated 1878 and inscribed "Sam Gilson by God". Sam Gilson owned a ranch in Juab County. In June of 1878, while driving a herd of horses to the railroad in Wyoming, Gilson camped in Horse Canyon and carved the inscription in a pynion juniper. Gilson is also known for discovering asphaltum, also known as Gilsonite. The site also contains the signature of W.B. Liddell (July 11, 1906) and James Brace (August 17, 1912) on a rock outcrop on the southwest corner of the site area. This site is eligible to be placed on the National Register of Historic Places. It is on private land and falls within the Lila Canyon Mine permit area. It is approximately 2.5 miles north of the proposed disturbed surface area.

42Em1223 This site consists of a non-significant wooden root cellar, dug into an embankment. The site does not

meet National Register Criteria for age, unique architecture, historic persons or events.

42Em2099 This site is the Geneva Mine Works which is the largest, newest, and most technologically advanced of all the sites. The mine works were built in 1942 and continued in operation until 1984. The mine structures begin at the mouth of Horse Canyon where the Carbon County Railway ends, underneath the tipple and up the canyon from the tipple to the transfer house and the main complex of buildings. Beyond these buildings is the mine entrance and the trestle by which the tram cars move across the canyon. The cap house and powder house are further up the canyon on the east side. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

The inventory of the 1981 study prepared for Kaiser Steel Corporation (Rauch et al., 1981) south lease area, identified and recorded many cultural resource sites. Twelve sites are within the Lila Canyon Mine permit area. These sites are depicted upon Plate 4-3.

42Em1335 This site consists of one log structure located at the head of Lila Canyon, adjacent to the Little Park Road. It was reportedly a range homestead utilized in the late 1930's and early 1940's. It was constructed of notched, hand-hewn logs and saw cut boards. It measures 2.5 meters by 3.5 meters. Little Park Road was cut around the south and east sides of the structure and has caused the structure to lean toward the canyon bottom. This road construction may have obliterated part of the site. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1337 This site is composed of an uncompleted hand-hewn log structure located near an unnamed spring in an eastern side canyon to Little Park Wash. The structure measures 2.5 meters by 3.5 meters and is only one log high. All logs associated with the structure are decomposing. Widely scattered artifacts include approximately 25 rolled-seam cans, 1 horseshoe, bailing wire, top of oil drum, small glass jar. The site does not meet National Register Criteria for age,

unique architecture, historic persons or events.

42Em1339 This site contains remnants of a wooden structure and its associated debris. This site had a diverse and extensive refuse area. Little Park Road cuts through the refuse area on the west side of the site. Diverse artifacts were noted. The site was given a "ball park" date of 1947-1949. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1341 This site consists of a mine, scattered milled lumber and logs, a wooden cupboard, and associated debris. This site measures approximately 150 meter east-west by 50 meter north-south. It is situated in the bottom of a steep sloped canyon and has been highly disturbed by erosional forces. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1376 This site represents both prehistoric and historic cultural activity. This site is situated at the head of a trail (42Em1505) leading from the Mancos Shale Lowlands to the top of the first set of cliffs, the western edge of the Book Cliffs. The trail has historically been used by local ranchers and appears on the 1948 topographic map of the area, i.e., the Woodside Quadrangle. Prehistoric findings include 75 secondary and tertiary bifacial thinning flakes and approximately 25 pieces of Emery Grey ceramics. Based upon this ceramic type, this site is assigned a Fremont cultural affiliation. A rock cairn located at the top of the trail served as a marker for the trail location and is highly visible from the area around it. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1505 This is a historic trail that appears to have been used in prehistoric times. It appears on the 1948 U.S. Geological Survey topographic map of the area. Local informants report that the trail was used to move livestock from the Mancos Shale Lowlands to the western rim of the Book Cliffs. The site does not meet National Register Criteria for age, unique architecture,

historic persons or events.

42Em1336 This is a prehistoric site and consists of a petroglyph panel. The figures portrayed on the panel include sheep, serpents, concentric circles, anthropomorphs, and rows of dots and lines. The panel is located in Little Park Wash on the face of a sandstone outcrop. It measures 7 meters in length by 2.5 meters in height. The panel is heavily weathered, with patina covering and highlighting many of the figures. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1338 This is a prehistoric site and consists of a small, low density lithic scatter comprised of 15 secondary debitage flakes of white chert. A biface fragment of the same lithic material was noted, as well as one horseshoe. The site measures 15 meters in diameter. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1340 This is a prehistoric site and consists of a small, low density lithic scatter of blue-grey, red and white chert material. Within an area of 10 meter diameter, 15 debitage flakes were observed. Also, one nondiagnostic projectile point tip, one biface fragment and a sandstone metate fragment were observed. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1343 This is a prehistoric site consisting of lithic and ground stone scatter. The lithic material consists of various chert and quartzite. Approximately 50 bifacial thinning flakes were observed with approximately 5 flakes appearing to have been utilized. One Elko-series projectile point and one Desert Side-notched projectile point were observed on the site and collected. One biface fragment was also observed. Sandstone was used for ground stone material. Two metates were noted, one consisted of a flat slab with a central pecked area, the other was a trough metate. A test excavation was performed at this site. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1344 This is a prehistoric site comprised of small lithic scatter approximately 20 meters in diameter. The lithic material consists of 25 bifacial thinning flakes of white chalcedony. Five bifacial thinning flakes appear to have been utilized. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42Em1375 This is a prehistoric site of lithic scatter consisting of 50 flakes of white chalcedony within a 5 meter diameter area. The site appears to be a single activity site and the lithic material is consistent throughout the site area. Artifacts consisted primarily of secondary and tertiary bifacial thinning flakes. The site does not meet National Register Criteria for age, unique architecture, historic persons or events.

42 Em2255 (Miller) This is a prehistoric site of lithic scatter. The site is buired (buried), it was defined by the extent of ant hills containing small lithic flakes. Very few flakes were found on the surface between ant hills. Cultural material did not show up in the walls of little park wash, east of the site. If the flakes are an indication of undisturbed buired (buried) cultural material the site could yield important information. This site does meet National Register Criteria for age, unique architecture, historic persons or events.

42 Em2256 (Miller) This is a prehistoric site of lithic scatter. The lithic flakes are widely scattered around the area. Most of the observed flakes wee in ant hills, indicating some buired (buried) deposits. A fence of piled junipers has been constructed on the ridge some time in the past. Diagnostic artifacts are not available to date this part of the site. The surface attributes of the site will not contribute important information. However, buiried (buried) material may be present that would yield important information. This site does meet National Register Criteria for age, unique architecture, historic persons or events.

42Em2517 This is a small Fremont component rock shelter situated on the primary terrace of an intermittent drainage at the mouth of Lila Canyon. The shelter has

been extensively potted. An eroded spoil pile occurs in front of the shelter. The looters pile contains charcoal and oxidized sandstone rocks as well as most of the artifacts described. The site does meet National Register Criteria for age, unique architecture, historic persons or events.

Detailed archeological ground surveys were conducted at the mine site and associated disturbed area, by Montgomery Archaeological personnel. This survey was conducted in 1998 and 1999 and is included within Appendix 4-1, along with the previously mentioned reports. No additional sites were located during the 1998 or 1999 surveys which would be eligible for the National Register of Historic Places.

411.141. All such sites are depicted on Plate 4-3.

411.141.1 The locations of cultural and historical resources listed in the National Register of Historic Places have been discussed previously in Section 411.140. Detailed descriptions of such sites are presented in Appendix 4-1. All sites are depicted in Plate 4-3.

411.141.2 No cemeteries are located in or within 100 feet of the proposed permit area.

411.141.3. No land within the proposed permit area is within the boundaries of any units of the National System of Trails or the Wild and Scenic Rivers System.

411.142. As discussed previously, no cultural resources of significance were located. SHPO will issue a determination of No Historic Properties for the proposed mine site and associated disturbances. No publicly owned parks or places listed on the National Register of Historic Places would be adversely affected by the proposed coal mine.

411.144 Of the eighteen cultural and historical sites identified within the Lila Canyon mine permit area, only one, 42Em1222, is listed on the National Register of Historic Places. This site is visibly protected by fencing and signs. It lies approximately 2.5 miles north of the

surface facility. No impacts should occur at this site.

411.200. Previous mining and exploration activities have occurred within the proposed permit area within the last twenty years. In the mid-1950's, the road along the bottom of Lila Canyon was constructed to allow exploration of the resources. The road intersects the Horse Canyon Highway approximately 1.4 miles to the north and loops back to the south to intersect Highway 191 and 6 to the south (see Plate 4-1). Two sealed breakouts (Plate II-2 of Horse Canyon Plan) are located in the left fork of Lila Canyon where the Lila Canyon fan was installed in the 1950's. The Lila Canyon fan was used until the closure of Horse Canyon post 1977, and therefore, the current Coal Regulatory Program has jurisdiction over this disturbance and it is included in the permit area.

411.210. Coal was removed from the outcrop of Horse Canyon and transported back through the Horse Canyon Mine. Excavation indicates only a small amount of coal was previously removed.

411.220. In the past, coal was removed from the Sunnyside Seam.

411.220. Because the old portal has been sealed, it is difficult to ascertain the total amount of coal which had been removed.

411.240. The exact date of the coal outcrop excavations is unknown. It is believed that coal was removed during the late 1950's or early 1960's.

411.250. The land use prior to outcrop excavation was the same as currently exists within the area. Wildlife habitat, grazing, and coal exploration was previously and is currently the predominant land use in the area.

412. Reclamation Plan

412.100. Post mining land use will be the same as currently exists today, that being: wildlife habitat, grazing, and

limited recreational activities.

412.110. After all mining activity has been completed and the disturbed area regraded and reseeded, the site will enter a post reclamation phase. During the first ten years, the site will be monitored for vegetative success and erosion control. The reclaimed, revegetated area may be fenced to discourage livestock grazing until final reclamation has been achieved and the reclamation bond released.

Support activities to achieve the post-mining land use plan included: site monitoring, remedial actions including regrading, reseeding, remulching and replanting; and fencing as necessary to restrict access and grazing on the site until the reclamation bond has been released.

412.120. After the reclamation bond has been released, the property will be returned to the care of the surface land owners, which, for the most part, is the BLM. Management of the site will be according to the BLM's current range management plan for the region existing at that time.

412.130. Since premining land use is the same as postmining land use this section is not applicable.

412.140. This post-mining program is in accordance with the Emery County and BLM management framework plans. See Correspondence with Emery County Zoning Administrator, Bryant Anderson, and the BLM, regarding the zoning of lands within the Lila Canyon Extension included within Appendix 4-2. A Large Scale Industrial Site Plan was required by the county for any significant mining or industrial operations. A copy of the approval for the Large Scale Industrial Site Plan can be found in Appendix 4-2.

Based on the desire expressed by the BLM and/or Emery County, at the time of reclamation of the mine site, mine personnel would agree to work with the BLM and/or Emery County to achieve future land use objectives.

412.200. A Large Site Plan Approval has been filed with Emery County regarding the plans to mine coal in the Lila Canyon area. The approval process and a copy of this application are included in Appendix 4-2. A copy of the BLM post mine land use determination can be found in Appendix 4-2.

412.300. The mine operator does not propose to leave fills containing excess spoil.

413. Performance Standards

413.100 All disturbed areas will be restored to the conditions equal to or better than existed prior to disturbance.

413.200 Wildlife habitat and grazing will resume following reclamation activities of the mine site. No alternative postmining land uses, nor higher or better uses are being proposed.

413.300. No alternative post-mining land use is being proposed at this time.

414. Premining Land use: It is the operations intent to return the mine properties to its pre-mine use. The reclamation practices to be implemented as outlined in chapter five have a proven record of success.

420. Air Quality.

421. Compliance with the Clean Air Act: Mining and reclamation operations will be conducted in compliance with the requirements of the Clean Air Act and other applicable state, federal statues.

422. Compliance Efforts: Appendix 4-3 contains the "Intent to Approve" and the actual "Approval Order" for the air quality permit obtained from the Utah Bureau of Air Quality.

423. Since Lila Canyon Mine is an underground operation this section is not applicable.

423.100 Since Lila Canyon Mine is an underground operation this section is not applicable.

423.200 Since Lila Canyon Mine is an underground operation this section is not applicable.

424. Since Lila Canyon Mine is an underground operation this section is not applicable.

425. Since Lila Canyon Mine is an underground operation this section is not applicable.

REFERENCES

Stephens, Don, U.S. Bureau of Land Management, Federal Coal Leases Map, 1990.

Division of Water Rights, PLAT program

Emery County Recorder's Office

Miller Field Notes

Miller Report cannot be located by either the operator or by Miller.

STATE #	42EM2255	TEMP. #	LP-1

Determined Eligible

IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by
BLM - Utah, Idaho, Nevada, Wyoming
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

*1. State No.: 42 EM 2255
*2. Agency No.: —
3. Temp No.: LP-1
County: Emery

4. State: Utah
5. Project: LITTLE PARK BURN
*6. Report No.: U 91BL-656
7. Site Name/Property Name:
8. Class: [X] Prehistoric [ ] Historic [ ] Paleontologic [ ] Ethnographic
9. Site Type: LITHIC SCATTER
*10. Elevation: 6840 ft.
*11. UTM Grid: Zone 12 558840 m E 4362540 m N
*12. ___ of NW of SW of SW of Section 24 T. 16.0S R. 14.0E
*13. Meridian: SLC (Utah)
*14. Map Reference: LILA POINT 7.5
15. Aerial Photo:
16. Location and Access:
GO EAST ON U-124 PAST THE HORSE CANYON MINE ABOUT 3/4 MILE. TAKE RIGHT FORK AND TRAVEL ABOUT 6 MILES TO LITTLE PARK. THE SITE IS LOCATED IN A SAGEBRUSH FLAT SOUTH OF THE ROAD JEST BEFORE THE ROAD CROSSES LITTLE PARK WASH.
*17. Land Owner: BLM
*18. Federal Admin. Units: Moab Price River
*19. Location of Curated Materials:
20. Site Description:
THIS SITE IS BUIRED. IT WAS DEFINED BY THE EXTENT OF ANT HILLS CONTAINING SMALL LITHIC FLAKES. VERY FEW FLAKES WERE FOUND ON THE SURFACE BETWEEN ANT HILLS. CULTURAL MATERIAL DID NOT SHOW UP IN THE WALLS OF LITTLE PARK WASH, EAST OF THE SITE.
*21. Site Condition: Fair
*22. Impact Agent(s): (1) Erosion (2) Rodent Damage
(3)
*23. Nat. Register Status: National Reg Qlty (Professional Judgmnt)
Justify:
IF THE FLACKS ARE AN INDICATION OF UNDISTURBED BUIRED CULTURAL MATERIAL THE SITE COULD YIELD IMPORTANT INFORMATION.
24. Photos:
25. Recorded by: BLAINE MILLER
*26. Survey Organization: BLM *28. Survey Date: 8/20/91
27. Assisting Crew Members:

List of Attachments:
[X] Part B [X] Topo Map [X] Photos
[ ] Part C [X] Site Sketch [ ] Continuation Sheets
[ ] Part E [ ] Art/Feat Sketch [ ] Other

BLM 8100-1 FS R-4 2300-2 3/90

*Encoded data items

Part A - Environmental Data

Site No. 42 EM 2255

*29. Slope= 1 (Degrees) Aspect= 100 (Degrees)

*30. Direction/Distance to Permanent Water= 999.00x 100 Meters

*Type of Water Source: Unknown

Name of Water Source:

*31. Geographic Unit: Book Cliffs-Roan Plateau

*32. Topographic Location:

PRIMARY LANDFORM	SECONDARY LANDFORM
tableland/mesa	valley

Describe:
THE SITE IS ON THE VALLY FLOOR OF LITTLE PARK.

*33. On-site Depositional Context

Type: alluvial plain

Description of soil:

34. Vegetation

*a.Life Zone: Upper Sonoran

*b.Community: [P] Primary OnSite [H] Secondary OnSite [H] Surrounding Site

Describe:
TEH SITE IS IN A SAGEBRUSH FLAT SURROUNDED BY PINYON-JUNIPER.

*35. Miscellaneous Text:

36. Comments and Continuations:

Part B - Prehistoric Sites

Site No.: 42 EM 2255

1. Site Type: LITHIC SCATTER

*2. Culture: AFFILIATION Unknown Aboriginal DATING

3. Site Dimensions: 100m X 100 m *Area= 10000 sq m

*4. Surface Collection/Method: None
Sampling Method:

*5. Depth of Cultural Fill: Fill noted, but unknown
How Estimated: LITHIC WERE FOUND IN ANT HILLS
(If tested, show location on site map.)

*6. Excavation Status: Unexcavated
Testing Method:

*7. Summary of Artifacts and Debris:

[X] Lithic Scatter (LS) [ ] Isolated Artif.(IA) [ ] Burned Stone(BS) [ ] Bone Scatter (WB)
[ ] Ceramic Scatter (CS) [ ] Organic Remains(VR) [ ] Ground Stone(GS) [ ] Charcoal Sctr(CA)
[ ] Bsketry/Textiles(BT) [ ] Shell (SL) [ ] Lithic Source(s)

Describe:
LITHICS ARE WIDELY SCATTERED AND FOUND MAINLY IN ANT HILLS.

*8. Lithic Tools:

#	TYPE	#	TYPE
None			

Describe:

*9. Lithic Debitage - Estimated Total Quantity: 25-100
Material Type: CHERT

Flaking Stages (0)Not Present (1)Rare (2)Common (3)Dominant

Decortication 0 Secondary 2 Tertiary 2 Shatter 2 Core 0

10. Maximum Density - #/sq m (all lithics): 10

BLM 8100-1 FS R-4 2300-2 3/90

Part B - Prehistoric Sites

Site No.: 42 EM 2255

1. Site Type: LITHIC SCATTER

*2. Culture: AFFILIATION — Unknown Aboriginal; DATING

3. Site Dimensions: 100m X 100 m *Area= 10000 sq m

*4. Surface Collection/Method: None
Sampling Method:

*5. Depth of Cultural Fill: Fill noted, but unknown
How Estimated: LITHIC WERE FOUND IN ANT HILLS
(If tested, show location on site map.)

*6. Excavation Status: Unexcavated
Testing Method:

*7. Summary of Artifacts and Debris:

[X] Lithic Scatter (LS) [ ] Isolated Artif.(IA) [ ] Burned Stone(BS) [ ] Bone Scatter (WB)
[ ] Ceramic Scatter (CS) [ ] Organic Remains(VR) [ ] Ground Stone(GS) [ ] Charcoal Sctr(CA)
[ ] Bsketry/Textiles(BT) [ ] Shell (SL) [ ] Lithic Source(s)

Describe:
LITHICS ARE WIDELY SCATTERED AND FOUND MAINLY IN ANT HILLS.

*8. Lithic Tools:

#	TYPE	#	TYPE
None			

Describe:

*9. Lithic Debitage - Estimated Total Quantity: 25-100
Material Type: CHERT

Flaking Stages (0)Not Present (1)Rare (2)Common (3)Dominant

Decortication 0 Secondary 2 Tertiary 2 Shatter 2 Core 0

10. Maximum Density - #/sq m (all lithics): 10

BLM 8100-1 FS R-4 2300-2 3/90

Part B - Prehistoric Sites

Site No.: 42 EM 2255

*11. Ceramic Artifacts:

#	TYPE	#	TYPE
None			

Describe:

12. Maximum Density - #/sq m (ceramics): 0

*13. Non-Architectural Features (locate on site map):

[ ] Hearth/Firepit (HE) [ ] Rubble Mound (RM) [ ] Earthen Mound (EM) [ ] Water Control (WC)
[ ] Midden (MD) [ ] Stone Circle (SC) [ ] Burial (BU) [ ] Petroglyph (PE)
[ ] Depression (DE) [ ] Rock Alignment (RA) [ ] Talus Pit (TP) [ ] Pictograph (PI)

Describe:

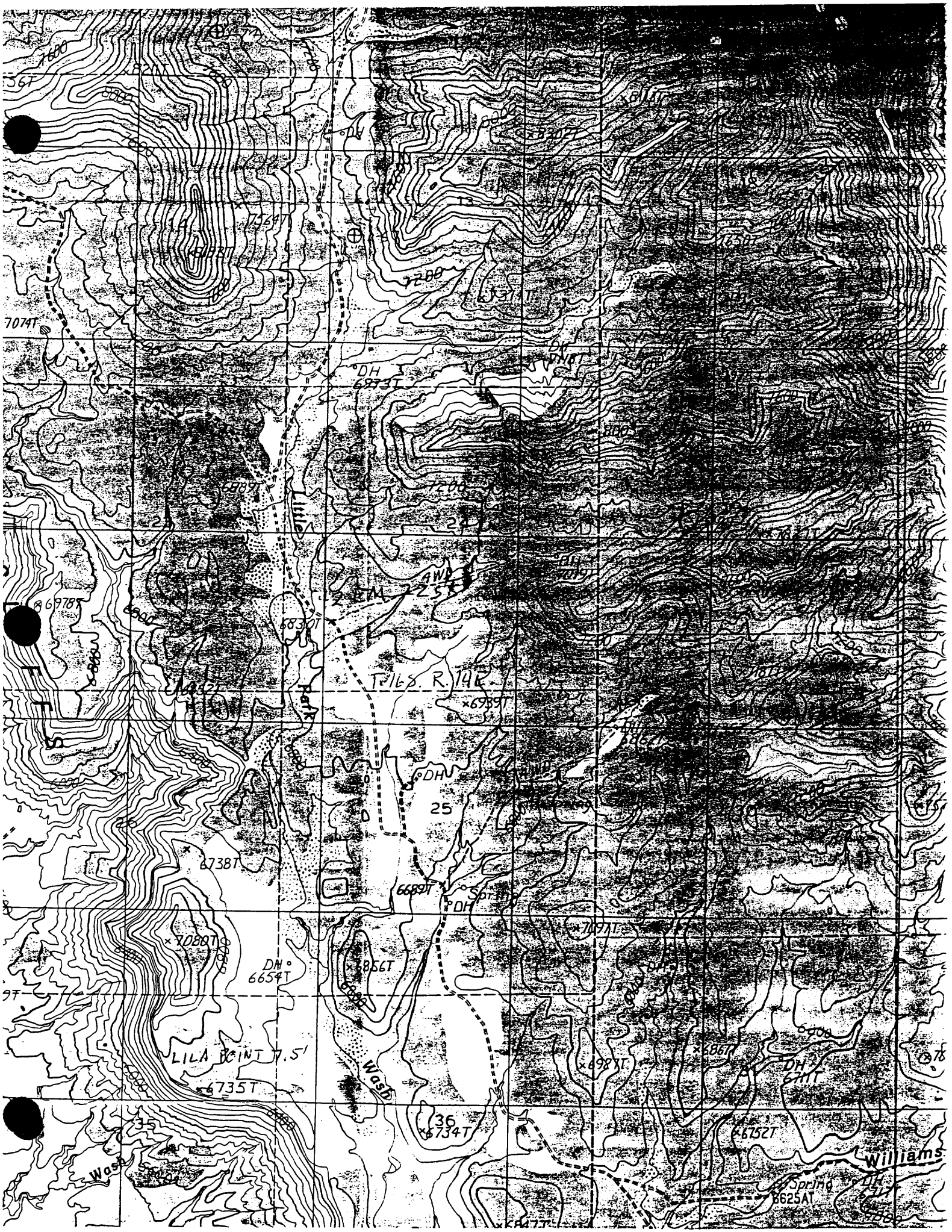
*14. Architectural Features (locate on site map):

#	MATERIAL	TYPE	#	MATERIAL	TYPE
None					

Describe:

15. Comments/Continuations:

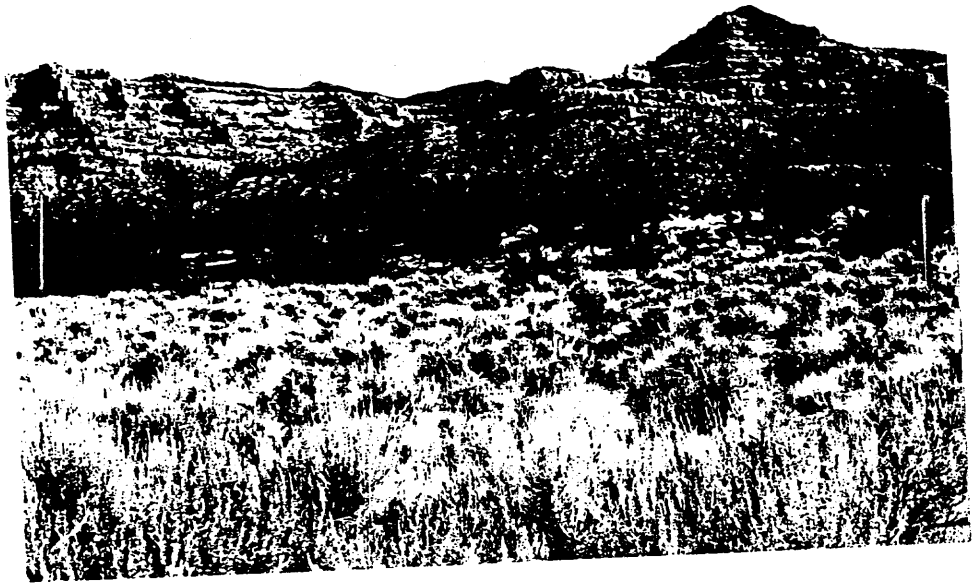
BLM 8100-1 FS R-4 2300-2 3/90



7074T
DH
6973T
6889T
Little
Park
6830T
T.16S. R.14E.
6939T
DH
25
6738T
6689T
Spring
DH
7080T
DH
6654T
6856T
LILA POINT 7.5'
6735T
Wash
36
6734T
6987T
6867T
DH
6711T
6752T
Williams
Spring
6625AT
Wash

STATE #	42EM2256	TEMP. #	LP-2

Determined Eligible



IMACS SITE FORM

Part A - Administrative Data

INTERMOUNTAIN ANTIQUITIES COMPUTER SYSTEM
Form approved for use by
BLM - Utah, Idaho, Nevada, Wyoming
Division of State History - Utah, Wyoming
USFS - Intermountain Region
NPS - Utah, Wyoming

*1. State No.: 42 EM 2256
*2. Agency No.: -
3. Temp No.: LP-2
County: Emery

4. State: Utah
5. Project: LITTLE PARK BURN
*6. Report No.: U 91BL-656
7. Site Name/Property Name:
8. Class: [X] Prehistoric [X] Historic [ ] Paleontologic [ ] Ethnographic
9. Site Type: LITHIC SCATTER / FENCE
*10. Elevation: 6740 ft.
*11. UTM Grid: Zone 12 55940 m E 4361600 m N
*12. of NE of SE of NW of Section 25 T. 16.0S R. 14.0E
*13. Meridian: SLC (Utah)
*14. Map Reference: LILA POINT 7.5'
15. Aerial Photo:
16. Location and Access:
FROM U-124 TRAVEL PAST THE HORSE CANYON MINE ABOUT 3/4 MILES AND TAKE THE RIGHT FORK OF THE ROAD. GO ABOUT 6 MILES TO LITTLE PARK. ABOUT 1 MILE AFTER CROSSING LITTLE PARK WASH YOU WILL CROSS A SMALL WASH. ON THE EAST SIDE OF THIS WASH AN OLD ROAD WILL TAKE OF TO THE NORTH. THE SITE WILL BE FOUND ON THE EAST SIDE OF THIS ROAD, ON A PINYON-JUNIPER COVERED RIDGE.
*17. Land Owner: BLM
*18. Federal Admin. Units: Moab Price River
*19. Location of Curated Materials:
20. Site Description:
THE SITE IS LITHIC FLAKES WIDELY SCATTERED AROUND THE AREA. MOST OF THE OBSERVED FLAKES WERE IN ANT HILLS, INDICATING SOME BURIED DEPOSITS. A FENCE OF PILED JUNIPERS HAS BEEN CONSTRUCTED ON THE RIDGE SOME TIME IN THE PAST. DIAGNOSTIC ARTIFACTS ARE NOT AVAILABLE TO DATE THIS PART OF THE SITE.
*21. Site Condition: Fair
*22. Impact Agent(s): (1) Erosion (2) (3)
*23. Nat. Register Status: National Reg Qlty (Professional Judgmnt)
Justify:
THE SURFACE ATTRIBUTES OF THE SITE WILL NOT CONTRIBUTE IMPORTANT INFORMATION. HOWEVER, BURIED MATERIAL MAY BE PRESENT THAT WOULD YIELD IMPORTANT INFORMATION.
24. Photos:
25. Recorded by: BLSINE MILLER
*26. Survey Organization: BLM *28. Survey Date: 8/20/91
27. Assisting Crew Members:

List of Attachments:

[X] Part B	[X] Topo Map	[X] Photos
[ ] Part C	[X] Site Sketch	[ ] Continuation Sheets
[ ] Part E	[ ] Art/Feat Sketch	[ ] Other

BLM 8100-1 FS R-4 2300-2 3/90

*Encoded data items

Part A - Environmental Data Site No. 42 EM 2256

*29. Slope= 98 (Degrees) Aspect= 180 (Degrees)

*30. Direction/Distance to Permanent Water= 999.00x 100 Meters

*Type of Water Source: Unknown

Name of Water Source:

*31. Geographic Unit: Book Cliffs-Roan Plateau

*32. Topographic Location:

PRIMARY LANDFORM: valley

SECONDARY LANDFORM: ridge/knoll

Describe:
THE SITE IS LOCATED ON A LOW RIDGE ALONG THE WEST SIDE OF LITTLE PARK VALLEY.

*33. On-site Depositional Context

Type: residual

Description of soil:

34. Vegetation

*a.Life Zone: Upper Sonoran

*b.Community: [H] Primary OnSite [H] Secondary OnSite [P] Surrounding Site

Describe:

*35. Miscellaneous Text:

36. Comments and Continuations:

BLM 8100-1 FS R-4 2300-2 3/90

Part B - Prehistoric Sites

Site No.: 42 EM 2256

1. Site Type: LITHIC SCATTER / FENCE

*2. Culture: AFFILIATION DATING

Unknown Aboriginal

3. Site Dimensions: 50m X 100 m *Area= 5000 sq m

*4. Surface Collection/Method: None

Sampling Method:

*5. Depth of Cultural Fill: Fill noted, but unknown

How Estimated: LITHICS WERE FOUND IN ANT HILLS

(If tested, show location on site map.)

*6. Excavation Status: Unexcavated

Testing Method:

*7. Summary of Artifacts and Debris:

[X] Lithic Scatter (LS) [ ] Isolated Artif.(IA) [ ] Burned Stone(BS) [ ] Bone Scatter (WB)
[ ] Ceramic Scatter (CS) [ ] Organic Remains(VR) [ ] Ground Stone(GS) [ ] Charcoal Sctr(CA)
[ ] Bsketry/Textiles(BT) [ ] Shell (SL) [ ] Lithic Source(s)

Describe:

LITHICS ARE WIDELY SCATTERED AND MOSTLY FOUND ON ANT HILLS.

*8. Lithic Tools:

#	TYPE	#	TYPE
None			

Describe:

*9. Lithic Debitage - Estimated Total Quantity: 25-100

Material Type: CHERT

Flaking Stages (0)Not Present (1)Rare (2)Common (3)Dominant

Decortication 0 Secondary 2 Tertiary 2 Shatter 2 Core 0

10. Maximum Density - #/sq m (all lithics): 8

BLM 8100-1 FS R-4 2300-2 3/90

Part B - Prehistoric Sites

Site No.: 42 EM 2256

*11. Ceramic Artifacts:

#	TYPE	#	TYPE
None			

Describe:

12. Maximum Density - #/sq m (ceramics): 0

*13. Non-Architectural Features (locate on site map):

[ ] Hearth/Firepit (HE) [ ] Rubble Mound (RM) [ ] Earthen Mound (EM) [ ] Water Control (WC)
[ ] Midden (MD) [ ] Stone Circle (SC) [ ] Burial (BU) [ ] Petroglyph (PE)
[ ] Depression (DE) [ ] Rock Alignment (RA) [ ] Talus Pit (TP) [ ] Pictograph (PI)

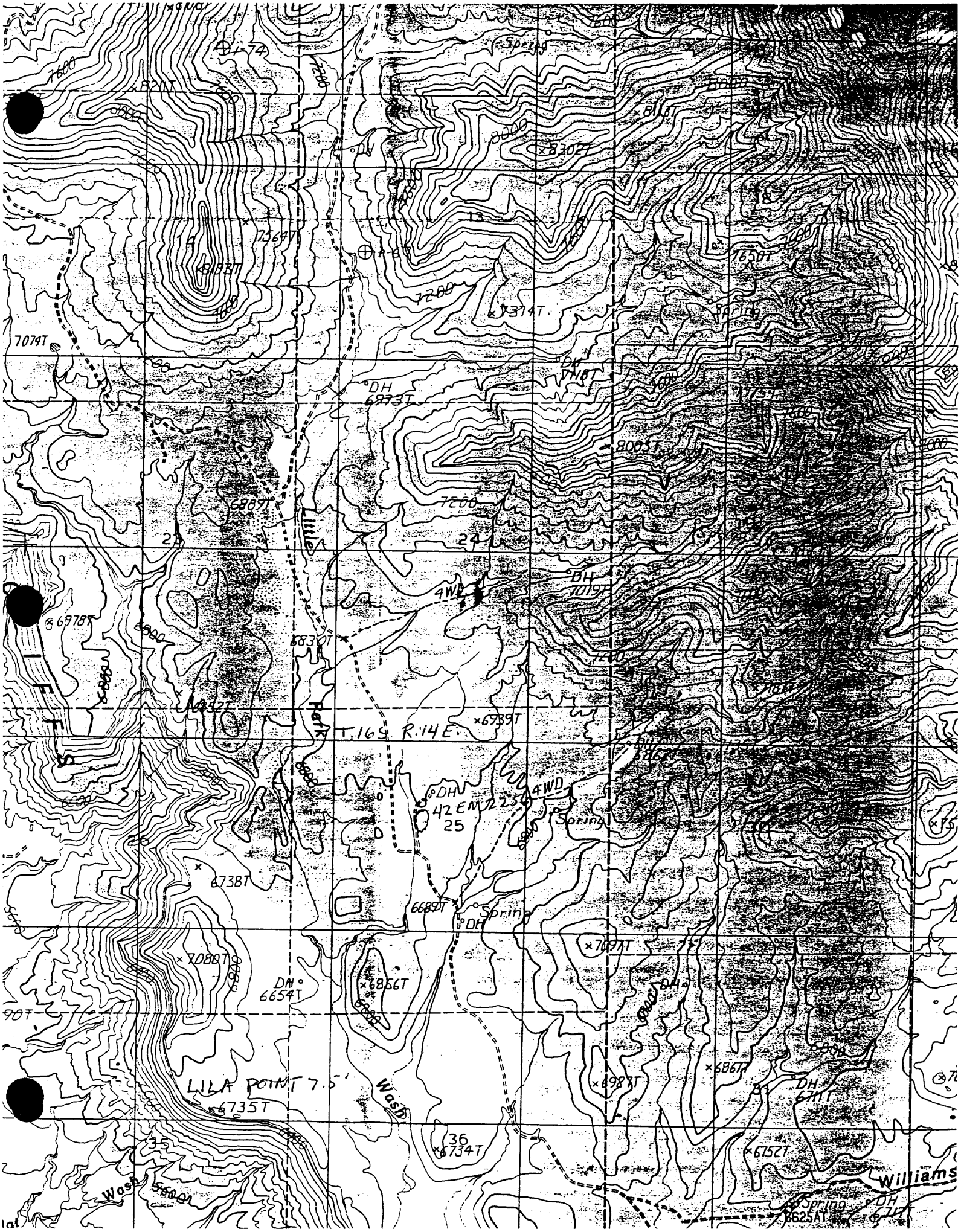
Describe:

*14. Architectural Features (locate on site map):

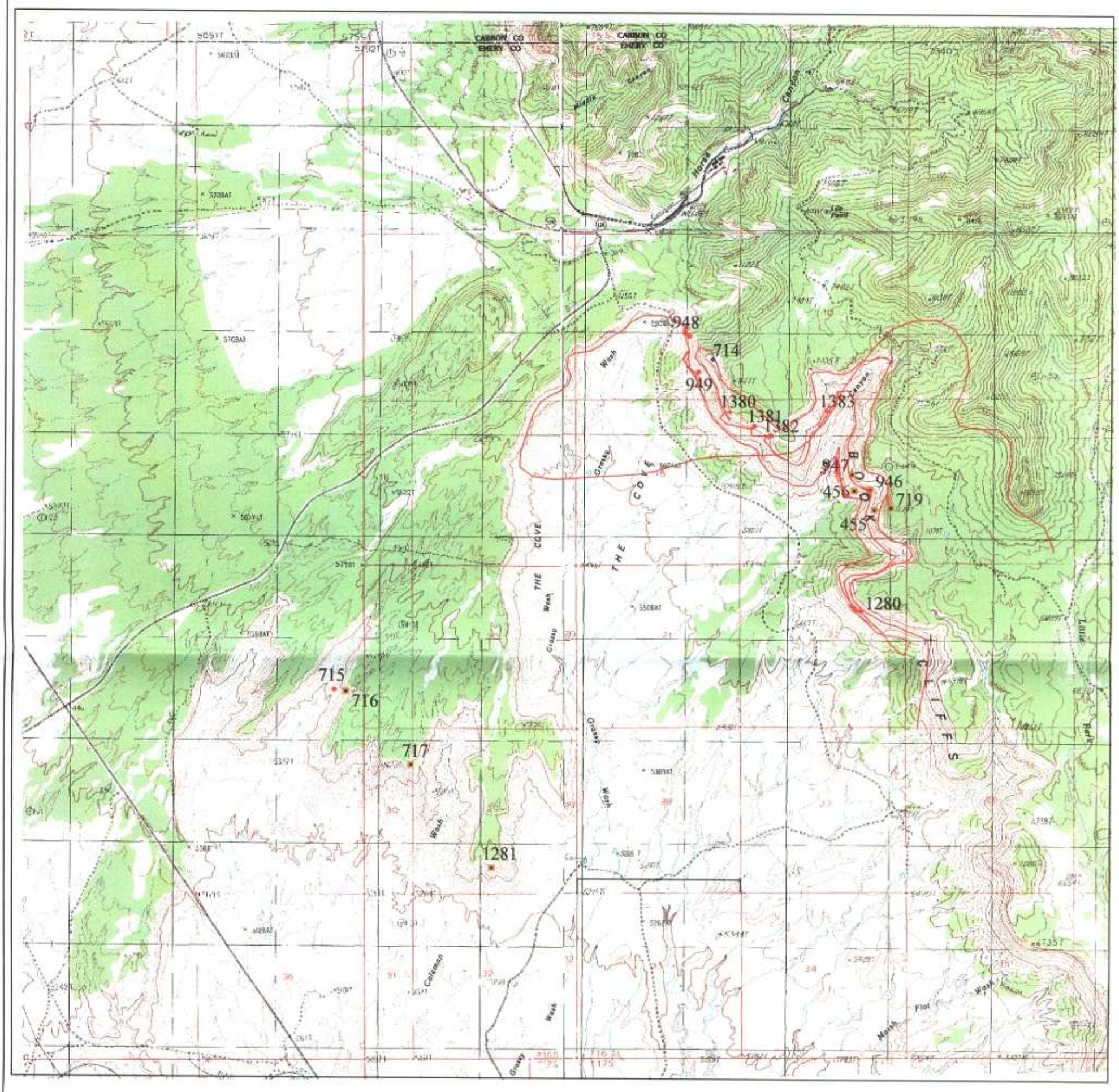
#	MATERIAL	TYPE	#	MATERIAL	TYPE
None					

Describe:

15. Comments/Continuations:



Spring
7564T
7074T
DH
6973T
8003T
6889T
Little
Park
4WD
DH
7019T
6978T
6830T
6939T
T.16S R.14E.
DH
42 EM 225
25
4WD
Spring
6738T
6689T
Spring
DH
7097T
7080T
DH
6654T
6856T
LILA POINT 7.5'
6735T
Wash
6987T
6867T
DH
6711T
36
6734T
6752T
Williams
Spring
DH
6625AT
Wash



LEGEND:

- FLIGHT LINE
- RAVEN/UNKNOWN
- FALCON
- GOLDEN EAGLE

REVISIONS	
9/8/03	RJM

N

SCALE:

1000' 0' 2000' 4000'

LILA CANYON MINE

LILA RAPTOR DATA 2003
Appendix 3-5

September 2002	
AS SHOWN	RAPTOR 2003

Lila Canyon Extension

Chapter 5
Engineering

Volume 4 of 7

Table of Contents

500. ENGINEERING . . . . . Page -1-
510. Introduction . . . . . Page -1-
511. General Requirements. . . . . Page -1-
512. Certification . . . . . Page -2-
513. Compliance With MSHA Regulations and MSHA Approvals. . . . . Page -3-
514. Inspections. . . . . Page -4-
515. Reporting and Emergency Procedures. . . . . Page -7-
516. Prevention of Slides: . . . . . Page -8-
520. Operation Plan. . . . . Page -8-
521. General: . . . . . Page -19-
522. Coal Recovery. . . . . Page -24-
523. Mining Methods: . . . . . Page -25-
524. Blasting and Explosives: . . . . . Page -28-
525. Subsidence: . . . . . Page -33-
526. Mine Facilities. . . . . Page -39-
527. Transportation Facilities. . . . . Page -43-
528. Handling and Disposal . . . . . Page -44-
529. Management of Mine Openings: . . . . . Page -47-
530. Operational Design Criteria and Plans. . . . . Page -48-
531. General. . . . . Page -48-
532. Sediment Control: . . . . . Page -48-
533. Impoundments. . . . . Page -48-
534. Roads. . . . . Page -49-
535. Spoil: . . . . . Page -50-
536. Coal Mine Waste. . . . . Page -51-
537. Regraded Slopes. . . . . Page -53-
540. Reclamation Plan. . . . . Page -54-
541. General. . . . . Page -54-
542. Narratives, Maps and Plans. . . . . Page -54-
550. Reclamation Design Criteria and Plans. . . . . Page -56-
551. Casing and Sealing of Underground Openings. . . . . Page -56-
552. Permanent Features. . . . . Page -56-
560. Performance Standards. . . . . Page -59-

List of Appendixes

Appendix 5-1	Inspection Form for Excess Spoil
Appendix 5-2	Inspection Form for Impoundments
Appendix 5-3	Coal Mine Waste Fire Extinguishing Plan
Appendix 5-4	New Facility Designs
Appendix 5-5	Slope Stability Analysis
Appendix 5-6	Mine Openings (Closures)
Appendix 5-7	Rock Slope Material (Refuse Pile)
Appendix 5-8	Reclamation Plan

List of Plates

Plate 5-1	Previously Mined Areas
Plate 5-1A	Premining Contours
Plate 5-2	Surface Area Lila Canyon Mine (Official Disturbed Area Boundary Map)
Plate 5-3	Subsidence Control Map
Plate 5-4	Coal Ownership
Plate 5-5	Mine Map
Plate 5-6	Post Mining Topography
Plate 5-7A-1	Mine Site Cross Sections
Plate 5-7A-2	Mine Site Cross Sections
Plate 5-7A-3	Mine Site Cross Sections
Plate 5-7A-4	Mine Site Cross Sections
Plate 5-7B-1	Mine Site Cross Sections
Plate 5-7B-2	Mine Site Cross Sections
Plate 5-7B-3	Mine Site Cross Sections
Plate 5-7C	Reclaimed Profile
Plate 5-8	Coal Handling Facilities
Plate 5-9	Portal Plan and Sections

Chapter 5

500. ENGINEERING

510. Introduction

This section presents the engineering portion for the Lila Canyon Extension to the Horse Canyon Mine Reclamation Plan and is based upon previous publications, permit applications for the adjacent Sunnyside and South Lease areas and design which follows basic engineering standards. The objective of this chapter is to provide sufficient engineering design to support the mining and reclamation plan for the Lila Canyon Mine which is part "B" of the Horse Canyon Permit (ACT/007/013) and to satisfy the rules found in R645-301-500. All of the activities associated with the coal mining and reclamation operations are designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plan. The engineering section of the permit application is divided into the introduction, the operation plan, operational design criteria, reclamation plan, and performance standards. All design criteria associated with the operation and reclamation plan have been met.

511. General Requirements.

511.100 The permit application includes a description of the proposed coal mining and reclamation operations with appropriate maps, plans, and cross sections.

511.200 A description of the proposed mining operation and its potential impacts to the environment as well methods and calculations utilized to achieve compliance with design criteria is addressed within this chapter.

511.300 A description of the proposed reclamation plan is included in this chapter.

512. Certification

512.100. Cross Sections and Maps that require certification have been prepared by, or under the direction of, and certified by a qualified, registered, professional engineer, with assistance

from experts in related fields when needed. Cross Sections and Maps will be updated as needed or required by the Division. Listed below are some of the maps and cross sections that have been certified by a qualified registered professional engineer.

512.110. A map showing the extent of known existing mine workings and the approximate year mined has been included and certified by a qualified registered professional engineer and included as Plate 5-1.

512.120. All Surface facilities and operations are shown on the appropriate maps and have been certified by a qualified registered professional engineer.

512.130 Maps showing final surface configuration with cross sections have been included and certified by a qualified registered professional engineer. (See Plate 5-6, 5-7c, and Appendix 5-4)

512.140 Appropriated hydrology drawings and cross sections have been certified by a qualified registered professional engineer. (See Chapter 7)

512.150 Geologic cross sections and maps that are required to be, have been certified by a qualified registered professional engineer. See Chapter 6 and Plate 7-1B.

512.200 Plans and Engineering Designs which may include: Excess spoil piles, durable rock fills, coal mine waste, impoundments, primary roads and variances from approximate original contour. These Plans and Designs have been certified by a qualified registered professional engineer if appropriate.

512.210 Lila Canyon Mine is an underground operation, therefore it is anticipated that no excess Spoil will be produced. This section does not apply.

512.220 The professional engineer experienced in the design of

earth and rock fills has certified that the durable rock fill design will ensure the stability of the fill and that the fill meets design requirements.

512.230 The professional engineer experienced in the design of coal mine waste piles has certified the design of the coal mine waste disposal facility. (See Appendix 5-7)

512.240 Prudent engineering practices was used in the design and construction of impoundments in the permit area. The impoundment designs have been certified by a qualified registered professional engineer. (See Plate 7-6)

512.250 The professional engineer has certified the design and construction or reconstruction of primary roads as meeting the appropriate design criteria.

512.260 The operator is not requesting a variance from the approximate original contours (AOC).

513. Compliance With MSHA Regulations and MSHA Approvals.

513.100 No Coal processing waste dams or embankments are not anticipated during the term of this permit. Therefore, this section is not applicable.

513.200 Planned impoundments and sedimentation ponds do not meet the size or other qualifying criteria of MSHA, 30 CFR 77.216(a). Therefore, this section is not applicable.

513.300 Underground development waste transported to the surface, coal processing waste and excess spoil will not be disposed of underground. However, material such as overcast material, rock falls, and slope material, not transported to the surface, may be disposed of underground according to the appropriate MSHA regulations.

513.400 Refuse piles meet the requirements of MSHA, 30 CFR 77.214 and 30 CFR 77.215 and all appropriate R645 regulations. (See Appendix 5-7)

513.500 Shafts, drifts, adits, tunnels, exploratory holes, entryways or

other opening to the surface from the underground will be capped, sealed, backfilled or otherwise properly managed consistent with MSHA, 30 CFR 75.1771.

513.600 Surface water discharges into the underground mine workings is not anticipated or planned, Therefore, this section is not applicable.

513.700 Mining within 500 feet to an active underground mine is not planned nor anticipated. Therefore, this section does not apply.

513.800 Coal mine waste fires plans will be submitted to MSHA and the Division for their approval prior to extinguishing any coal mine waste fires. (See Appendix 5-3)

514. Inspections

All engineering inspections, except the quarterly inspections of impoundments not subject to MSHA, will be conducted by a qualified registered professional engineer or other qualified professional specialist under the direction of the professional engineer.

514.100 Lila Canyon is an underground operation and it is not anticipated that any spoil will be produced. Therefore, this section does not apply.

514.200 Refuse Piles. A professional engineer or specialist experienced in the construction of similar earth and waste structures will inspect the refuse pile during construction.

514.210 Regular inspections by the engineer or specialist will also be conducted during placement and compaction of coal mine waste materials. If it has been determined that a danger of harm exists to the public health and safety or the environment, more frequent inspections will be conducted. Inspections will continue until the refuse pile has been finally graded and revegetated or until a later time as required by the Division.

514.220 The refuse pile inspections will be performed at least quarterly throughout construction and during the

following construction periods:

514.221 In addition to quarterly inspections, an inspection will be performed during foundation preparation which includes the removal of all organic material and topsoil;

514.222 Since no under-drain or protective filter systems are planned, this section is not applicable.

514.223 In addition to quarterly inspections, an inspection will be performed during the installation of the final surface drainage systems.

514.224 In addition to quarterly inspections, an inspection will be performed after the final grading and the facility has been revegetated.

514.230 The division will be provided a certified report prepared by, or under the supervision of, the qualified registered professional engineer after each inspection. The report will certify that the refuse pile has been constructed and maintained as designed and in accordance with the approved plan and R645 Rules. This report will include statements stating the appearances of instability, structural weakness, and other hazardous conditions if found. (See Appendix 5-1)

514.240 Since protective filters and under-drain are not required in the current design criteria this section is not applicable.

514.250 Required refuse pile reports will be retained at or near the mine site in an area convenient to the resident agent and the qualified registered professional engineer. Appendix 5-1 is an example of the refuse pile inspection form.

514.300 Impoundments

514.310 A professional engineer or specialist experienced in the construction of impoundments will inspect impoundments.

514.311 During construction inspections will be made on a regular basis and upon completion of the pond the inspections will be performed at least yearly. Inspections will continue yearly until the pond is removed or the performance bond is released.

514.312 After each inspection the qualified registered professional engineer will promptly provide to the Division, a certified report. This report will state that the impoundment has or has not been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include a discussion of any appearances of instability, structural weakness or other hazardous conditions. All so included in the report will be the depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability.

514.313 Required impoundment inspection reports will be retained at or near the mine site in an area convenient to the resident agent and the qualified registered professional engineer. Appendix 5-2 is an example of the impoundment inspection form.

514.320 Since the pond contained in the Lila Canyon Project is less than 20 feet high and stores less than 20 acre-feet of water it is not subject to MSHA, 30 CFR 77.216. Therefore, this section does not apply.

515. Reporting and Emergency Procedures.

515.100 If a slide occurs, the operator will telephone DOGM to notify them of the situation and recommend remedial measures to be

taken to alleviate the problem. Additional remedial measures required by DOGM will be implemented.

515.200 During impoundment inspections any potential hazards noted will be reported to DOGM along with measures to be implemented to eliminate the hazard.

515.300 In the case of temporary cessation of operations the following will apply:

515.310 All provisions of the approved permit will be complied with during temporary cessation or abandonment.

515.311 In case of temporary cessation the operator will support and maintain all surface access openings to underground operations, and secure surface facilities in areas in which there are no current operations, but operations are to be resumed under an approved permit.

515.312 Since Lila Canyon Mine is an underground operation this section does not apply.

515.320 Prior to a temporary cessation of coal mining and reclamation operations which is expected to last longer than 30 days, or when a temporary cessation is extended longer than 30 days, the operator will submit to the Division a notice of intention to cease or abandon operations. The following will be included in the notice of temporary cessation.

515.321 The temporary cessation notice will contain the exact number of surface acres and the horizontal and vertical extent of subsurface strata included in the permit area. In addition a description of the reclamation activities accomplished and activities such as backfilling regrading, revegetation, environmental monitoring, underground opening closures and water treatment activities that will continue during the temporary cessation.

515.322 Since the Lila Canyon Mine is an underground operation this section does not apply.

516. Prevention of Slides: Since the Lila Canyon Mine is an underground operation this section does not apply.

520. Operation Plan.

At first glance it would appear to a non-mining person that the best access to UEI's leases would be from the existing (sealed) Horse Canyon portals using the current Horse Canyon surface disturbance. However, the existing Horse Canyon site is not suitable for a large longwall operation. The old Horse Canyon Mine was not designed to produce 4.5 million tons as will be Lila. Some strategic pillars in the old mains were extracted upon retreat preventing any future access. The number of entries in the old works are not adequate for ventilation purposes. Portions of the old mine are flooded preventing reentry. The distance from the old portals to the current leases would result in unacceptable travel times for crews and supplies. Rehabilitating and maintaining an old mine is extremely hazardous and expensive. As a result of the conditions described above it has been determined that new portals at the Lila Canyon site is the most logical and only feasible access to the permittee's coal leases.

Mine Facilities List
Lila Canyon Mine

A list of new structures and facilities follows:

Buildings

1) Office/Bathhouse
2) Shop Warehouse
3) Security Shack

Utilities

4) Mine Substation
5) Power Lines, Power Poles
6) Water Treatment Plant
7) Potable Water Tank

8) Process Water tank
9) Sewer Tank
10) Drain Field

Mine Facilities

11) Ventilation Fan
12) 60-inch Conveyor from tunnels to Coal Stockpile
13) (ROM) Underground Belt from Stockpile to Crusher
14) 48-inch Conveyor from Crusher to Loadout Bin
15) 48-inch Conveyor from Loadout Bin to Truck Loadout
16) Reclaim Tunnel, Escape Tunnel, Fan and Fan House
17) ROM Storage Pile, Coal Stacking Tube
18) Crusher Screen Plant
19) Truck Scale and Loadout
20) Coal Loadout Storage Bin
21) Guardrails
22) Underground Pipes
23) Chain Link Fence

Support Facilities

24) Non-Coal Waste Area
25) Equipment & Supplies Storage Area
26) Topsoil Pile
27) Refuse Pile
28) Sediment Pond
29) Slope Access Road / Portal Access Road
30) Rock Slopes
31) Mine Facilities Road / Truck Loadout Road
32) Office/Bathhouse/Warehouse Asphalt Parking Area
33) Mine Parking
34) Fuel Tanks
35) Powder and Cap Magazines

Culvert locations are shown on Plate 7-2.

A description of new structures and facilities follows:

Office/Bathhouse

The office and bathhouse building is shown on Plate 5-2. This building will jointly house all support personnel such as accounting, administration, engineering, and safety and will provide a comfortable office environment for all employees. Bathhouse and toilet facilities will be found

for all employees at this location. The bathhouse will proved for a location for underground miners to change from clean street clothes to clothing suitable for underground use. The area will proved showers for employees for use after their scheduled work shifts so they can cleanup prior to returning home. Both the bathhouse and office buildings will be of prefab construction and will rest on a concrete pad. The pad dimensions will be approximately 150' by 100' by 12". The facility will be designed to accommodate up to 145 employees working rotating shifts.

Shop Warehouse

The shop warehouse building is shown on plate 5-2. Parts and supplies consumed during the mining process will be stored in the warehouse to be issued as needed. The shop area will be used to perform minor equipment repairs and overhauls. The shop warehouse will be a prefab modular type building approximately 100' by 150' and will rest on a concrete pad.

Security Shack

The Security Shack shown of Plate 5-2, when used will provide security to the mine site. The security shack will be used primary at times when the mine is not in production. Security may be provided to protect the public from hazards associated with a mine site and to protect company property from unauthorized use. The security shack will be approximately 10' by 20' by 8"` and will be of prefab construction.

Mine Substation

The mine substation will be located as shown on Plate 5-2 will proved power to surface and underground areas of the mine property. The substation will comprise of approximately four transformers setting on a concrete pad approximately 20' by 20' by 12" and fully fenced. The total area of the substation is approximately 40' by 40'. Power will be fed into the transformers at 46 KVA and will be transformed down to usage voltages for both the surface and underground facilities. It is anticipated that voltages of 110, 220, 440 will be used on the surface and 12,470 volts will be utilized underground. The mine substation will be constructed in a way to fulfill all appropriate MSHA regulations.

Power Lines and Power Poles

The power lines and power poles location and design will be determined by UP&L. Withing the disturbed area it is anticipated that a single pole shown on Plate 5-2 will be all that is required. Underground lines will be run where feasible. As builds will be provided.

Water Treatment Plant

The water treatment plant is located on the north-east side of the surface facility area. The plant will rest on a 15' by 15' slab. Process water will flow through the treatment plant at which time it will be treated and made suitable for potable water uses. The potable water will be stored in the potable water tank until it is used. The location of the water treatment plant can be found on Plate 5-2.

Potable Water Tank

Water treated by the water treatment plant and intended to be used as potable water will be stored in this 15' diameter by 20' high tank. The tank will set on a 15' by 15' concrete pad designed for adequate support of the tank. The location of the potable water tank can be found on Plate 5-2.

Process Water Tank

Process water, water to be used for mine use or to be treated for potable use, will be stored in this tank. The 15' diameter by 20' high process water tank will rest on a 15' by 15' concrete pad. Process water tank will be filled by using mine discharge water or may be hauled in from off site. The location of the process water tank can be found on Plate 5-2.

Sewer Tank & Drain Field

The sewer system has been designed to facilitate 145 employees working on rotating shifts. The sewer tank and drain field will be located under the south end of the office and bathhouse parking area. The drain field will be located at a lower elevation and south of the sewer tank. The location of the sewer tank and drain field can be found on Plate 5-2. The design for the Sewer Tank and Drain Field can be found in Appendix 5-4.

Ventilation Fan

The ventilation fan will be accessed and installed from underground. The ventilation portal will be driven from underground and broken from inside out. The location of the portal and fan is shown on Plate 5-2. Fan power will be run underground. Fan access for maintenance and monitoring will be from the underground works. The need for surface fan access is not anticipated at this time, access will be from underground.

Conveyor from slopes to Coal Stockpile (Main Conveyor)

The Run of Mine underground belt will provide for a means for coal to be conveyed from the working faces to the run of mine coal storage pile on the surface. The belt will provide capacity to convey to the surface, all coal mined in the underground workings. Preliminary design suggests that the conveyor that extends from the bottom of the rock slopes to the stacking tube at the coal storage area, shown on Plates 5-2 and 5-8, will have the following specifications: 60" wide, speed approximately 700 fpm with a length of approximately 320 feet long. Since the ground beneath the conveyor will not be disturbed due to the steepness and remoteness of the area, this conveyor will be completely contained within a tube type structure.

Reclaim Conveyor

The Reclaim conveyor will provide for a means for coal to be conveyed from the coal stockpile to the crusher. The belt will provide capacity to convey to the crusher at a rate suitable for crushing. Preliminary design suggests that the reclaim conveyor, shown on Plates 5-2 and 5-8, will have the following specifications: 48" wide, speed approximately 500 fpm with a length of approximately 280 feet long. The portions of the conveyor running on the surface will be covered.

Loadout Conveyor

The Loadout conveyor will provide for a means for coal to be conveyed from the crusher to the loadout bin. The belt will provide capacity to convey to the loadout at the same rate as the Reclaim conveyor. Preliminary design suggests that the Loadout conveyor, shown on Plates 5-2 and 5-8, will have the following specifications: 48" wide, speed

approximately 500 fpm with a length of approximately 210 feet long. The portions of the conveyor running on the surface will be covered.

Truck Conveyor

The Truck conveyor will provide for a means for coal to be conveyed from the loadout bin to the trucks being loaded. The belt will provide capacity to convey to the trucks at a rate suitable for truck loading. Preliminary design suggests that the truck conveyor, shown on Plates 5-2 and 5-8, will have the following specifications: 48" wide, speed will vary with a length of approximately 50 feet long. The portions of the conveyor running on the surface will be covered.

Reclaim Tunnel, Escape Tunnel, Fans

Design for the escape and reclaim tunnels is not complete. Standard practice is to construct the tunnels from either concrete or corrugated metal. Appropriate safety and environmental concerns will be addressed upon detailed design. The preliminary layout is shown on Plates 5-2 and 5-8.

ROM Storage Pile

The run of mine storage pile receives coal directly from the underground works and provides storage for the coal until it is crushed and loaded into trucks for transportation to a unit train loadout. The coal from the underground run of mine belt will be dropped into a stacking tube located in the center of the run of mine storage pile. This tube will help reduce any fugitive dust. The stacking tube will be approximately 80' high and will allow for approximately 27,000 tons of open storage in the run of mine storage pile. The run of mine storage pile is shown on Plates 5-2 and 5-8.

Crusher

The enclosed crusher will crush coal from the 8" minus down to a 2" minus size, at the rate of approximately 500 tons per hour. No screening is anticipated at this time. The crushed coal will leave the crusher and be stored temporarily in a 500 ton storage bin located at the truck loadout. The crusher location is shown in Plates 5-2 and 5-8.

Truck Scale and Loadout

Coal will be reclaimed from the coal storage bin, weighed and then loaded into coal haul trucks for transportation to the various unit train loadouts. A small loadout shack will be constructed to provide cover and protection for the various equipment and controls need for the coal loading process. The truck scale and loadout are shown on Plates 5-2 and 5-8.

Coal Storage Bin

The coal storage bin is part of the truck loadout and is shown of Plate 5-2. The coal storage bin is where crushed coal is stored waiting to be loaded into coal haul trucks. The bin provides for surge capacity and allows for better control of crushing time. The coal storage bin provides for a enclosed dry location for temporary crushed coal storage. Coal is delivered from the crusher to the coal storage bin by use of a 48" covered surface conveyor running at a speed of approximately 500 FPM. The preliminary layout is shown on Plates 5-2 and 5-8.

Coal Stacking Tube.

The final design for the coal stacking tube is not yet complete. Preliminary design indicates that the stacking tube will be approximately 15' radius and approximately 80 feet high. Standard practice is to construct the tube of either concrete or steel. The preliminary layout is shown on Plates 5-2 and 5-8.

Culverts

A complete list and design for the culverts can be found in Appendix 7-4 Tables 9 and 10, and are shown on Plate 7-2. A summary of the culverts follows:

Culvert	Length	Width
DC-5	40'	18"
DC-6	60'	24"
DC-7	40'	24"
DC-8	40'	18"
DC-9	40'	18"
UC-2	500'	60"

Guard Rails

Guard rails will be installed on the mine access road according to the detailed engineering plan being prepared. Appropriate MSHA and UDOT requirements will be taken into consideration.

Underground Pipes

Locations of the underground pipes have yet to be determined. Once detailed engineering design is completed the underground pipes will be added to Plate 5-2 or other appropriate Plates.

Chain Link Fence

A six foot high chain link fence will be constructed as shown on Plate 5-2. The fence will be constructed to protect the public, and proved security along the section of county road that runs adjacent to the property.

Non-Coal Waste Area

An area for non-coal waste has been identified on Plate 5-2. Non-coal waste such as papers, timbers, cans, and miscellaneous scrap that is brought to the surface will be disposed of in a metal bin or "dumpster" located in the non-coal waste area identified on Plate 5-2. Metal will be separated from other forms of trash for salvage. Material not salvageable will be transported to the East Carbon Development Corporation (ECDC) dump or other approved disposal site for permanent disposal. Once a dumpster has reached capacity, the full dumpster will be replaced with an empty dumpster, and then the full dumpster will be hauled by a contract hauler to the specified disposal site.

Equipment & Supplies Storage Area

The equipment and supply storage area is approximately 350' by 400'. This storage area will be used to store mine supplies and equipment from the time of delivery until they are needed underground. Supplies such as timbers, bolts, plates, rock-dust, pipes, resin, screens, concrete blocks,

steel, cables, and numerous other materials may be stored in this area. Equipment both new and used will be stored in this area. Many various longwall pieces such as shields, pan-lines, shears, chains, head and or tail drives, transformers, belt drives, pumps and numerous other material will be stored in this storage area. This secure area provides for a good storage area for diesel, gasoline, hydraulic, and roadway chemicals. All oil tanks will have appropriately designed berms or retaining walls. The equipment and supplies storage area is shown on Plate 5-2. Any explosives will be stored here according to appropriate MSHA regulations. Rock dust bins will be located in this area.

Topsoil Pile

The topsoil pile has been located on the south west end of the surface facilities. The pile has been designed to contain adequate topsoil for redistribution according to the reclamation plan found in Chapter 5. The proposed location provides for good protection from wind contamination as well as protection from mine related activities. The location of the topsoil pile is shown on Plate 5-2.

Refuse Pile

The refuse pile has been designed to provide a location for the storage of underground development waste that is brought to the surface and for any excess slope rock which will be generated and not used as fill. The capacity of the pile is designed for approximately 44,400 yd3 which is in excess of projected needs. The refuse pile design is shown in Appendix 5-7 and shown on Plate 5-2. The areas for the rock slope material and for underground development waste are adjacent and conjoining and will be treated as one area or structure.

Sediment Pond

The sediment pond has been design to provide for adequate sediment protection for the project area. All water running off the disturbed area will be routed into the sediment pond for treatment. The sediment pond has been designed according to the appropriate R645 regulations and the designs can be found in Appendix 7-4 and Plate 7-6. Because the sediment pond does not fit into the requirement of 30 CFR 77.216(a) an MSHA number for the proposed pond is not required. The sediment pond is located on the south-

west end of the property and shown on Plate 5-2.

Slope Access / Portal Access Road

The slope access road splits off the facility access road near the north-east corner of the equipment and supply storage area, and follows an alignment that takes into consideration grade and direct access. The slope access road will be used to provide access to the rock slopes which in-turn proved access to the underground workings. The slope access road will be used as access for all men, material and equipment need in the mine. Since the slope access road provides for frequent access for men, equipment and materials for a period of six months or longer the slope access road is classified as a primary road. The slope access road will be designed, constructed, and maintained according to appropriate R645 regulations. The slope access road is shown on Plate 5-2.

Rock Slopes

Access to the underground workings of the Lila Canyon Mine will be provide by two rock slopes driven from the top of the Mancos shale up-dip to the intersection of the coal seam. One portal will proved for access for men, equipment and material to the mine. The second access slope will contain the run of mine belt line from the underground workings of the mine to the run of mine stock pile. There is a possibility that only one larger slope will be driven and then divided. to provide for two separate entries. The two 1,227 foot long slopes will slope up at approximately 12%, from a starting elevation of approximately 6150'. The intersection of the coal seam and the rock slope will take place at approximately 6,300 feet elevation. The length of the slopes were minimized by taking advantage of the coal seam dip which is approximately 12% to the east. The rock material removed from the slopes will be used as fill material for the surface facilities. The rock slope material / underground development waste will contain mostly shale, sandstone and mudstone. Traces of coal may be found but the amount will be insignificant. There are no known coal seams or significant rider seams found below the Sunnyside Seam in the Lila Canyon Portal Area. The rock slope locations are shown on Plate 5-2.

Mine Facilities Road / Truck Loadout Road

The mine facility road shown on Plate 5-2 begins at the edge of County Road 164 and allows for access to the various surface facilities. The road has been located in the most practical location taking into consideration grade, stability, and alignment. Employees will use this road to access the office & bathhouse facilities. Coal haul trucks will use this road to access the scales and truck loadout. All supplies will be hauled on a short portion of this road from the supply storage area to the slope access road. The road will initially be graveled but will be paved in the long term to minimize dust and provide good surface for heavy truck traffic as well as facility access. The facility access road will be approximately 24' wide to provide for two lane traffic and will have the appropriate drainage controls to insure long term life and low maintenance. The has been constructed and will be maintained according to the appropriate R645-534 and R645-527 regulations.

Office/Bathhouse/Warehouse Parking Area

Parking will be as shown on Plate 5-2. Parking facilities for office, mine, and warehouse employees will be provided jointly as shown. This area will also provide parking for all vendors, and visitors. The surface of the 150' by 475' area will initially be graded and graveled but may eventually be paved. The parking area is located and designed to allow for convenient and safe parking of personal vehicles. The sewer tank and drain field will be located on the south end of this parking area.

Mine Parking

A mine parking area will be provided as shown on Plate 5-2. The mine parking area is where all mine and mine related mobile equipment will be parked when on the surface. This is the location where the underground work crews will be loaded into man trips for transportation to the various work areas. The mine parking area will initially be graded and graveled but eventually may be paved. The mine parking area will be approximately 100' by 200'.

Fuel Tanks

Fuel tanks will be located in the Equipment & Supplies Storage Area and be installed as discussed under Equipment & Supplies Storage Area.

Powder and Cap Magazines

Powder and cap magazines will be mobile temporary, and supplied by the explosive distributer. Upon reclamation the powder and cap magazines will be returned to the distributer.

521. Included in this section are maps, cross sections, narratives, descriptions and calculations used to satisfy the relevant requirements. This section describes and identifies the lands subject to coal mining and reclamation operations covering the estimated life of the project.

521.100 This application includes the cross sections, maps and plans needed to present the relevant information required by the Division. This information includes the following:

521.110. Plate 5-1 Shows area previously mined and approximate dates of mining.

521.111 Plate 5-1 of part 'B" and 2-2 of part "A" shows the location and extent of known workings of inactive, or abandoned underground mines. The surface portals or mine openings to the surface are shown. Plates 5-1 and 2-2 of part "A" have been prepared and certified by or under the direction of a registered professional engineer.

Doelling lists several coal mines and mining activity in within or adjacent to the permit area. Doelling lists the Calkins prospect, the Lila Canyon prospect, and the Prentiss prospect. In addition Doellng lists several coal mines Prentiss, Utah Blue Diamond, Blue Diamond and Heiner Mines. The research has shown that the Prentiss, Utah Blue Diamond, Blue Diamond and Heiner Mines were engulfed by the Book Cliffs mine. The Lila Canyon prospect refers to the old Lila Canyon mine fan portals used to ventilate the Geneva (Horse Canyon mine. The Calkins prospect is believed to have been engulfed by the Geneva mine.

An outcrop fire has been detected in an area north of the exiting permit area "A". The fire is off the permit area and located in an area that has been sealed from the old horse canyon works. The outcrop fire is not anticipated to cause any problems with mining at the Lila Canyon Mine.

521.112 No surface mined areas are found within the permit area. Therefore, this section does not apply.

521.120 Only two existing structures, a 48" and a 24" CMP culvert located near the new proposed sediment pond, can be found at the Lila Canyon Mine. The existing culverts are shown on plate 5-1A. Existing Horse Canyon facilities are discussed in part "A" of this plan.

521.121 There are no buildings within 1000 feet of the proposed permit area for the Lila Canyon Mine, Part "B".

521.122 There are no subsurface man-made features, other than the culverts discussed in 521.200, within, passing through, or passing over the proposed permit area for Part "B".

521.123 Plate 4-1, as well as others, shows the existing county road 126 which is located partly within 100 feet of the proposed permit area. In Addition, the Little Park road is located above the surface facilities within the permit area. The Little Park road is also shown on plate 4-1

521.124 There are no known existing areas of spoil, waste, coal development waste, or non-coal waste disposal, dams, embankments, other impoundments, and water treatment and air pollution control facilities within part "B" of the proposed permit area. This section is not Applicable.

521.125 There are no existing sedimentation ponds,

permanent water impoundment, coal processing waste banks or coal processing waste dams near or within the permit area.

521.130 Landowner and right of entry maps are included in the permit application. These maps and cross sections show the following:

521.131 Plate 4-1 shows the surface ownership and Plate 5-4 shows the coal ownership of land included in or contiguous to the permit area.

521.132 The applicant has the legal right to enter and begin coal mining and reclamation operations on all areas shown within the permit area. The permit area is shown on Plates 5-3 and 5-4 as well as others.

521.133 Coal mining or reclamation operations are planned within 100 feet of a public road. There are no plans to relocate public roads.

521.133.1 Emery County has given permission to conduct coal mining or reclamation operations within 100 feet of the county road. (See Appendix 1-4)

521.133.2 The current permit does not propose any relocation of public roads. Therefore, this section is not applicable.

521.140 Mine maps and permit area maps and or cross-sections will clearly indicate the following:

521.141 Boundaries of all areas proposed to be affected over the life of the mine are shown on Plate 5-1 and Plate 5-2 as well as others. At this time, no additional subareas requiring additional permits are proposed for the life of the mine.

521.142 The underground workings are shown on Plate 5-5.

521.143 The proposed disposal site for placing the slope rock is shown on Plate 5-2 as well as other appropriate plates.

521.150 Plates 6-2, 6-3, and 6-4, show surface contours that represent the existing land surface configuration of the proposed permit area.

521.151 The Plates show the surface contours for all areas to be disturbed as well as over the total permit area. The Plates showing the surface contours has been prepared by or under the supervision of a registered engineer.

521.152 No previously mined areas are included within Part "B". Therefore this section does not apply.

521.160 The maps, plates, and cross sections associated with this chapter clearly show:

521.161 Proposed buildings, utility corridors, and facilities are shown on Plate 5-2 as well as others.

521.162 Area of land affected according to the sequence of mining and reclamation is shown on the appropriate plates.

521.163 Land for which a performance bond will be posted is shown on the appropriate plate. Plate 5-2 as well as others show the area for which the performance bond will be posted. All areas within the permit boundary has been bonded.

521.164 Coal storage and loading areas are shown on Plate 5-2 and certified as required. Additional information can be found in Appendix 5-4.

521.165 Topsoil, and waste piles are shown on Plate 5-2 as well as others.

521.166 The waste disposal areas are shown for non-coal waste and underground mine waste on Plate 5-2.

521.167 No explosives are expected to be stored on site. However, if explosives are stored they will be stored as discussed in Section 520. on Plate 5-2.

521.168 Since Lila Canyon mine is an underground operation this paragraph is not applicable.

521.169 The refuse pile is shown on Plate 5-2 and discussed in Appendix 5-7.

521.170 Transportation facility maps describing roads, and conveyor maintained within the permit is shown with descriptions of roads, embankments, culverts, and drainage structures are presented in section 520 and are shown on Plates 5-2, and 7-2.

521.180 Support facilities are described in section 520 and are shown on Plate 5-2. Plate 5-2 is the official disturbed area boundary map.

521.190 Other relevant information required by the Division will be addressed.

521.200 Signs and markers will:

521.210 Signs and markers will be posted maintained, and removed by the person who conducts the coal mining and reclamation operations.

521.220 Signs and markers will be of uniform design that can be easily seen and read and be made of durable material and conform to local laws and regulations.

521.230 Signs and marker will be maintained during all activities to which they pertain.

521.240 Mine and Permit Identification Signs.

521.241 Mine and permit identification signs will be displayed at each point of access from public roads to areas of surface operations and facilities on permit areas.

521.242 Since Lila Canyon Mine is an underground

operation, this section is not applicable.

521.243 Mine and permit identification signs where required, will show the name, business address, and telephone number of the permittee and the identification number of the permanent program permit authorizing coal mining and reclamation operations.

521.244 Mine and permit identification signs will be retained and maintained until after the release of all bonds for the permit area.

521.250 Perimeter Markers

521.251 The perimeter of all areas affected by surface operations or facilities before beginning mining activities will be clearly marked with perimeter markers.

521.252 Since Lila Canyon Mine is an underground operation this section is not applicable.

521.260 Buffer Zone Markers

521.261 Signs will be erected to mark buffer zones as required and will be clearly marked to prevent disturbance by surface operations and facilities.

521.262 Since Lila Canyon Mine is an underground operation this section is not applicable.

521.270 Topsoil Markers. Markers will be erected to mark where topsoil or other vegetation-supporting material is physically segregated and stockpiled.

522. Coal Recovery

Additional Details can be found in the R2P2 on file at the BLM Office.

Effective barrier and pillar designs are essential for safe and productive underground mining. Barrier pillars will be sized according to accepted engineering practices. One or more of the following methods may be used to properly size barrier pillars: Dunn's Rule, the Old English Barrier Pillar Law, Pennsylvania Mine Inspector's Formula, Ash and Eaton Impoundment Formula, Pressure Arch Method, British Coal Rule of Thumb, North American Method, Holland Rule of Thumb, or Holland Convergent Method.

Regardless of the methods or care taken to properly size barrier pillars the true effectiveness on any design can only be determined by conducting full-scale in-mine performance evaluations. Mine experience and history in the local area will have as much influence on pillar sizes as does the engineering formulas.

Barrier pillars will be utilized to isolate the abandoned Horse Canyon Mine from the new Lila Canyon Mine. Barrier pillars will also be used to simplify ventilation, to provide independent escape routes and to possibly retain large quantities of mine water. Barrier pillars will be employed along the outcrop in order to maintain ventilation courses.

A barrier pillar where no second mining will be allowed within the barrier will be used to protect the escarpments. The width of the escarpment barrier will be determined by implementing a 21.5° angle of draw project downward from the surface to the coal seam. Development mining or first mining will be allowed within the escarpment barrier.

For longwall mining applications the abutment loading is of prime importance. Initial longwall pillars will be designed using the ALPS method. Again mine experience and history in the local area will have as much influence on pillar sizes as does the engineering formulas.

Mine pillars will be sized taking into consideration the coal strength, depth of cover, width and height of pillars using one or more of the following methodologies: Obert-Duvall, Holand-Graddy, Holland, Salamon-Munro, or Bieniawski. Again mine experience and history in the local area will have as much influence on pillar sizes as does the engineering formulas.

523. Mining Methods:

Mining will begin in Section 15, T16S, R14E, in the Sunnyside seam. Development of the Sunnyside seam will be in a down dip direction toward

the east. The seam will be accessed by two 1,200 foot slopes driven up at 12% from the base of the cliffs.

Production during the first year is estimated to be 200,000 tons, the second through the fifth year production should be between 1,000,000 and 1,500,000 using continuous mining methods. If and when tonnage demand increases to justify longwall mining, production could peak as high as 4,500,000 tons a year and continue at that level for the life of the mine.

Mine production will begin with the slope construction. Once the coal is encountered development will continue using continuous miners and various haulage types. Battery, cable, or continuous haulage may be used in conjunction with continuous miners in development. Continuous miners will account for all the production during the first two to five years. Mining will consist of driving mains, developing room and pillar panels and gate entries for future longwall mining.

The majority of the second mining will be performed using longwall equipment. However, in isolated areas room and pillar type of mining may be used in areas not suitable for longwall mining. Longwall panels are sited approximately parallel lengthwise to the strike with a slight up dip orientation to provide drainage for the development faces. This practice will be applied to the continuous miner panels wherever possible. (See plate 5-5)

Roof control and ventilation plans will be submitted to MSHA and approved prior to any underground mining activities.

An air quality permit from the State Division of Air Quality has been obtained and will be modified as needed.

Ventilation of the mine will be by an exhaust type system. It has been estimated that 900,000 cfm will be required at full production. Intake air will be supplied by slopes and entries from the surface.

A water supply system will be installed. Potable water from an approved source will be hauled by truck and stored in a mine site storage tank located near the man and coal slope portals. Alternative sources for potable water are being considered. A treatment plant may be indicated. Process water will be hauled from the Price River or other approved source by truck and stored in another mine site storage tank. It is anticipated that once the old two entry development panel is encountered that adequate process water may be obtained from the old works. This process water will provide for dust control, water to the mine and fire suppression. Mine water will be used with

the process water.

Dust suppression will be accomplished by the use of sprays on all underground equipment as required. Sprays will also be used along sections of the conveyors and at transfer points.

No major de-watering concerns are anticipated at this property. The workings are expected to produce some water with more water being produced as the depth of mining increases. Part of this water will be used for dust suppression. The remainder will be collected in sumps and pumped to mined out sections of the mine or to the surface and treated when necessary.

Underground mining equipment to be used at Lila Canyon is typical of most room-and-pillar and longwall mine. A list of major equipment which may be used underground is listed below additional equipment not on the list may be used as needed.

Continuous Miners
Roof Bolters
Battery Shuttle Cars
Electric Shuttle Cars
Diesel Ram Cars
Feeder Breakers
Continuous Haulage Units
Battery Scoops
Diesel Scoops
Diesel Service Vehicles
Diesel Material Haulers
Diesel
Belts and Terminal Groups
Battery and Diesel Man Trips
Longwall Shields
Longwall Pan-lines
Longwall Shears
Longwall Stage-loaders
Longwall Pumps
Various Water Pumps
Various Transformers and Switches
Rock Drills
Loaders

523.100 No Surface Coal Mining and Reclamation Activities are

proposed to be conducted within the permit area within 500 feet of an underground mine, therefore this section is not applicable.

523.200 No Surface Coal Mining and Reclamation Activities are proposed with 500 feet of an underground mine, therefore this section is not applicable.

523.210 No Surface Coal Mining and Reclamation Activities are proposed to be conducted within the permit area within 500 feet of an underground mine, therefore this section is not applicable.

523.220 No Surface Coal Mining and Reclamation Activities are proposed to be conducted within the permit area within 500 feet of an underground mine, therefore this section is not applicable.

524. Blasting and Explosives: Surface blasting activities incident to underground coal mining is planned for the Lila Canyon mine during construction of the access slopes only.

524.100 Steps have been taken to achieve compliance with the blaster certification program and is described in this permit application.

524.110 Surface blasting involving 5 lbs of explosives or more will be conducted under the direction of a certified blaster.

524.120 Blasting certificates will be carried by the blasters or will be on file at the permit area during blasting operations.

524.130 The blaster and at least one other person will be present at the firing of a blast.

524.140 Persons responsible for blasting operations at a blasting site will be familiar with the blasting plan, if required, and site-specific performance standards and give on-the-job training to persons who are not certified and who are assigned to the blasting crew or assist in the use of explosives.

524.200 Since the planned blasting does not meet the requirements of 524.211 or 524.212 a blast design is not included in the permit application. If in the future blasting falls under section 524.200 then a plan will be submitted to Division for approval.

524.210 Since the planned blasting does not meet the requirements of 524.211 or 524.212 anticipated blast designs are not required.

524.300 Since planned blasting requires more than 5 lbs of explosives the preblasting survey is addressed where applicable in this permit application.

524.310 There are no dwellings or other structures located within one-half mile of the permit area owned by anyone but the operator. The operator will prepare the preblast survey if required. Notification procedures implied in this section are not applicable.

524.320 Since the operator is the only owner of structures and no dwelling exist within one-half mile of any part of the permit area this section is not applicable.

524.330 Because the operator is the only owner of structures or dwellings within one-half mile of any part of the permit area, this section is not applicable.

524.340 Because the operator is the only owner of structures or dwellings within one-half mile of any part of the permit area, this section is not applicable.

524.350 Because the operator is the only owner of structures or dwellings within one-half mile of any part of the permit area, this section is not applicable.

524.400 The blast schedule is as follows:

524.410 Since there are no residents within one-half mile of the projected blasting site this section does not apply.

524.420 All surface blasting will be conducted between sunrise and sunset unless nighttime blasting is approved by the

Division.

524.430 Since there are no residents within one-half mile of the projected blasting site this section does not apply.

524.440 Since there are no residents within one-half mile of the projected blasting site a flexible blasting schedule is allowable. Surface blasting may take place anytime during daylight hours, unless approved differently by the Division.

524.450 Because of the remote location of the Lila Canyon Mine, over six miles from the nearest locality (Columbia), this section does not apply.

524.460 Since the town of Columbia is the nearest locality, and is over six miles distance from the permit area, this section does not apply.

524.500 The blasting signs, warnings and access control is described below.

524.510 Blasting signs will meet the specifications of R645-301-521.200. The following will apply.

524.511 Signs reading "Blasting Area" will be conspicuously place at the point where any road provides access to the blasting area.

524.512 The signs posted at all entrances to the permit area from public, roads, or highways will be placed in a conspicuous location and will state "Warning! Explosives in Use" and will clearly list and describe the meaning of the audible blast warning and all clear signals that are in use.

524.520 Audible warning and all-clear signals of different character or pattern will be given. Each person within the permit area will be trained in the meaning of the signals.

524.530 Access within the blasting area will be controlled until an authorized until the operator has reasonably determined the following:

524.531 No unusual hazards, such as imminent slides or undetonated charges, exist; and

524.532 Access to and travel within the blasting area can be safely resumed.

524.600 Adverse blasting effects are described as follows:

524.610 Blasting will be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel, or availably of surface or ground water outside the permit area.

524.620 Airblast Limits

524.621 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does not apply.

524.622 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does not apply.

524.630 Monitoring: Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does not apply.

524.640 Ground Vibration: Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance form the permit area, this section does not apply.

524.650 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does

not apply.

524.660 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does not apply.

524.670 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does not apply.

524.680 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does not apply.

524.690 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, sections 524.620 through 524.632 and 524.640 through 524.680 do not apply.

524.700 Records of blasting operations will be maintained at the mine site for at least three years and will be available for inspection by the Division or the public. Blasting records will contain the following information.

524.710 Blasting records will include.

524.711 The name of the operator will be on the blasting record.

524.712 The location, date, and time of the blast will be recorded on the blasting record.

524.713 The name, signature, and certification number of the blaster will be recorded on the blasting record.

524.720 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area, this section does

not apply.

524.730 Weather conditions will be recorded on the blasting record.

524.740 A record of the blast will include the following:

524.741 The type of material blasted will be recorded on the blasting record.

524.742 Sketches of the blast pattern including number of holes, spacing, burden, decks, and delay pattern will be recorded on the blasting record.

524.743 The diameter and depth of holes will be recorded on the blasting record.

524.744 The type of explosives used will be recorded on the blasting record.

524.745 The total weight of the explosives used per hole will be recorded on the blasting record.

524.746 The maximum weight of explosives detonated in an eight-millisecond period will be recorded on the blasting record.

524.747 Information on the initiation system will be recorded on the blasting record.

524.748 The type and length of the stemming will be recorded on the blasting record.

524.749 Mats or other protections used will be recorded on the blasting record.

524.750 Since all structures are either owned by the permittee and not leased to another person or are located over six miles distance from the permit area a record of seismographic and airblast information is not required.

524.760 Since a blasting schedule is not required this section does not apply.

524.800 The operator will comply with the various appropriate State and Federal laws and regulations in the use of explosives.

525. Subsidence: The permittee will comply with the appropriate R645-301-525 requirements.

525.100 Subsidence Control Plan

525.110 Plate 5-3 shows the location of State-appropriated water and eagle nests that potentially could be diminished or interrupted by subsidence.

525.120 No major impacts of subsidence to the surface caused by the underground mining methods proposed during the permit term are anticipated.

The coal seam is approximately 12.5 feet thick with only about 10.5 feet being extracted, and the depth of cover ranges from 1500' to approximately 2,300'. The rocks overlaying the coal seam are sandstones and mudstones with some thin bands of coal. Due to the strength of the overburden, and depth of workings, even with full seam extraction, only minimal subsidence if any is anticipated.

Some surface expressions of tension cracks, fissures, or sink holes may be experienced but should be insignificant. The chances of subsidence related damage to any perceived renewable resource is minimal.

All dirt roads above the mine are in areas in excess of 1,000 feet of cover or in areas where mining will not take place. The chance of subsidence negatively effecting these dirt roads is minimal. However, in the unlikely event that cracks, fissures or sink holes are observed as a result of subsidence the road will remain accessible by regraded, filling in the cracks, fissures or sinkholes.

The unnamed ephemeral channel in the southwest corner of the permit area is located in an area where no mining is planned or over the top of a bleeder system

that will not be second mined. The chance of subsidence negatively effecting this ephemeral channel is minimal. However, in the unlikely event that cracks, fissures or sink holes are observed as a result of subsidence the channel will be regraded, filling in the cracks, fissures or sinkholes by hand methods due to its inaccessibility.

A small portion of Little Park Wash, which is ephemeral, has less than 1,000 feet of cover in the southwest corner of the permit area. The portion with less than 1,000 feet of cover runs diagonally across one longwall panel and then parallel to the bleeder system in the second longwall panel. In the unlikely event that cracks, fissures or sink holes are observed as a result of subsidence the channel will be regraded, filling in the cracks, fissures or sinkholes. Since this stream channel is accessible and is traversed by 4 wheel drive, access for repairs would not be a problem. If any subsidence repairs cannot be fixed using hand methods, a small pieces of earth moving equipment could be used.

DWR and BLM wildlife Biologist in consultation with the Division, have determined that any loss of snake dens to subsidence would be random and a minor impact to the population of snakes.

525.130 A survey was conducted within the proposed permit area and adjacent area and it was determined that limited renewable resource lands exist within the area surveyed. Limited areas were found which contribute to the long-range productivity of water supply or fiber products. No structures exist with in the permit area in which subsidence if it occurred, could cause material damage or diminution or reasonably foreseeable use. See plates 5-5 and 5-3 for areas of potential subsidence. Identification and data for the State appropriated water supplies can be found in chapter 7 section 727.

According to Mark Page (State Water Rights), there is not a water conversation district associated with Lila

Canyon Mine.

525.200. Protected Areas

525.210. Since there are no public buildings or other facilities such as churches, school or hospitals, and since there are no impoundments with a storage capacity of more than 20 acre-feet, this section does not apply.

525.220. Since R645-301-525.210 does not apply this section

does not apply.

525.230. Since there are no planned operations under urbanized areas, cities, towns, and communities, or adjacent to industrial or commercial buildings, major impoundments, or perennial streams this section does not apply.

525.240. A detailed plan of the underground workings including maps and descriptions, of significant features of the underground mine, including the size, configuration, and approximate location of pillars and entries, extraction ratios, measure taken to prevent or minimize subsidence and related damage, and areas of full extraction can be found in the R^2P^2 on file with the BLM local and state offices.

525.300. Subsidence control.

525.310. Measures to prevent or minimize damage.

525.311 No attempt will be made to prevent subsidence in any area except where the escarpment near the outcrop is to be protected. The use of continuous miners in a pillar section as well as longwall technology provides for planning subsidence in a predictable and controlled manner. Some surface expressions of tension cracks, fissures, or sink holes may be experienced but should be insignificant. The chances of subsidence related damage to any perceived renewable resource is minimal. The value and foreseeable use of the

surface lands will not be affected by potential subsidence.

525.312 Since there are no buildings or occupied residential dwellings or structures within the Lila Canyon project area this section does not apply.

525.313 Room-and-pillar mining in addition to longwall methods will be used at the Lila Canyon Mine.

525.400. Since state-appropriated water supplies exists on the surface 525.400 has been addressed.

525.410 Coal will be removed using a combination of continuous miner and long wall methods as described in sections 522 and 523. Sequence and timing for the development of underground workings are also discussed in sections 522 and 523.

525.420 Plate 5-5 shows the underground workings and depicts areas where first mining only will be utilized to protect the escarpment and raptor nests that may exist on the escarpment. State-appropriated water rights are shown on Plates 5-3, 5-5 as well as Plate 7-1.

525.430 No major impacts of subsidence to the surface caused by the underground mining methods proposed during the permit term are anticipated.

The coal seam is approximately 12.5 feet thick with only about 10.5 feet being extracted, and the depth of cover ranges from 1500' to approximately 2,300'. The rocks overlaying the coal seam are sandstones and mudstones with some thin bands of coal. Due to the strength of the overburden, and depth of workings, even with full seam extraction, only minimal subsidence if any is anticipated.

525.440 Aerial subsidence monitoring will be done annually while the significant subsidence is taking place. The subsidence monitoring will be initiated in an area prior to any 2nd mining being done within that area. Initially a 200 foot grid along with baseline photograph will be established prior to any 2nd mining. Approximately 12-16

control points will be needed to cover the total mining area. Six of these points will be located outside of the subsidence zone. The accuracy of this survey will be plus or minus 6" horizontally and vertically. From this data a map will be created that will show subsided areas. Once a year a follow up aerial will be performed to determine the extent and degree of active subsidence. Subsidence monitoring will continue for a minimum of 5 years after the mining ceases. If at the end of the 5 year period the annual subsidence in any of the 3 prior years measures more than 10 percent of the highest annual subsidence amount, subsidence monitoring will continue until there are 3 consecutive years where the annual subsidence amount is less than 10 percent of the highest annual subsidence amount. If for three years in a row the subsidence is measured to be less than 10% of the highest subsidence year, subsidence will be determined to be complete, and no additional monitoring for that area will be required.

A ground survey will be performed in conjunction with the quarterly water monitoring program. During the normal water monitoring program any cracks observed will be noted and reported to DOGM.

525.450 Subsidence control measures.

525.451. No backstowing or backfilling of voids used as a subsidence control measure is planned at this time. Therefore, this section is not applicable.

525.452. Support pillars as a subsidence control measure is not anticipated at this time.

525.453. An outcrop barrier of coal will be left to protect the escarpments at the outcrop. As per the R2P2 only first mining will be allowed within 200' of the outcrop. Mains, submains, and ventilation portals will be allowed within the outcrop.

525.454 No measures will be taken on the surface to prevent material damage or lessening of the value or reasonable foreseeable use of the surface.

525.460. Anticipated effects of planned subsidence may include tension cracks, fissures, or sink holes. Areas of minimal ground lowering may be anticipated. The chances of subsidence related damage to any perceived renewable resource is minimal.

525.470. Since no urbanized areas, cities, towns, public buildings, facilities, churches, schools, or hospitals exist within the permit area this section does not apply.

525.480. There are no plans to change or modify the mining plan to protect any springs or seeps. Springs with water rights will be monitored for flow and quality as described in Chapter 7 Section 731.211. UEI has committed to provided for mitigation of any lost water rights as per Chapter 7 Section 727.

525.490. Other information specified by the Division as necessary to demonstrate that the operation will be conducted in accordance with R645-301-525.300 will be provided.

525.500. Repair of damage.

525.510. If the effects of subsidence is confirmed, any material damage to the surface lands will be restored to the extent technologically and economically feasible. The land will be restored to a condition capable of maintaining the value and reasonable foreseeable uses which it was capable of supporting before the subsidence.

525.520. Since no structures exists within or adjacent to the permit area which could be damaged by subsidence, should it occur, this section does not apply.

525.530. Since no structures exists within or adjacent to the permit area which could be damaged by subsidence, should it occur, this section does not apply.

526. A narrative explaining the construction, modification, use, maintenance and removal of the mine facilities follows. Additional information can be found in Appendix 5-4 and Chapter 8.

526.100 Mine Structures and Facilities.

526.110 The only existing structures are found in Horse Canyon (Part "A" of this permit) and are the remains of the United States Steel operation. Horse Canyon has received phase II bond release and the remaining structures have been left in place for future use. Only two existing structures, a 36" CMP culvert located near the new proposed sediment pond, and the County road on top of Little Park, can be found within the Lila Canyon Permit. The existing culvert is shown on plate 5-1A. The existing road on Little Park can be found on Plate 5-1 as well as most other plates showing the surface area of the Lila Canyon Permit. Several vehicle ways will be used for water and subsidence monitoring. These ways branch off the Little Park Road and generally follow the ephemeral drainages. The ways are shown on Plate 5-1 as well as most other plates showing the surface area of the Lila Canyon Permit. More detail of the existing Little Park Road can be found in Appendix 5-4.

526.111 The location of the existing culverts is shown on Plate 5-1A.

526.112 The existing 48" culvert is assumed to be in poor condition and will be replaced with the construction of the sediment pond.

526.113 It is believed that the existing culverts were installed with the road construction around 1940.

526.114 Since the existing culvert is going to be removed upon construction of the sediment pond this section does not apply.

526.115 Since the existing culvert is going to be removed upon construction of the sediment pond this section does not apply. The County road and the culvert within the disturbed area boundary will be modified or reconstructed by the County.

526.115.1. Since the existing culvert is going to be removed upon construction of the sediment pond this section does not apply. See Appendix 5-4 for existing road details.

526.115.2. Since the existing culvert is going to be removed upon construction of the sediment pond this section does not apply. See Appendix 5-4 for existing road details.

526.115.3. Since the existing culvert is going to be removed upon construction of the sediment pond this section does not apply. See Appendix 5-4 for existing road details.

526.115.4. Since the existing culvert is going to be removed upon construction of the sediment pond this section does not apply. See Appendix 5-4 for existing road details.

526.116 The only coal mining and reclamation operations that are planed within 100 feet of the County Road are office complex, sediment pond, topsoil pile, and security shack. The permit area adjacent to the county road will be fenced to protect the public from the sediment pond and other mine associated buildings. Other than fencing no additional measures are planned after the construction phase. During construction measures to control traffic on the County Road will be taken to protect the public from construction related hazzards.

526.116.1. A cooperative agreement with Emery County as stated in Appendix 1-4 requires a six foot chain link fence to be constructed adjacent to the Lila Canyon Road to provide safety to the general public in the proximity to the mine site and mine related structures and activities.

526.116.2. At the current time there are no plans to relocate any public road.

526.200 Utility Installation and Support Facilities.

526.210 All coal mining and reclamation operations will be conducted in a manner which minimizes damage, destruction, or disruption of services provided by oil, gas, and water wells, oil, gas, and coal-slurry pipelines, railroads, electric and telephone lines, and water and sewage lines which may pass over, under, or through the permit area, unless otherwise approved by the owner of those facilities and the Division. Since no existing services are found within the projected disturbed area, no negative impact to any service is anticipated.

A BLM and State Lands Utility Right-of-Way has been applied for to contain an access road, rail from the existing main line near highway 10, electric power, phone lines, and gas service. See ROW application in Appendix 1-4). This ROW is not included within the MRP and will not fall under the R645 regulations.

526.220 The new support facilities are described in section 520 and in Appendix 5-4 and shown on plate 5-2 and will be operated in accordance with the mine reclamation plan. Plans and drawings for each support facility to be constructed, used or maintained within the permit area are found in Appendix 5-4, Plates 5-7A, 5-7B, and 5-8.

526.221 The new facilities designs shown in Appendix 5-4 prevents or controls erosion and siltation, water pollution, and damage to public or private property, and:

526.222 The new facilities designs shown in Appendix 5-4 minimizes damage to fish, wildlife, and related environmental values; and minimizes additional contributions of suspended solids to stream flow or runoff outside the permit area to the extent possible by using the best technology currently available.

526.300 Water pollution control facilities consist of sedimentation control and properly designed sewage systems.

The sedimentation control is accomplished by containing all disturbed area runoff in a properly sized sedimentation pond.

Complete designs are presented in Appendix 7-4 and on Plate 7-6.

The sewage system will consist of a septic tank and drainfield. The system is shown on Plate 5-2. Complete designs are presented in Appendix 5-4.

The drain field design and layout is shown on plate 5-2b and details are shown in Appendix 5-4.

526.400 Since Lila Canyon Mine is an underground operation this section does not apply.

527. Transportation Facilities.

527.100 All new roads within the disturbed area have been classified as primary roads.

527.110 All roads on the disturbed area have been classified as primary roads.

527.120 Since all roads within the disturbed area will be used frequently for access for a period in excess of six months, and or will transport coal, they are classified as primary roads.

527.121 See 527.120 above.

527.122 See 527.120 above.

527.123 Since none of the new roads planned within the disturbed area will be retained for an approved postmining land use this section does not apply.

527.130 Since all roads within the disturbed area have been classified as primary this section does not apply.

527.200 A detailed design and description for each road, and conveyor to be constructed used, and maintained within the proposed permit area is included in Appendix 5-4. The roads are show on Plate 5-2.

527.210 The specifications for each road width, road gradient,

road surface, road cut, fills, embankments culverts, drainage ditches and drainage structures are shown on Plate 5-2 and in Appendixes 5-4 and 7-4.

527.220 Since no alteration or relocation of natural drainage ways is anticipated this section is not applicable.

527.230 Roads shall be maintained in manner that allows them to meet their design standards throughout their use.

527.240 If any of the roads on the disturbed area is damaged by a catastrophic event, the road will be repaired as soon as practical after the damage has occurred.

527.250 Steep cut slopes or requests for alternative specifications are not anticipated at this time therefore this section does not apply.

528. Handling and Disposal of Coal, Overburden, etc:

A narrative explaining the construction modifications, use, maintenance and removal of coal, overburden, excess spoil and coal mine waste.

528.100 Coal will be mined using continuous miners and longwall equipment. The coal will be transported from the face and deposited on the underground mine belts using shuttle cars or continuous haulage equipment. The coal will be transported by a series of conveyor belts from the section to the run of mine stockpile. The coal will be removed from the run of mine stockpile by a reclaim belt to an enclosed crusher. Once crushed the coal will be conveyed to a storage bin from which it will loaded in to coal haul trucks for transportation to a unit train loadout.

528.200 Overburden: Lila Canyon is an underground operation and it is not anticipated that any material that overlays the coal seam, consolidated, or unconsolidated, other than topsoil, will be disturbed. Therefore, this section does not apply.

528.300 Spoil, coal processing waste, mine development waste, and noncoal waste removal, handling, storage, transportation, and disposal areas and structures are discussed below.

528.310 Excess Spoil: Since Lila Canyon is an underground operation it is not anticipated than any spoil will be

generated. Therefore this section does not apply.

528.320 Coal Mine Waste: Coal processing waste and underground development waste brought to the surface, will be placed in disposal areas within the permit area which are approved by the Division for this purpose. Rock removed from the access slopes will be placed in the refuse pile area. Portions of this material, not containing coal, will be used as structural fill for the shop/warehouse. The areas for the rock slope material and for underground development waste are adjacent and conjoining and will be treated as one area or structure. The refuse pile is shown on Plate 5-2 and in Appendix 5-7.

528.321 Coal processing waste produced from the crusher will not be returned to any abandoned underground workings. Any and all of the coal processing waste from the crusher will be deposited in the refuse pile shown on plate 5-2 and in Appendix 5-7.

528.322 Refuse Piles. Each pile will meet the requirements of MSHA, 30 CFR 77.214 and 30 CFR 77.215, meet the design criteria of R645-301-210, R645-301-512.230, R645-301-513.400, R645-301-514.200, R645-301-515.200, R645-301-528.320, R645-301-536 through R645-301-536.200, R645-301-536.500, R645-301-536.900, R645-301-542.730, R645-301-553.250, R645-301-746.100, R645-301-746.200, and any other applicable requirements.

528.323 Burning and Burned Waste Utilization.

528.323.1. Coal mine waste fires will be extinguished by the person who conducts coal mining and reclamation operations, in accordance with a plan approved by the Division and MSHA. The plan will contain, at a minimum, provisions to ensure that only those persons authorized by the operator, and who have an understanding of the procedures to be used, will be involved in

the extinguishing operations. The coal mine waste fire plan can be found in Appendix 5-3.

528.323.2. No burning or burned coal mine waste will be removed from the permitted disposal area.

528.330 Noncoal Mine Waste.

528.331 Noncoal mine wastes including, but not limited to, grease, lubricants, paints, flammable liquids, garbage, abandoned mining machinery, lumber and other combustible materials generated during mining activities will be placed and stored in a controlled manner in a designated portion of the permit area. The noncoal mine waste will be placed in dumpsters and emptied on a as needed basis. The designated noncoal waste area is shown on Plate 5-2.

528.332 It is anticipated that final disposal of noncoal mine wastes will be at the ECDC facility near East Carbon City. Concrete will be disposed of in a specified area, refer to Plate 5-6 for this location. The disposal site will be located under the reclaimed coal stockpile. This area will receive the maximum fill during reclamation. Placement of this fill around the concrete will help to eliminate runoff. This will ensure that leachate and drainage does not degrade surface or underground water. The noncoal mine waste will be placed in dumpsters and emptied on a as needed basis.

528.333 The noncoal mine waste will be disposed of at the ECDC facility near East Carbon City.

528.334 Notwithstanding any other provision to the R645 Rules, any noncoal mine waste defined as "hazardous" under 3001 of the Resource Conservation and Recovery Act (RCRA) (Pub. L. 94-580, as amended) and 40 CFR Part 261 will

be handled in accordance with the requirements of Subtitle C of RCRA and any implementing regulations.

528.340 A description of the disposal methods for placing underground waste and excess spoil generated at surface areas according to R645-301-211, R645-301-212, R645-301-412.300, R645-301-512.210, R645-301-512.220, R645-301-514.100, R645-301-528.310, R645-301-535.100 through R645-301-535.130, R645-301-535.300 through R645-301-535.500, R645-536.300, R645-301-536.600, R645-301-542.720, R645-301-553.240, R645-301-745.100, R645-301-745.300, and R645-301-745.400 is covered in sections 535, and 536.

528.350 A description of measures to be employed to ensure that all debris, acid-forming and toxic-forming materials, and materials constituting a fire hazard are disposed of in accordance with R645-301-528.330, R645-301-537.200, R645-301-542.740, R645-301-553.100 through R645-301-553.600, R645-301-553.900, and R645-301-747 is included.

528.400 Dams, embankments and other impoundments. See Section 700 and Appendix 7-4.

529. Management of Mine Openings:

The permit application includes a description of the measures to be used to seal or manage the openings within the proposed permit area. New slope or drift openings required to be sealed shall be sealed with solid, substantial, noncombustible material for a distance of at least 25 feet into such openings. The closure design for portals, slopes, and drifts, can be found in Appendix 5-6.

529.100 Shafts or other exposed underground opening when no longer in use will be cased, lined, or otherwise managed as approved by the Division. All openings exposed by mining operations within the permit area will be permanently closed unless approved for water monitoring.

529.200 For the purposes of Underground Coal Mining and Reclamation Activities:

529.210 Mine entries which are temporarily inactive, but have a further projected useful service under the approved permit application, will be protected by barricades or other covering devices, fenced, and posted with signs, to prevent access into the entry and to identify the hazardous nature of the opening. These devices will be periodically inspected and maintained in good operating condition by the person who conducts the activity.

529.220 Since no portals are projected to return underground development waste, coal processing waste or water to the mine, this section does not apply. There is no current need to return any waste to the underground workings.

529.300 Section 529 does not apply to holes drilled and used for blasting.

529.400 No openings have been identified for use to return coal processing waste to underground workings. Therefore this section is not applicable.

530. Operational Design Criteria and Plans.

531. General plans for the sediment pond and refuse pile are found within this section.

532. Sediment control measures can be found in Chapter 7.

532.100 The smallest practicable area will be disturbed during the life of the project. Progressive backfilling, grading, and prompt revegetation of applicable will be completed as per R645-301-353.200.

532.200 Backfilled material will be stabilized to promote a reduction of the rate and volume of runoff in accordance with R645-301-537.200, R645-301-552 through R645-301-553.230, R645-301-553.260 through R645-301-553.420, R645-301-553.600, and R645-301-553.900.

533. Impoundments.

533.100 Since no impoundments meeting the criteria of 30 CFR 77.216(a) this section does not apply.

533.200 The only impoundment planed for this site is the sediment pond. The sediment pond is a temporary structure. A detailed design for the Sediment ponds can be found in Appendix 7-4, Section 3.1 and on Plate 7-6.

533.210 The sediment pond will be incised, except for the dam/road embankment. This embankment will be reconstructed and compacted to at least 95%. A detailed design for the Sediment ponds can be found in Appendix 7-4, Section 3.1 and on Plate 7-6.

533.220 Where fill is to be placed, natural ground shall be removed 12" below the structure. A detailed design for the Sediment ponds can be found in Appendix 7-4, Section 3.1 and on Plate 7-6.

533.300 Rip-rap or other protection (culverts, concrete) will be placed at all inlets and outlets to prevent scouring. A detailed design for the Sediment ponds can be found in Appendix 7-4, Section 3.1. Also see Plate 7-6.

533.400 External slopes of the impoundment will be planted with an approved seed mix to help prevent erosion and promote stability. A detailed design for the Sediment ponds can be found in Appendix 7-4, Section 3.1. A detailed design for the Sediment ponds can be found in Appendix 7-4, Section 3.1 and on Plate 7-6.

533.500 This section does not apply, there are no vertical highwalls associated with this impoundment.

533.600 Since no impoundments are planned that meet the criteria of MSHA, 30 CFR 77.216(a) this section does not apply.

533.700 Design and construction requirements, as well as operation and maintenance requirements are detailed in

Appendix 7-4, Section 3.1.

534. Roads. The designs for surface roads can be found in Appendix 5-4.

534.100 The roads have been designed, located, constructed and will be maintained to:

534.110 The roads have been designed, located, constructed and will be maintained to prevent or control damage to public or private property.

534.120 Nonacid or nontoxic-forming substances will be used in road surfacing.

534.130 The designs for the roads can be found in Appendix 5-4.

534.140 The reclamation plan for the roads can be found in section 542.600.

534.150 The roads have been designed to prevent or control erosion, siltation and air pollution.

534.200 Appropriate limits for grade, width, and surface materials have been used in the design of the roads.

534.300 Primary Roads. Primary roads will meet the requirements of R645-301-358, R645-301-527.100, R645-301-527.230, R645-301-534.100, R645-301-534.200, R645-301-542.600, R645-301-542.600, and R645-301-762, any necessary design criteria established by the Division, and the following requirements. Primary roads will:

534.310 The roads will be located insofar as practical, on the most stable available surfaces.

534.320 The roads will be surfaced with rock, crushed gravel, asphalt, or other material approved by the Division as being sufficiently durable for the anticipated volume of traffic and the weight and speed of vehicles using the road;

534.330 The roads will be routinely maintained to include repairs

to the road surface, blading, filling potholes and adding replacement gravel or asphalt. It will also include revegtating, brush removal, and minor reconstruction of road segments as necessary.

534.340 Culverts if required will be designed, installed, and maintained to sustain the vertical soil pressure, the passive resistance of the foundation, and the weight of vehicles using the road.

535. Spoil: It is anticipated that no spoil will be produced at the Lila Canyon Mine therefore this section is not applicable.

536. Coal Mine Waste: The proposed Lila Canyon Mine will produce 2 separate types of coal mine waste:

1. Normal coal processing waste or refuse and;
2. Underground development waste.

Disposal of each of the 2 types of coal mine waste will be the same and both type will be deposited in the refuse storage area shown on plate 5-2.

The rock slope material / underground development waste will be examined and tested as necessary to determine acid- or toxic-forming potential.

Coal Processing waste and any underground development waste containing too much coal to leave underground, will be disposed of in the refuse storage area as described further in this chapter and in Appendix 5-7.

It is not anticipated that any underground waste other than the rock slope material / underground development waste will be brought to the surface. Coal processing waste and underground development waste brought to the surface will be placed in a controlled manner and have a design certifications describe under R645-301-512 if appropriate.

536.100 The refuse pile has been designed using current prudent engineering practices and will meet design criteria established by the Division. See Appendix 5-7.

536.110 The refuse pile will be designed to attain a minimum long-term slope stability safety factor of 1.5. See Appendix 5-7.

536.120 The refuse pile will be constructed on natural ground once the topsoil has been removed according to section 230.232. There are no underground mine workings in the immediate area of the refuse pile. All mine workings are found at a higher elevation than the refuse pile.

536.200 Underground development waste brought to the surface and coal processing waste deposited in the refuse pile will be deposited according to the plan described in Appendix 5-7.

536.210 Refuse Pile construction described in Appendix 5-7, will ensure mass stability and prevent mass movement during and after construction;

536.220 Refuse Pile construction per the plan in Appendix 5-7 will not create a public hazard; and

536.230 Will prevent combustion.

536.300 Since no spoil fills will be generated this section does not apply.

536.400 Since there will not be any impounding structures constructed of coal mine waste this section does not apply.

536.500 As discussed in Section 536 and 536.300, it is proposed to dispose of the rock slope material / underground development waste within the refuse disposal area as structural fill as shown on Plate 5-2.

536.510 It is not anticipated that coal mine waste will be disposed of in any area off the permit area. Therefore this section does not apply.

536.520 It is not anticipated that coal mine waste will be disposed of in any area off the permit area. Therefore this section does not apply.

536.600 In areas where slope rock or coal processing waste is

deposited, the topsoil will be removed and stored in the topsoil stockpile area until reclamation.

536.700 It is not anticipated that coal processing waste will be returned to abandoned underground workings therefore this section does not apply

536.800 Since no coal processing waste banks, dams, or embankments are planned for the Lila Canyon Mine therefore, this section does not apply.

536.900 Refuse Piles. (See Appendix 5-7) The refuse pile is designed to meet the requirements of R645-301-210, R645-301-512.230, R645-301-513.400, R645-301-514.200, R645-301-515.200, R645-301-528.322, R645-301-528.320, R645-301-536 through R645-301-536.200, R645-301-536.500, R645-301-536.900, R645-301-542.730, R645-301-553.250, R645-301-746.100 through R645-301-746.200, and the requirements of MSHA, 30 CFR 77.214 and 30 CFR 77.215.

537. Regraded Slopes.

537.100 Each application will contain a report of appropriate geotechnical analysis, where approval of the Division is required for alternative specifications or for steep cut slopes under R645-301-358, R645-301-512.250, R645-301-527.100, R645-301-527.230, R645-301-534.100, R645-301-534.200, R645-301-534.300, R645-301-542.600, R645-301-742.410, R645-301-742.420, R645-301-752.200, and R645-301-762.

537.200 Some low areas will be filled with Rock slope material / underground development waste. See Plate 5-2. The area will be covered with material and re-seeded as per chapters 2, and 7, and section 540.

537.210 The slope rock material will be treated as underground development waste.

537.220 The slope rock material will not be located so as to be detrimental to the environment, to the health and safety of the public, or to the approved postmining land use.

537.230 Since the refuse pile will be totally incised it will be inherently stable.

537.240 The surface of the underground development waste piles will be vegetated according to section 356 and section 357, and surface runoff will be controlled in accordance with section 742.300.

537.250 The refuse pile will be reclaimed according to section 553.250. The slope rock material used in the pads will be left in place and reclaimed according to section 540.

540. Reclamation Plan.

541. General.

541.100. The operator is committed to performing all reclamation as in accordance with R645 rules.

541.200. N/A. The operator is not involved in surface mining activities.

541.300. The operator is committed to the removal of all equipment facilities and structures upon cessation of mining activities.

541.400. The operator will address all reclamation activities as referenced in Chapter 5 of this document.

542 Narratives, Maps and Plans.

542.100. See Table 3-3 time table based on project reserves markets and life of mine.

542.200. The surface facility area comprises approximately 42.6 acres within the disturbed area boundary. The actual disturbance, pads, silos, coal processing structures, parking constitute a total of 25.3 acres. The following R645 regulations will give detailed description and reclamation procedures to address these areas of

disturbance.

542.300. Included.

542.310. Included. (See Plates 5-2 & 7-7)

542.320. There will not be any surface facilities left post mining.

542.400. Not applicable. No surface facilities will remain post bond liability period.

542.500. A reclamation time table is included as Table 3-3.

542.600. A small portion of the county road (in the vicinity of the sediment pond culvert) will be left after final reclamation. The county road will allow for access for ranchers, and recreationists conforming with the post mine land use of wildlife, grazing, and incidental recreation.

542.610. The time table of reclamation activities will enable the roads to be removed concurrently with reclamation activities. So, no closures specific to traffic would be anticipated.

542.620. All bridges and culverts will be removed concurrent with reclamation.

542.630. All disturbed areas will be ripped and top soiled prior to revegetation activities in compliance with all applicable R645 regulations. (See Appendix 5-8)

542.640. Road surfacing materials such as sand and gravel, which are not suitable for revegetation establishment will be buried on site and covered with a minimum of two feet of material that would support vegetation. Concrete will be disposed of in the designated area and covered with four feet of cover. Asphalt will be disposed of off site, either in a landfill or sent to a recycling facility.

542.700. Final Abandonment of Mine Openings and Disposal Areas.

542.710. Appendix 5-6 depicts a typical seal that will be constructed at all mine openings.

542.720. No excess spoil is anticipated at this time.

542.730. All coal mine waste will be placed in the waste disposal area as shown on Plate 5-2 and reclaimed in accordance with R645 regulations.

542.740. Disposal of Noncoal Mine Wastes.

542.741. All non coal waste will be temporarily stored on site in approved waste bins and commercially picked up and transported to an approved disposal site. Non Coal waste generated during reclamation (such as concrete structure, buried culverts, utility lines, septic systems etc.) will be buried in the refuse disposal area and covered with a minimum of four feet of fill.

542.742. No noncoal waste will be stored on site or disposed of on site during the life of the mine.

542.800. A detailed cost break down is included in Chapter 8. Appendix 8-1 relative to bonding.

550 Reclamation Design Criteria and Plans. Each permit application will include site specific plans that incorporate the following design criteria for reclamation activities.

551. All underground openings will be sealed as detailed in Appendix 5-6.

552. Permanent Features.

552.100. In course of reclamation, areas that have been recontoured and top soiled will be "pock-marked"

creating small basins that will facilitate vegetation establishment as well as minimizing erosion.

552.200. No permanent impoundments will be left post reclamation.

553. The operator will comply with all regulations applicable to underground mining activities relative to backfilling and grading as required by R645 regulations.

Some minor cut slopes along the reclaimed road may be left after reclamation due to the difficulty and inability to reclaim all material pushed over the side while making the road cut. See plate 5-7B-1 cross section 16+00 for details. UEI will make reasonable efforts to minimize the cut slopes being left.

553.100. Disturbed Areas. Disturbed areas will be backfilled and graded to:

553.110 The operator will obtain a post mining topography similar in form as what existed premining.

553.120 Since Lila Canyon is an underground operation, no spoil piles will be created. Minor highwalls may be created with the development of the rock slope portals. Upon completion of mining these entries will be seal as per Closure for Mine Openings Appendix 5-6 and all highwalls will be eliminated during the reclamation phase of the operation. Plate 5-9 shows the proposed portal plan. During reclamation, suitable material will be placed against the portals. This material will be shaped to eliminate the highwall and to bring the slope back to the approximate original contour.

553.130 All fill slope will have a static safety factor of 1.3 as shown in Appendix 5-5.

553.140 Erosion and water pollution will be minimized on site by the use of drainage control structures (burms, channels and silt fence) and the use of small depression, soil tackifiers, mulch and

sediment pond design. No water is anticipated leaving the reclaimed site prior to adequate treatment in the form of retention and/or filtration that does not meet and/or exceed UPDES standards.

553.150 The post mining land use of wildlife and domestic grazing should be enhanced to some degree with the revegetation of a more desirable seed mix and a vegetative cover in excess of what was present premining.

553.200 Spoil and Waste.

553.210 All underground development waste brought to the surface and coal processing waste generated on the surface as a result of coal processing will be placed in the coal mine waste (refuse) disposal area and reclaimed in accordance with R645 regulations.

553.220 Since no spoil will be produced this section does not apply.

553.221 All vegetation and /or organic material will be removed prior to any coal mine waste being stored.

553.222 All useable topsoil or topsoil substitute will be removed from the structural fill and refuse areas prior to use. Table 2-1 shows estimates of salvageable soil by soil type based on current NRCS soil inventories. The location of the soil storage are shown on Plate 5-2. This material will be spread over the recontoured structural fill and refuse areas prior to seeding and mulching.

553.223 Since no spoil will be produced this section does not apply.

553.230 All recontoured areas will be compacted to minimize slippage. The area will then be over laid with topsoil and ripped. In addition the area will be "pock-marked" to minimize the potential for erosion as well as enhance revegetation establishment. It is not anticipated that soil will be disturbed in areas to steep for equipment to operate.

553.240 The refuse and structural fill areas will have slopes of less than 8% upon final recontouring and revegetated to enhance the post mining land use of grazing and wildlife habitat.

553.250 The refuse pile design is shown in appendix 5-7.

553.260 The operator will commit to all applicable R645 regulations relative to disposal of coal processing waste.

553.300 Any combustible materials or acid and toxic forming materials exposed used or produced during mining will be disposed of in the refuse disposal area and treated as refuse. This material will be covered by four feet of fill. Noncoal waste will be disposed of as described in Section 528.331.

553.400 Cut-and-fill terraces may be allowed by the Division

553.410 No cut and fill terraces will be required.

553.420 No terraces will be required for post mining land use.

553.500-540 and 553.600-553.650.500

The only area that falls under these provisions are the reclaimed Horse Canyon mine which lies in the north west portion of the lease area and is addressed under approved MRP Act #0013 (Part "A").

553.700-553.900

This operation will only involve underground mining and as such the above referenced regulations do not apply.

560. Performance Standards. Coal mining and reclamation operations will be conducted in accordance with the approved permit and requirements of R645-301-510 through R645-301-553.

New Slope Access / Portal Access Road
Main Mine Road

DESIGN

See Appendix 5-4 and Plate 5-2 for additional information:

Main Mine Road Profile
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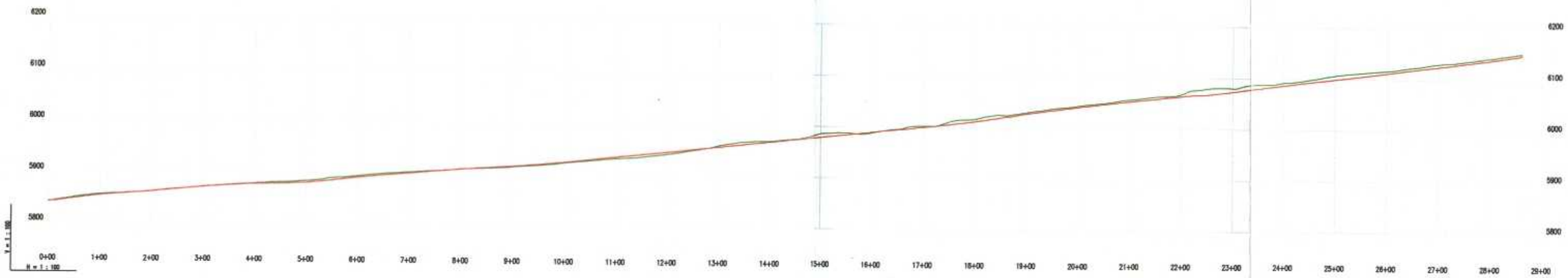
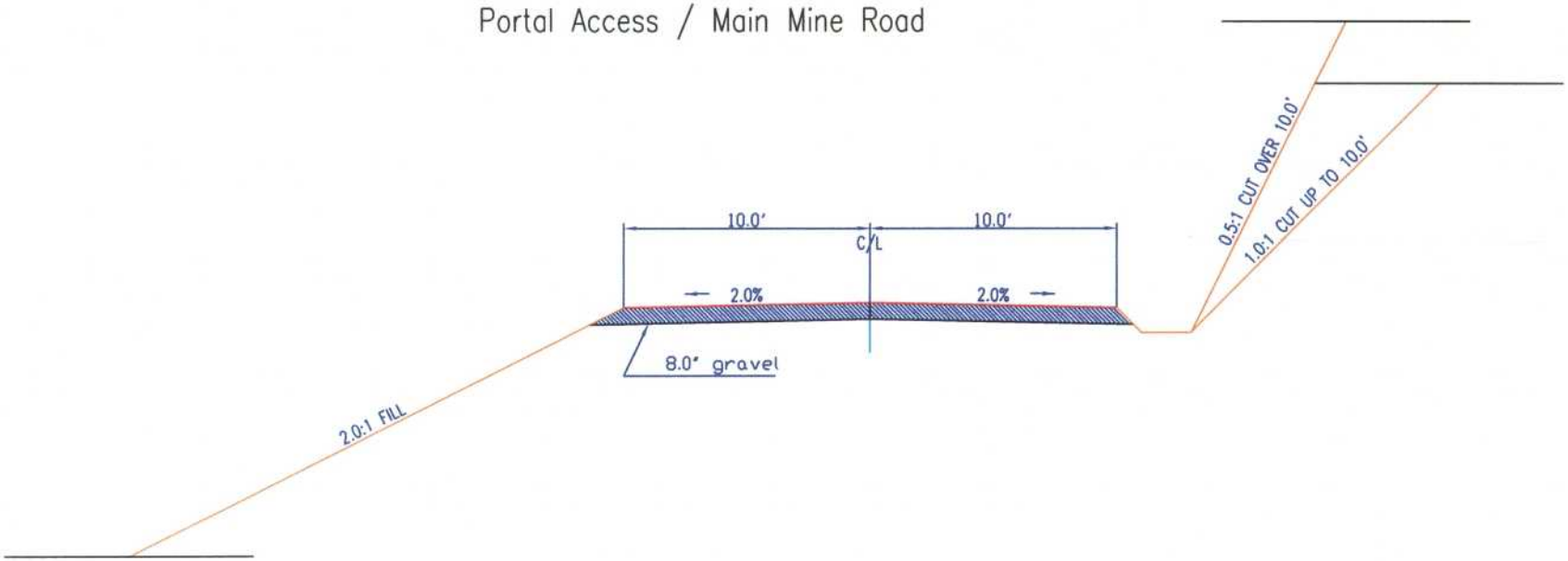
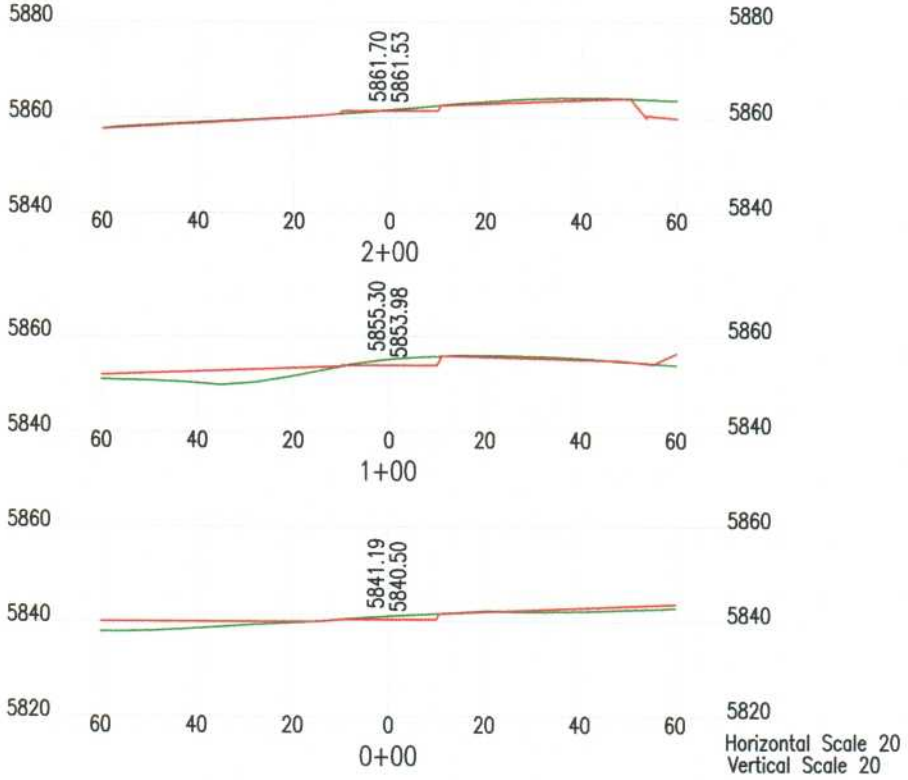


Typical Crossection

Portal Access / Main Mine Road





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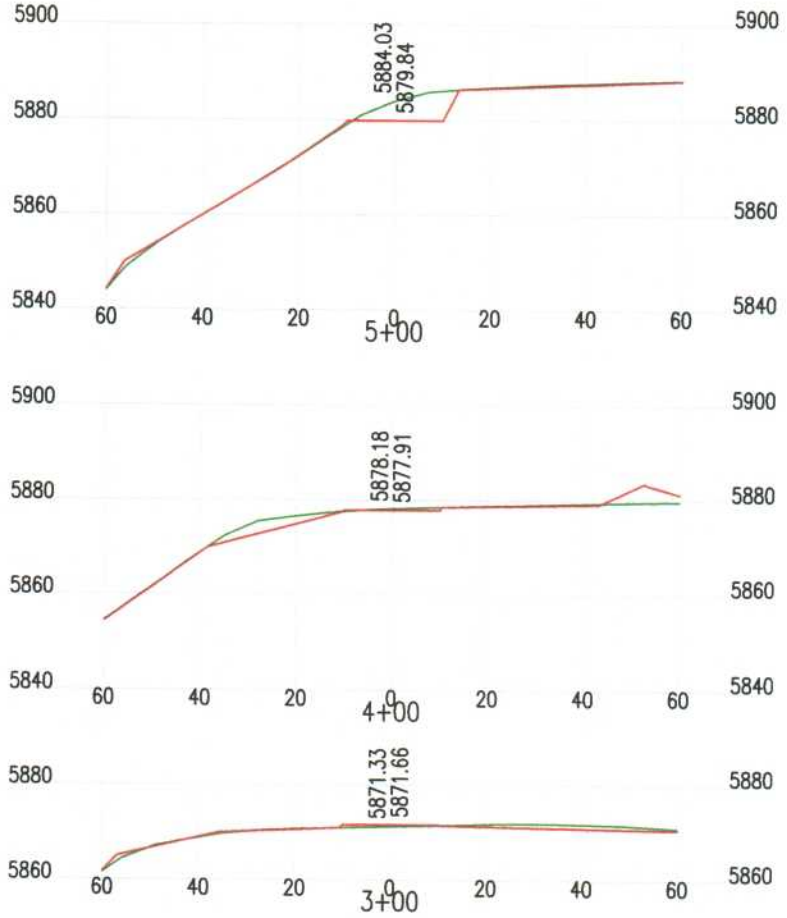

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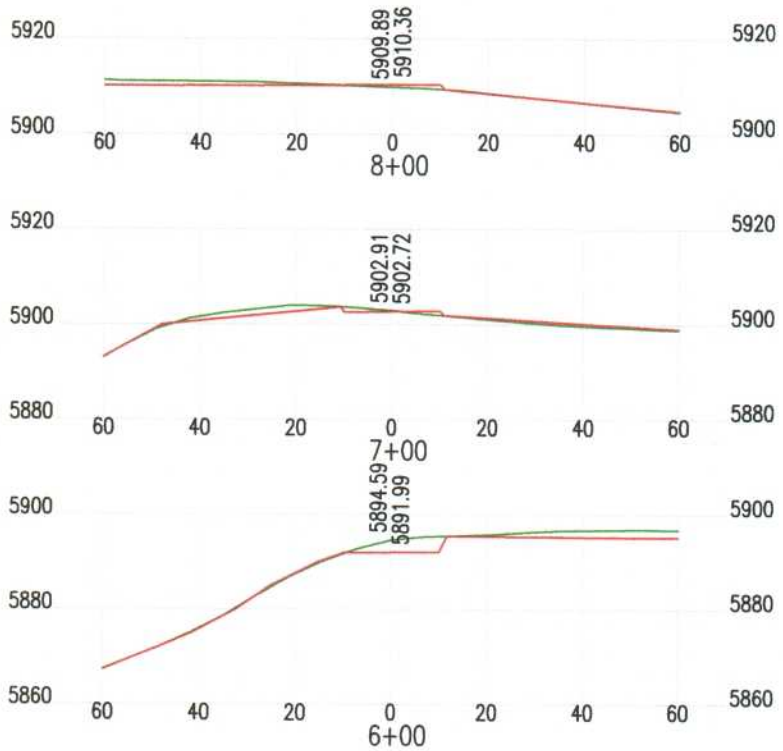

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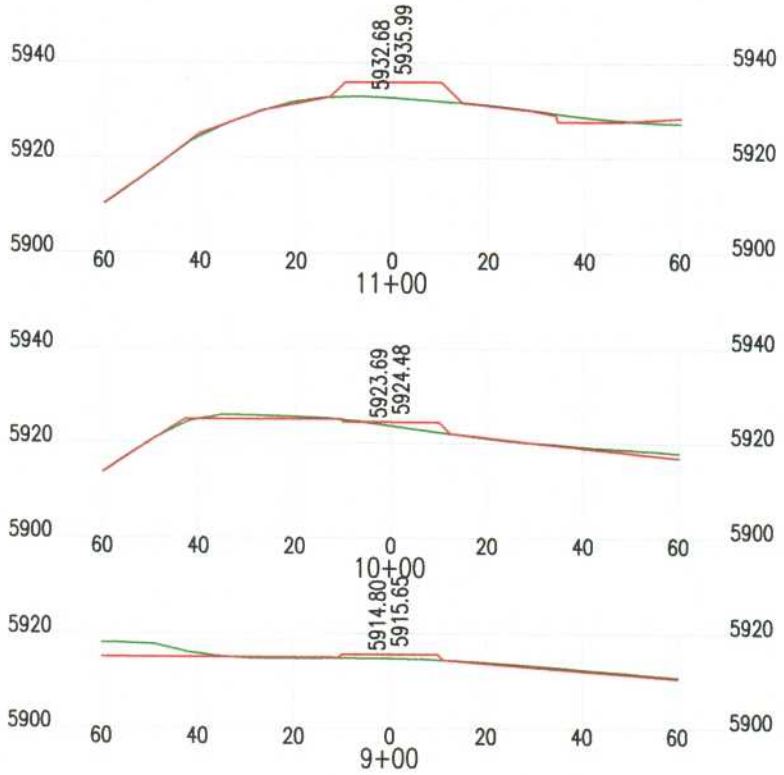

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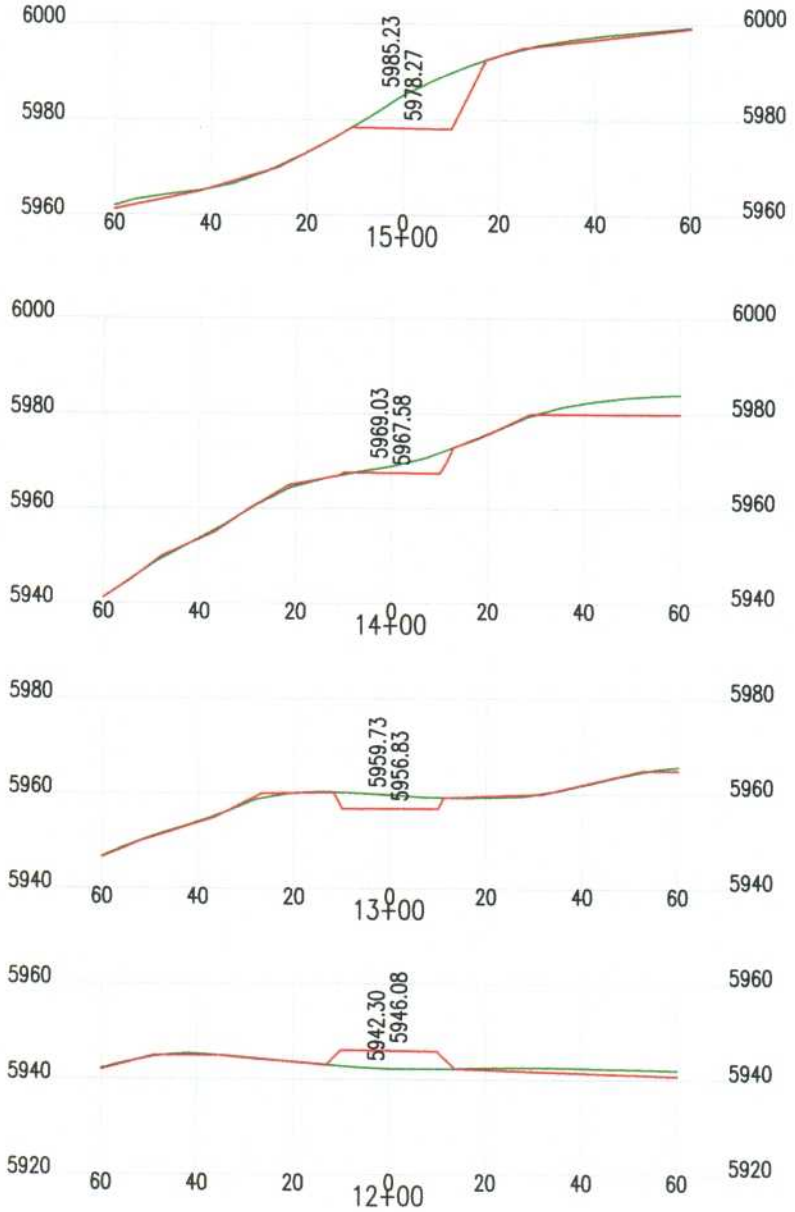

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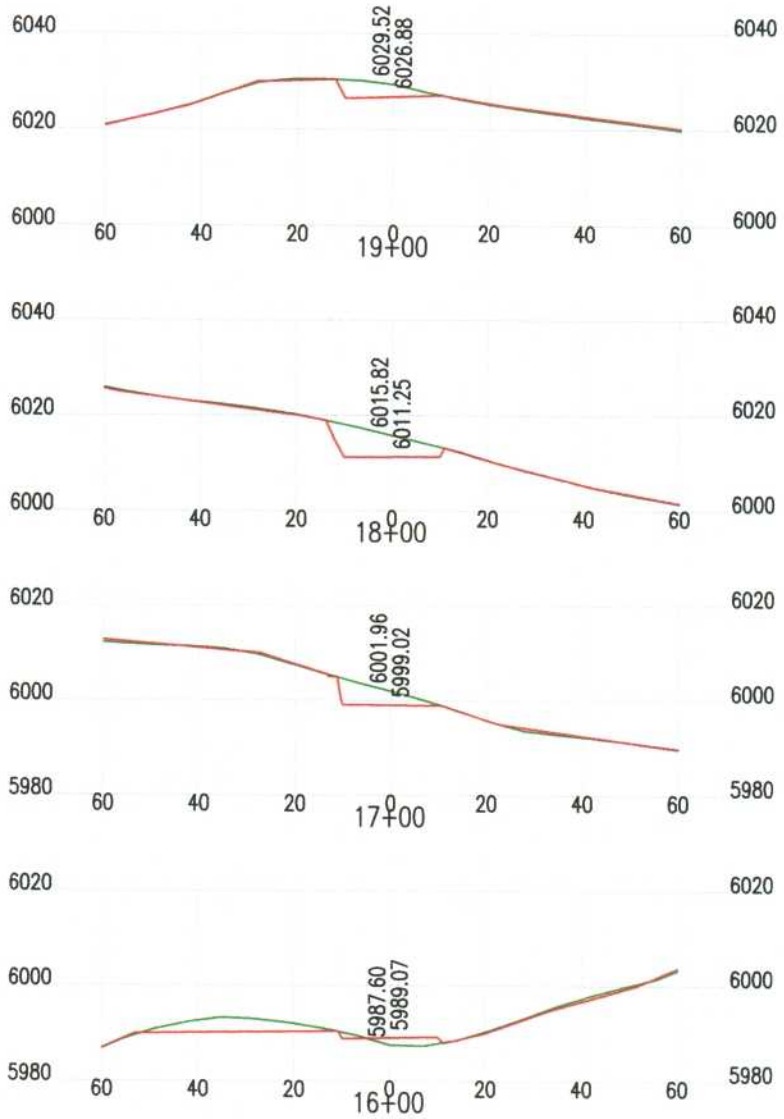

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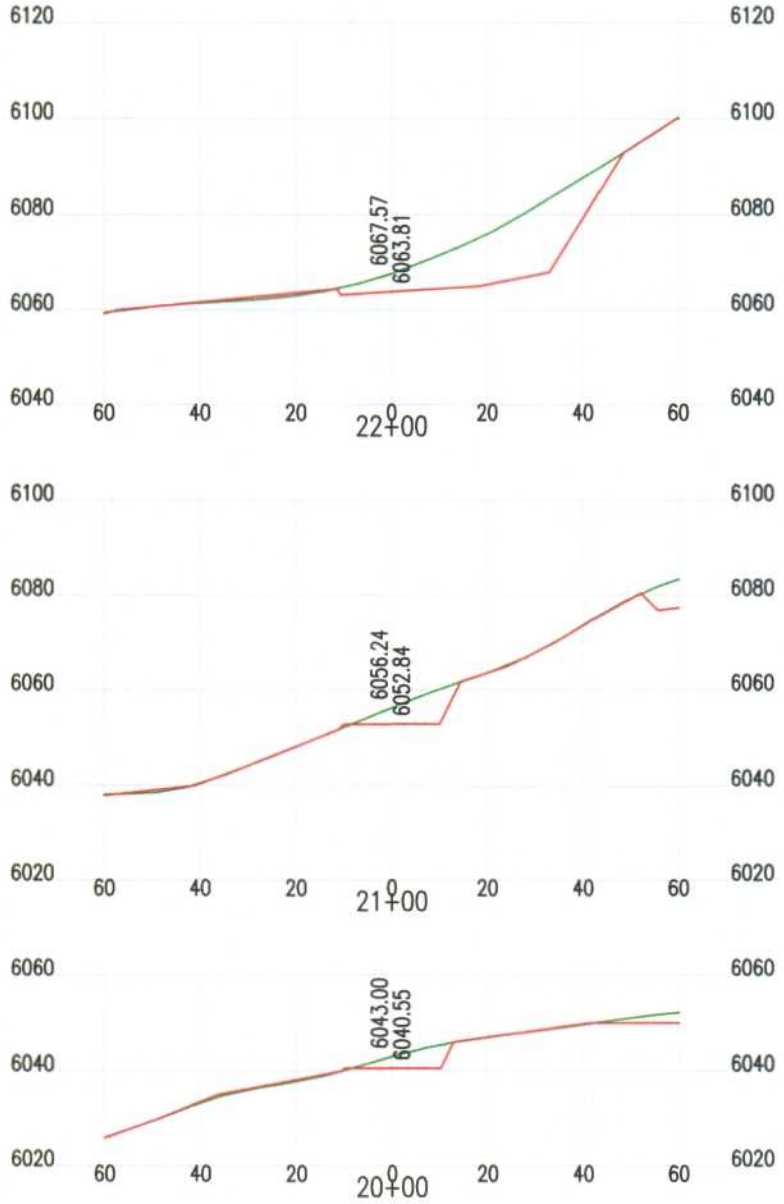
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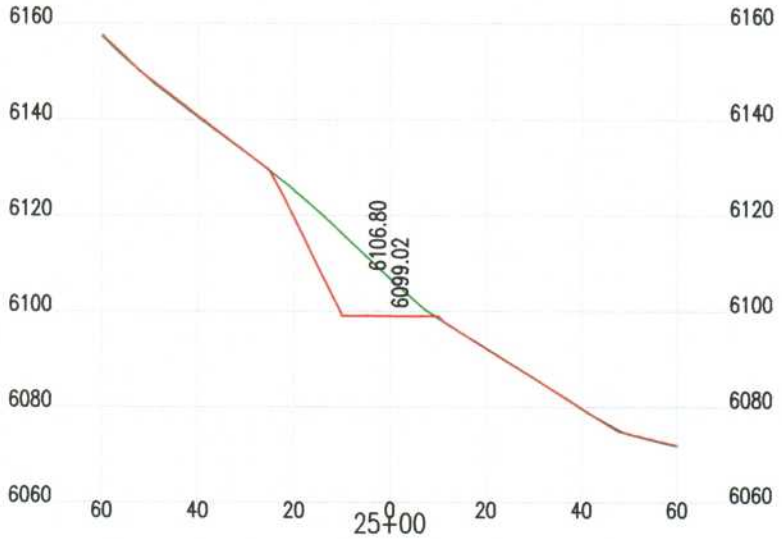
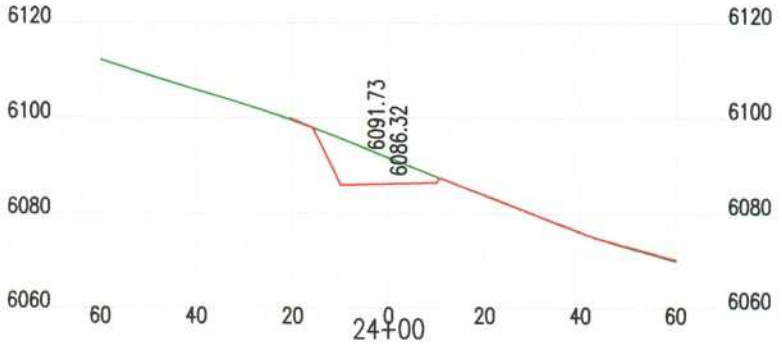
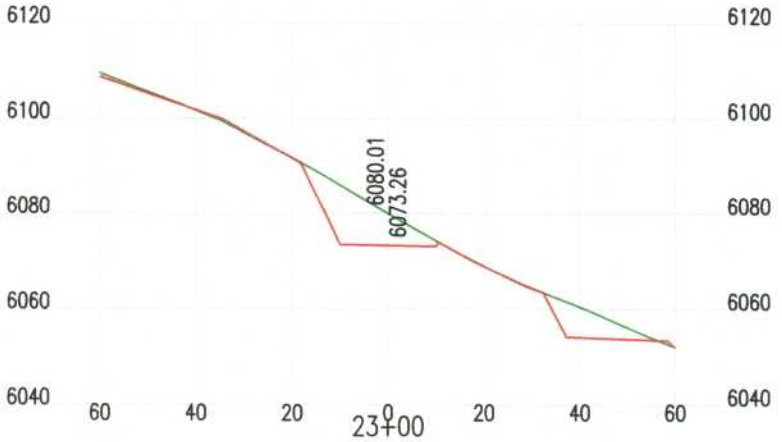
6100
6080
6060
6040
6067.57
6063.81
60
40
20
0
20
40
60
22+00
6100
6080
6060
6040
6020
6056.24
6052.84
21+00
6060
6040
6020
6043.00
6040.55
20+00

Scale 1'=40'







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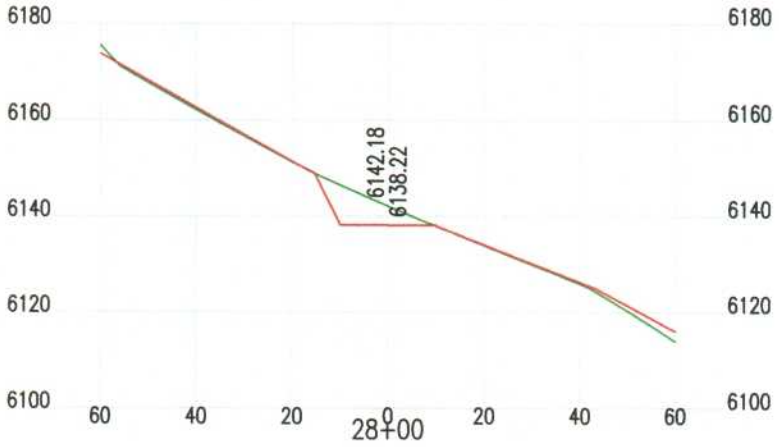
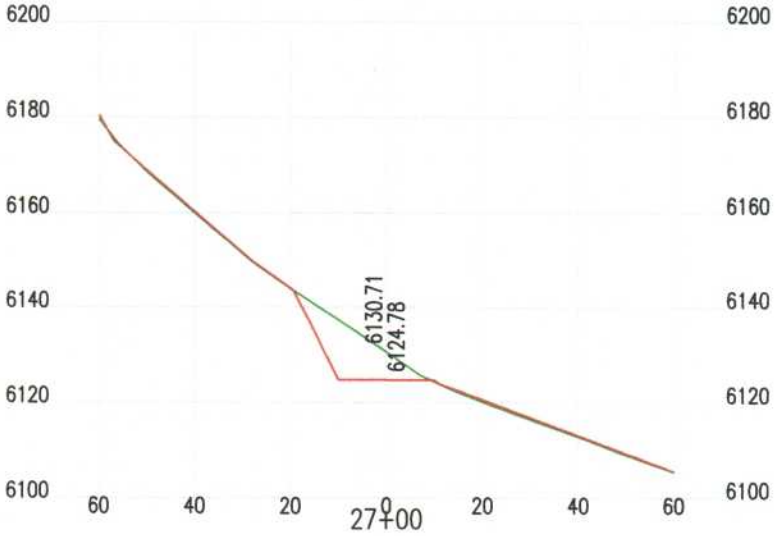

6180
6160
6140
6120
6100
6142.18
6138.22
60
40
20
0
20
40
60
28+00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6180
6160
6140
6120
6100
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6124.78
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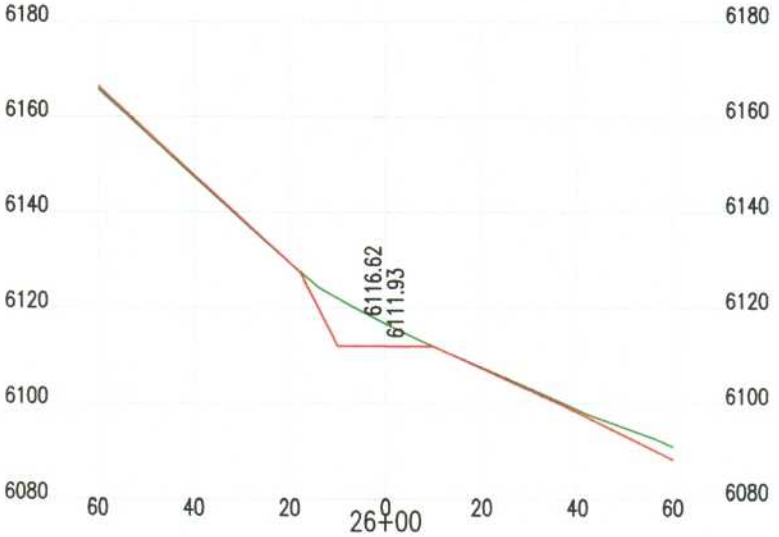
20
0
20
40
60
27+00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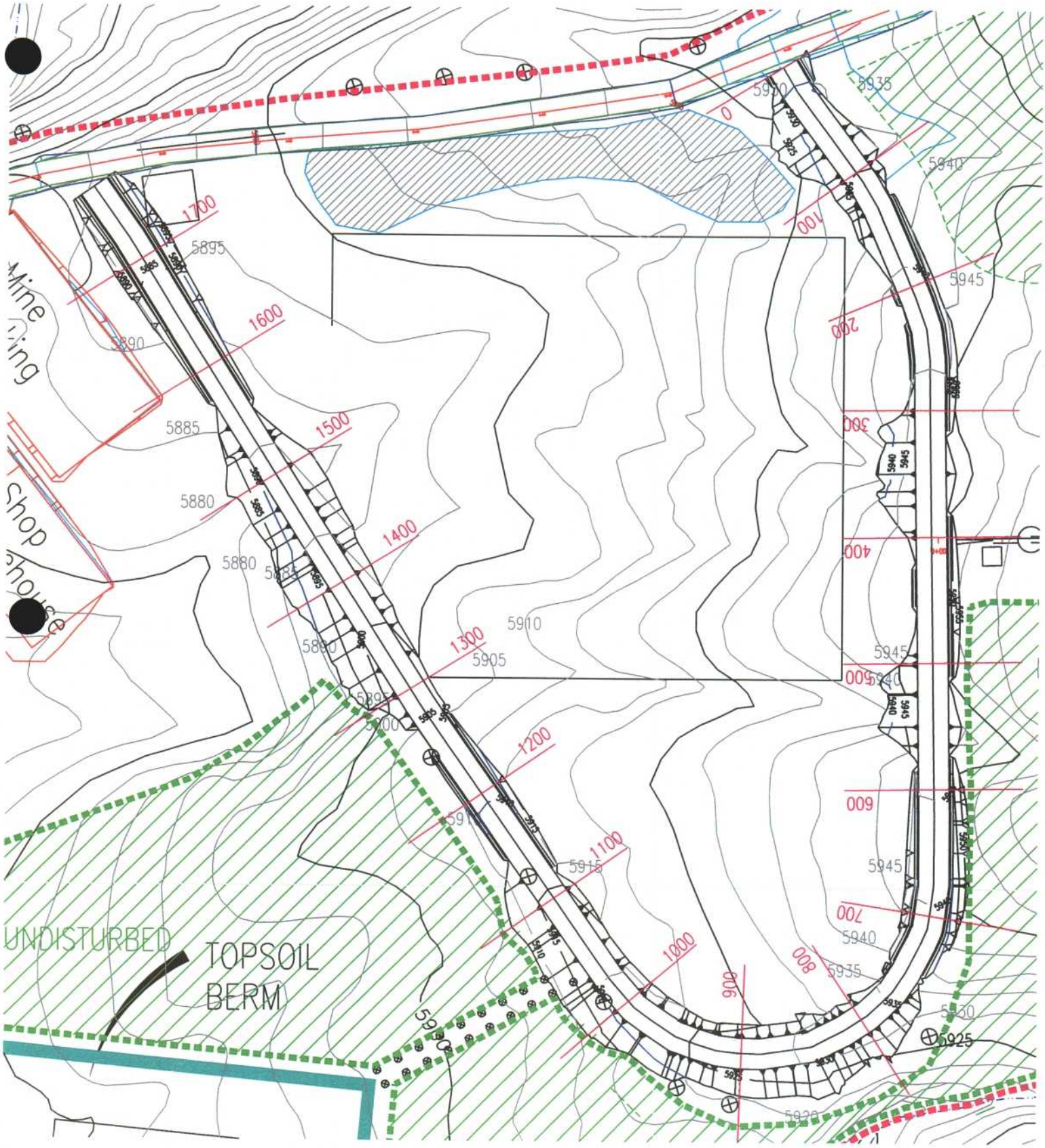
6160
6140
6120
6100
6080
6116.62
6111.93
60
40
20
0
20
40
60
26+00

Scale 1'=40'

Facility Access / Loadout Road

DESIGN

See Appendix 5-4 and Plate 5-2 for additional information:


UNDISTURBED
TOPSOIL
BERM
Mine
Shop
House
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
5895
5890
5885
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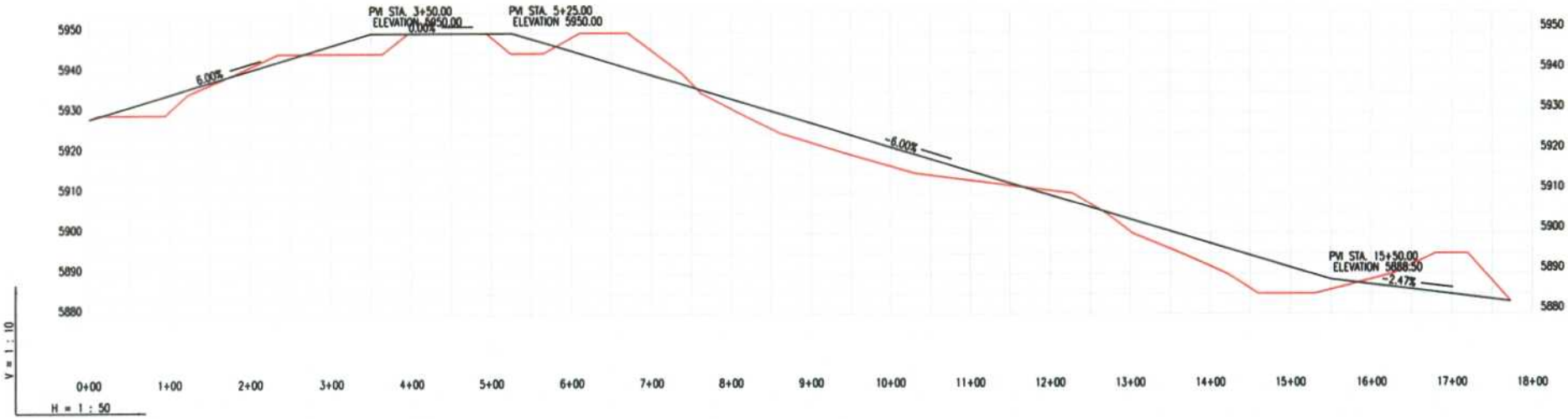
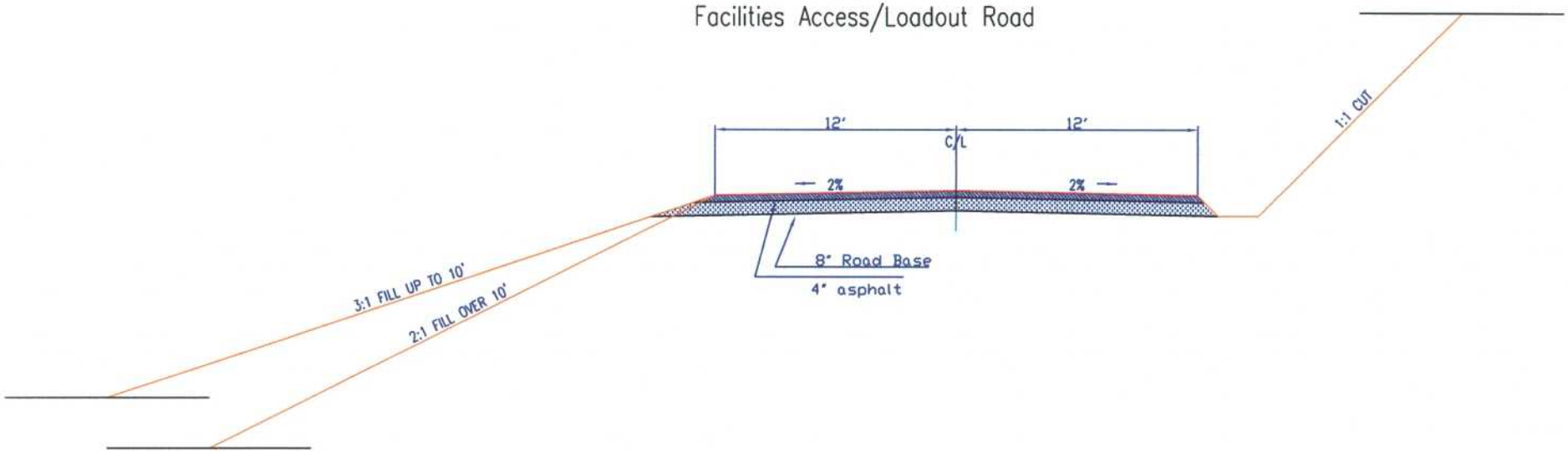
5905
5945
5940
5935
5930
5925
5920

Loadout Road Profile
1"=200'



Typical Crossection

Facilities Access/Loadout Road

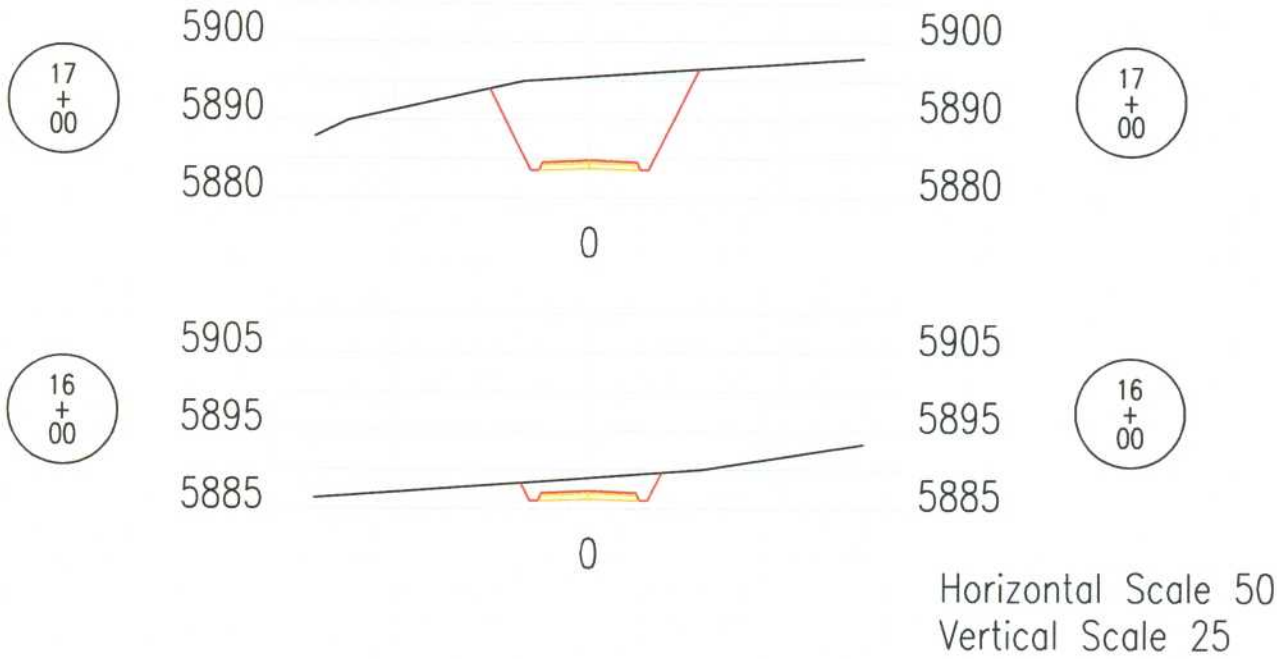


5980
5970
5960
5950
5940
5930
0
3 + 00
5950
5940
5930
0
2 + 00
5940
5930
5920
0
1 + 00
5940
5930
5920
0
0 + 00
Horizontal Scale 50
Vertical Scale 25

Horizontal Scale 50
Vertical Scale 25

Horizontal Scale 50
Vertical Scale 25

Horizontal Scale 50
Vertical Scale 25



Horizontal Scale 50
Vertical Scale 25

Appendix 5-5

Lila Canyon Mine

Safety Factor Analyses
for
Portal Access Road, Sediment Pond and Reclaimed Slope

UTAH REGISTERED
#152606
R. Jay Marshall
11/19/02
PROFESSIONAL ENGINEER

Appendix 5-5
Safety Factor Analyses
for
Portal Access Road, Sediment Pond and Reclaimed Slope

General

The soils information used in these calculations is taken from the data provided by Earthfax Engineering, Inc. for a slope stability analysis of a previously proposed access road. The access road location has been changed, reducing the height and angle of cut and fill slopes; however, the soils data is still representative of the new location. The data was compiled from 3 test pits located on the proposed mine site. (See Table 1) Parameters utilized in this report are based on the "worst-case" soils test for conservancy.

Safety factors in this report were determined by using Geo-Slope Slope/W Version 5 software. The "Spencer's Method" was used within Slope/W. Spencer's method considers both normal and shear inter-slice forces, and satisfies both force and moment equilibrium. Spencer's method is unique in that the ratio of shear to normal inter-slice forces is a constant, and is therefore the same for each slice. The safety factors are calculated using a given set of parameters, including slope height, slope angle, soil density, cohesion and internal friction angles.

The following assumptions are used in these calculations:

(1) The material forming the slope is assumed to be homogeneous;

(2) The sheer strength of the material is characterized by a cohesion (c) and a friction angle ϕ;

(3) Failure is assumed to occur on a circular failure surface which passes through the toe of the slope;

(4) A vertical tension crack is assumed to occur in the upper surface of the face of the slope;

(5) The location of the tension crack and failure surface are such that the factor of safety of the slope is a minimum for the slope geometry and groundwater conditions considered.

Portal Access Road

This road is shown on Plate 5-2, and will provide access from the bathhouse area to the rock slope portals. The road is approximately 1600' in length, with a maximum grade of 12.5%. The road will be constructed using standard cut/fill techniques. Cut slopes are expected to be no steeper than .5 H:1V with a maximum height of 23'. Fill slopes will not be steeper than 2H:1V with a maximum height of 50'.

Mine Facilities Access Road

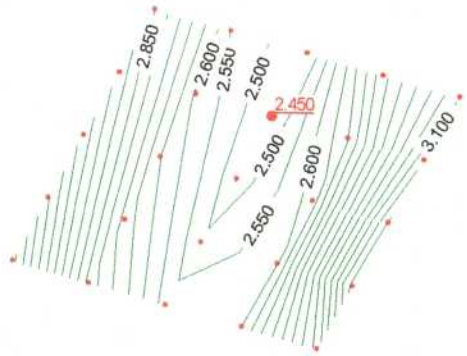
The mine facility road shown on Plate 5-2 begins at the edge of County Road 164 and allows for access to the various surface facilities. The road has been located in the most practical location taking into consideration grade, stability, and alignment. Employees will use this road to access the office & bathhouse facilities. Coal haul trucks will use this road to access the scales and truck loadout. All supplies will be hauled on a short portion of this road from the supply storage area to the slope access road. The road will be constructed using standard cut/fill techniques. Cut slopes are expected to be no steeper than 1H:1V with a maximum height of 5'. Fill slopes will not be steeper than 2H:1V with a maximum height of 5'. The road is relatively flat. Safety factors were not calculated for this road since the most severe conditions are found on the Portal Access Road. Since the Portal Access Road meets or exceeds the minimum safety standard of 1.3 of the Utah Coal Rules, then it should be intuitive that the much flatter mine facility access road will exceed the minimum 1.3 stability standard.

Road Embankment Stability

The following parameters were used for input for the proposed road embankment:

Slope Height	-	50'
Slope Angle	-	26.5° (2H:1V)
Soil Density	-	116 lbs/ft^3
Soil Cohesion	-	220 psf dry / 300psf saturated
Internal Friction Angle	-	41° dry / 24° saturated

The calculated Factor of Safety using the above parameters is 2.45 for dry conditions and 1.63 for saturated conditions. This exceeds the required 1.30 Factor of Safety required by the regulations.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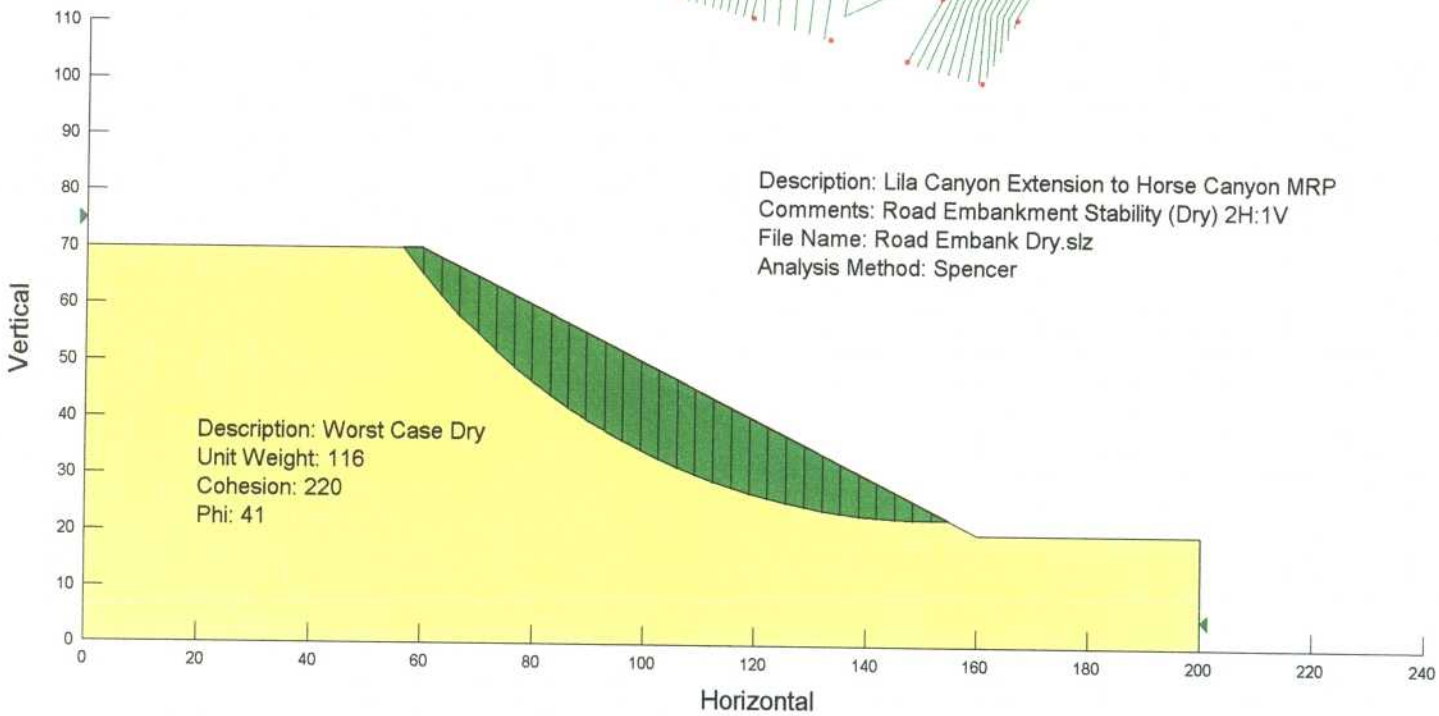
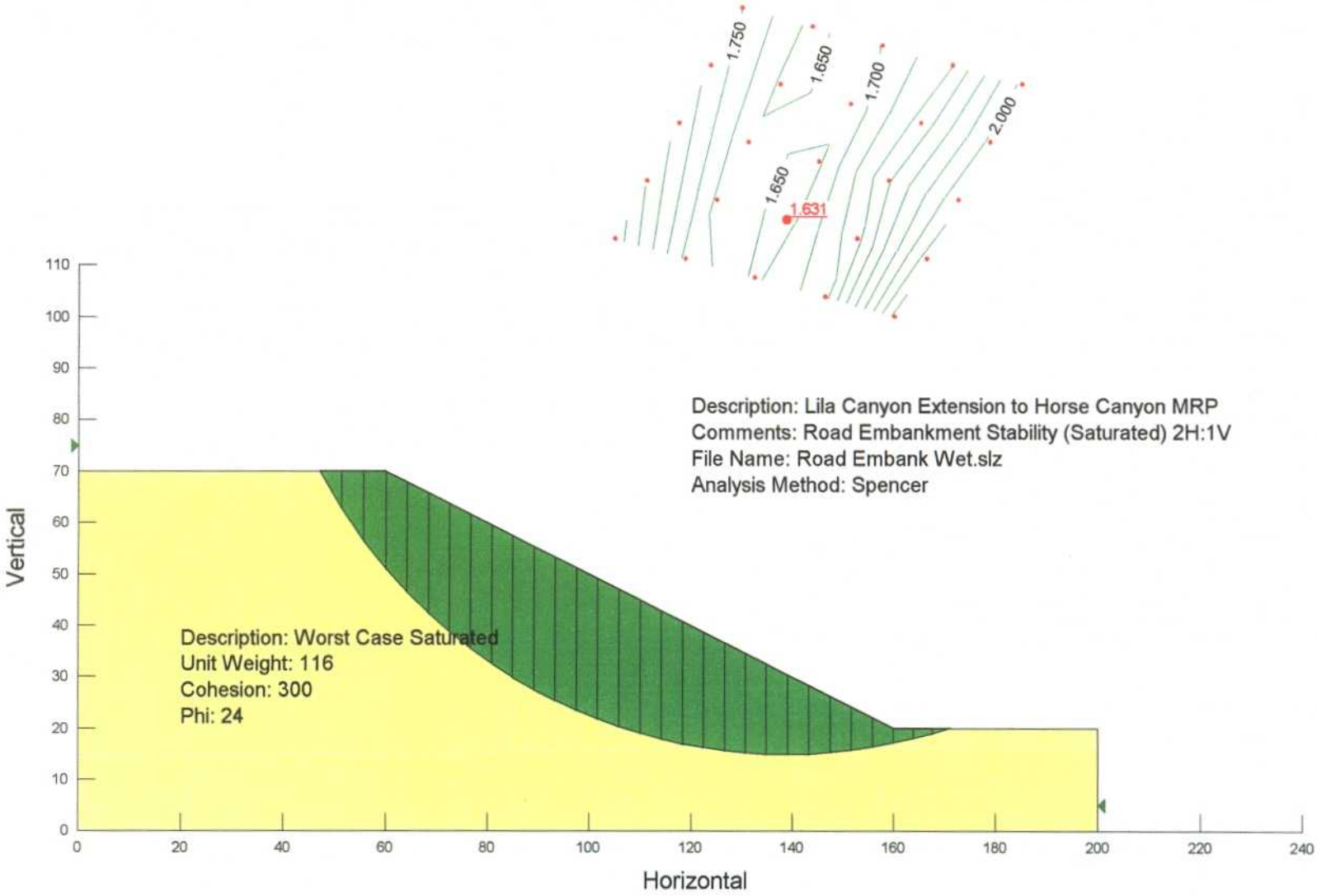
2.550
2.500
2.450
2.500
2.600
2.550
3.100


Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Road Embankment Stability (Dry) 2H:1V
File Name: Road Embank Dry.slz
Analysis Method: Spencer
Description: Worst Case Dry
Unit Weight: 116
Cohesion: 220
Phi: 41
Vertical
Horizontal
0
10
20
30
40
50
60
70
80
90
100
110
0
20
40
60
80
100
120
140
160
180
200
220
240

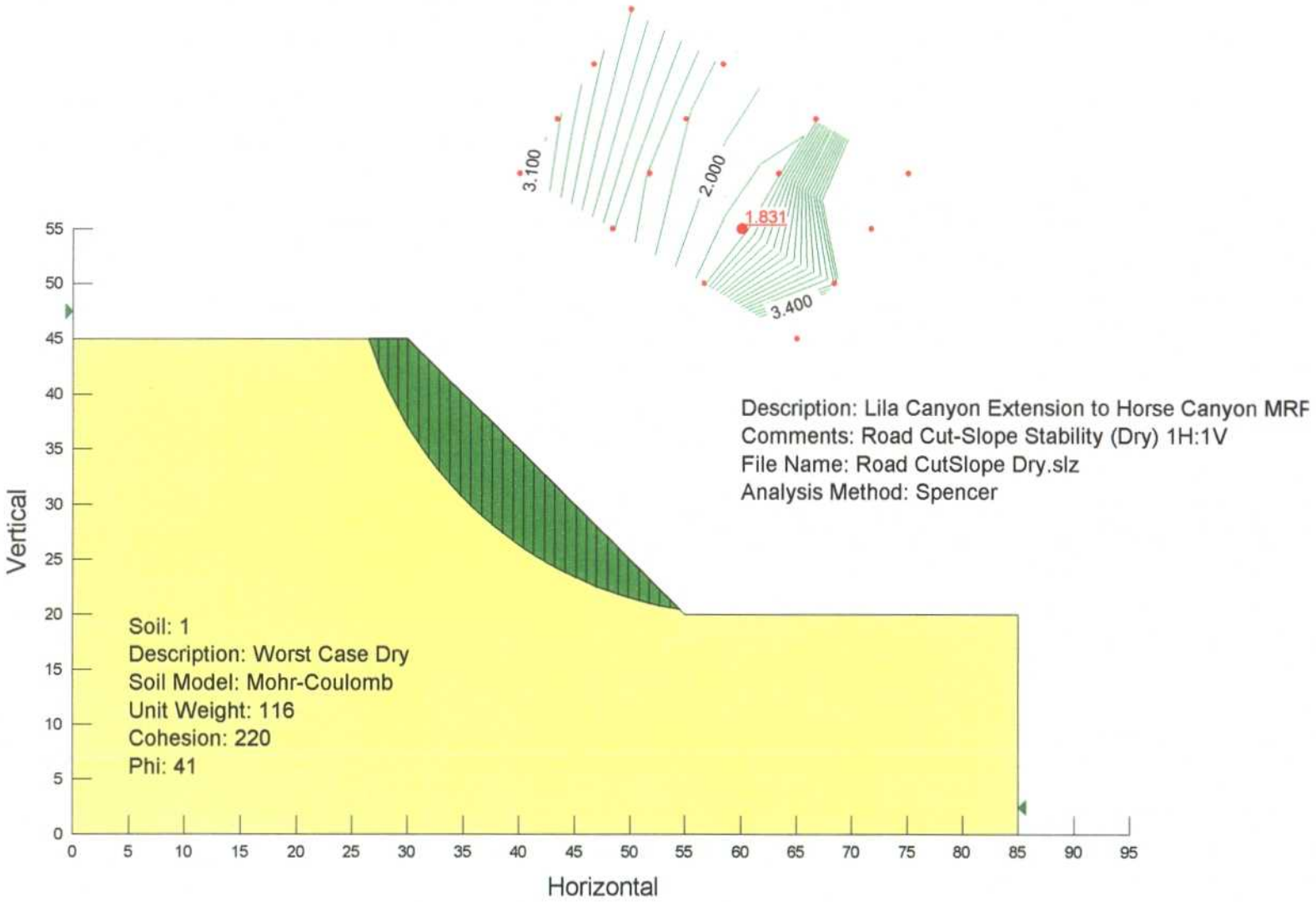

1.750
1.650
1.700
2.000
1.650
1.631
Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Road Embankment Stability (Saturated) 2H:1V
File Name: Road Embank Wet.slz
Analysis Method: Spencer
Description: Worst Case Saturated
Unit Weight: 116
Cohesion: 300
Phi: 24
Vertical
Horizontal
0
10
20
30
40
50
60
70
80
90
100
110
0
20
40
60
80
100
120
140
160
180
200
220
240

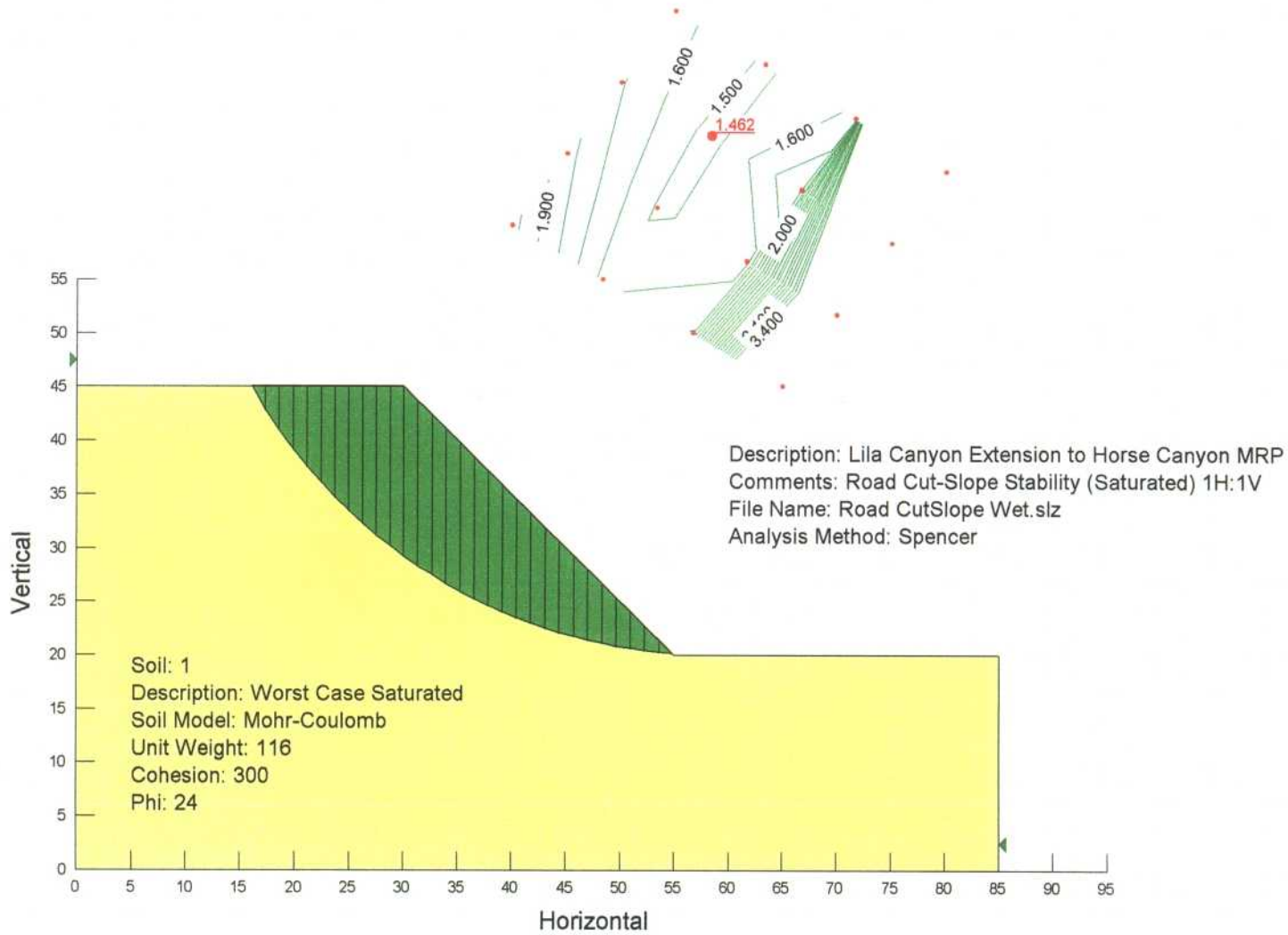
Road Cut-Slope Stability

The following parameters were used for the proposed road cut slopes:

Slope Height	-	23'
Slope Angle	-	45° (1H:1V)
Soil Density	-	116 lbs/ft^3
Soil Cohesion	-	220 psf dry / 300psf saturated
Internal Friction Angle	-	41° dry / 24° saturated

The calculated Factor of Safety for the cut slopes is 1.83 for dry conditions and 1.46 for saturated conditions. This also exceeds the 1.30 requirement of the regulations.


3.100
2.000
1.831
3.400
Description: Lila Canyon Extension to Horse Canyon MRF
Comments: Road Cut-Slope Stability (Dry) 1H:1V
File Name: Road CutSlope Dry.slz
Analysis Method: Spencer
Soil: 1
Description: Worst Case Dry
Soil Model: Mohr-Coulomb
Unit Weight: 116
Cohesion: 220
Phi: 41
Vertical
Horizontal
0 5 10 15 20 25 30 35 40 45 50 55
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95


1.600
1.500
1.462
1.600
1.900
2.000
3.400
Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Road Cut-Slope Stability (Saturated) 1H:1V
File Name: Road CutSlope Wet.slz
Analysis Method: Spencer
Soil: 1
Description: Worst Case Saturated
Soil Model: Mohr-Coulomb
Unit Weight: 116
Cohesion: 300
Phi: 24
Vertical
Horizontal
0 5 10 15 20 25 30 35 40 45 50 55
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95

Sediment Pond Stability

The proposed sediment pond is shown on Plates 5-2, 7-2 and 7-6. The pond will be located in an existing drainage and will therefore be mostly incised into natural ground. The pond dam embankment will also be a reconstructed portion of the county road, with a top width of approximately 25'.

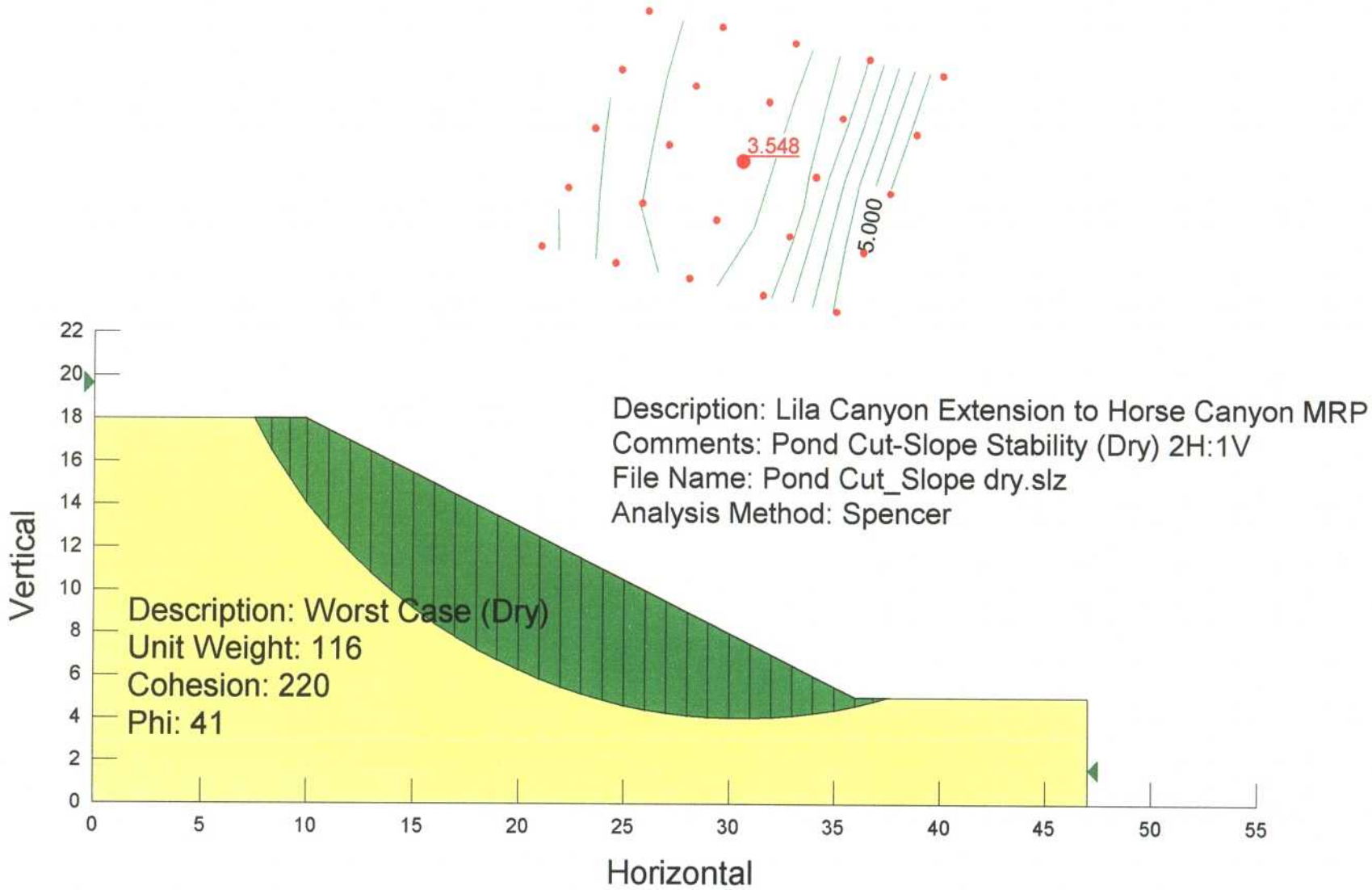
The proposed pond bottom will be a maximum of 13' below the top of the embankment. Slopes within the pond are proposed to be a maximum of 2H:1V for the incised portion and 3H:1V for the embankment. (See Sections C-C' and D-D')

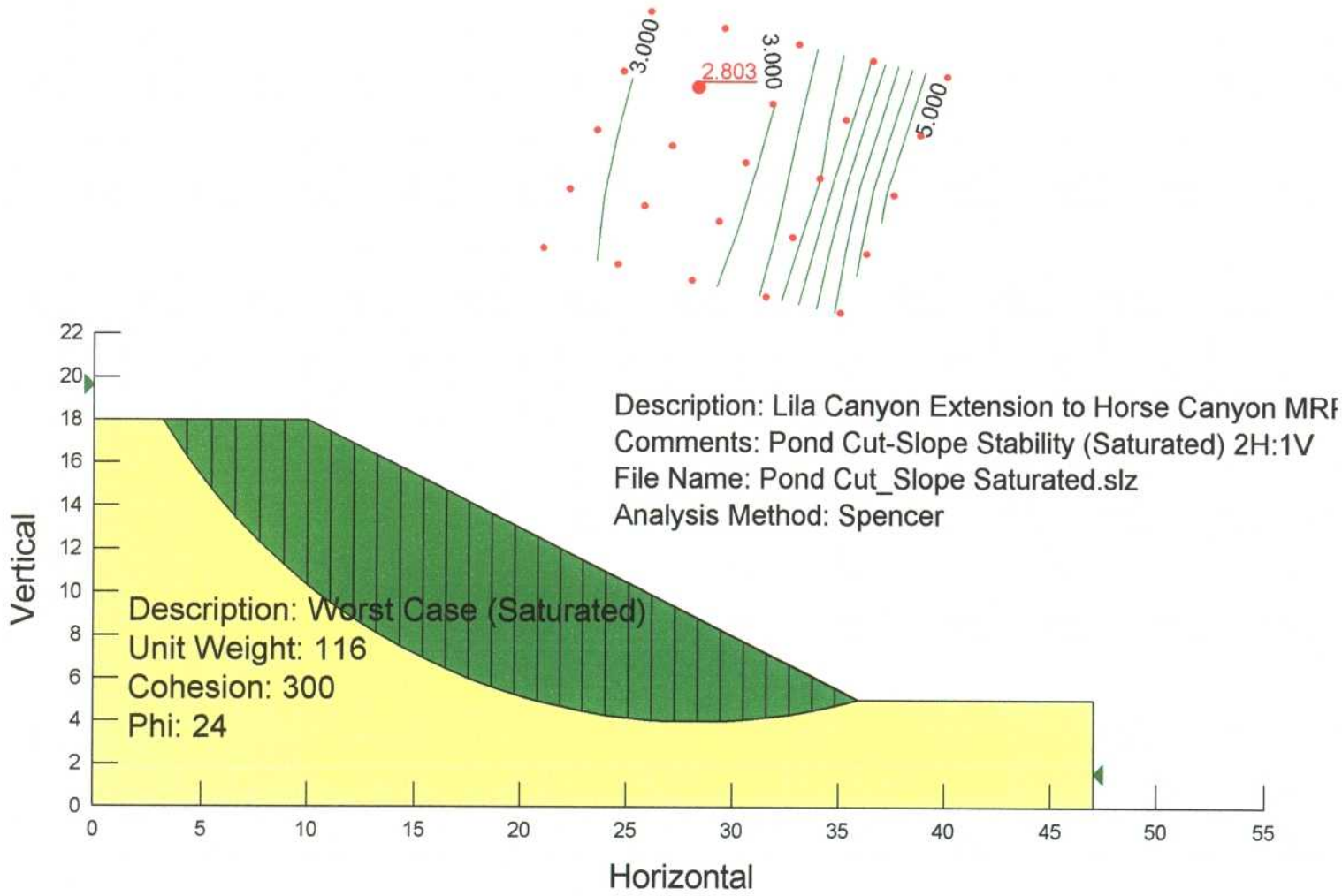
Pond Cut-Slope Stability

The following parameters were used for the proposed pond incised slopes:

Slope Height	-	13'
Slope Angle	-	26.5° (2H:1V)
Soil Density	-	113 lbs/ft^3
Soil Cohesion	-	220 psf dry / 300psf saturated
Internal Friction Angle	-	41° dry / 24° saturated

The calculated Factor of Safety for the pond cut slopes is 3.55 for dry conditions and 2.80 for saturated conditions. This exceeds the 1.30 requirements of the regulations.


3.548
5.000
Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Pond Cut-Slope Stability (Dry) 2H:1V
File Name: Pond Cut_Slope dry.slz
Analysis Method: Spencer
Description: Worst Case (Dry)
Unit Weight: 116
Cohesion: 220
Phi: 41
Vertical
Horizontal
0
2
4
6
8
10
12
14
16
18
20
22
0
5
10
15
20
25
30
35
40
45
50
55

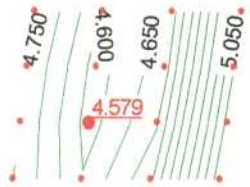

3.000
2.803
3.000
5.000
Description: Lila Canyon Extension to Horse Canyon MRF
Comments: Pond Cut-Slope Stability (Saturated) 2H:1V
File Name: Pond Cut_Slope Saturated.slz
Analysis Method: Spencer
Description: Worst Case (Saturated)
Unit Weight: 116
Cohesion: 300
Phi: 24
Vertical
Horizontal
0
2
4
6
8
10
12
14
16
18
20
22
0
5
10
15
20
25
30
35
40
45
50
55

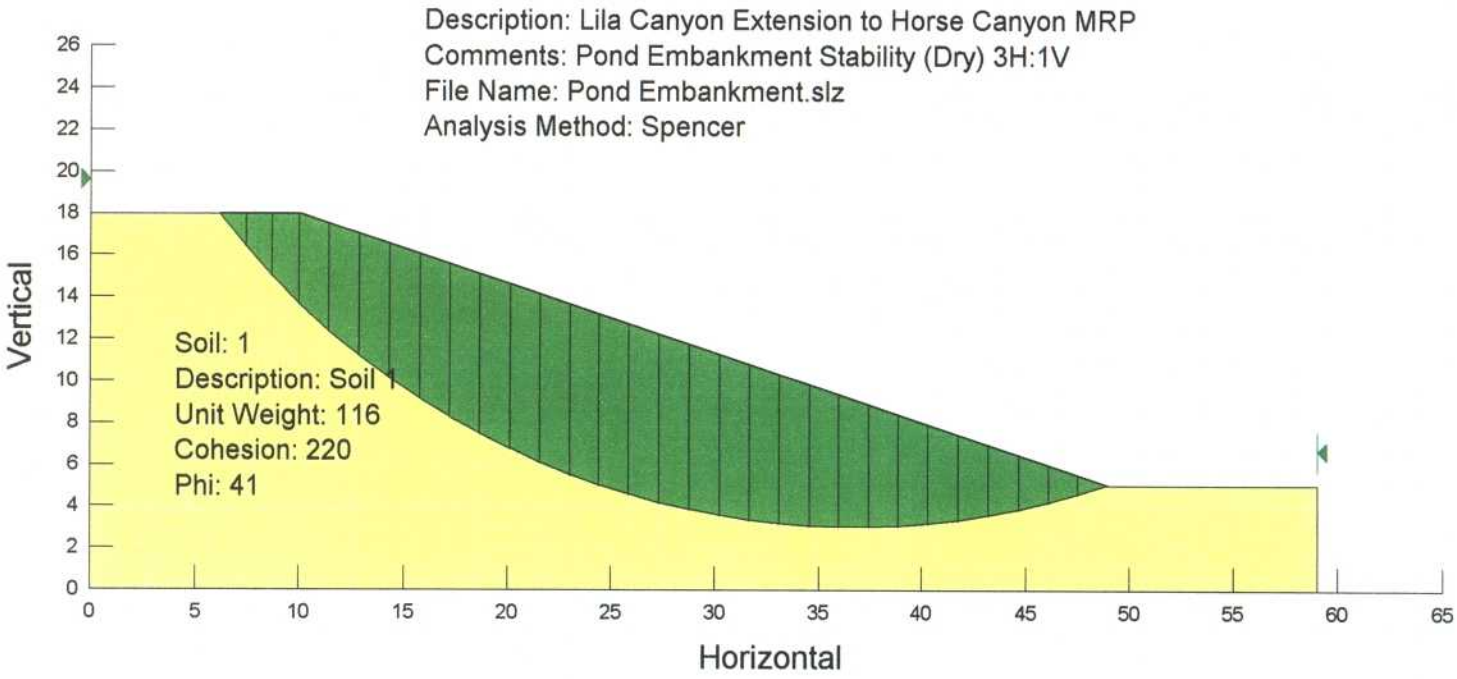
Pond Embankment Stability

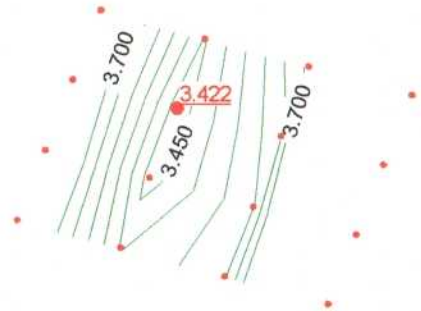
The following parameters were used for the proposed pond embankment:

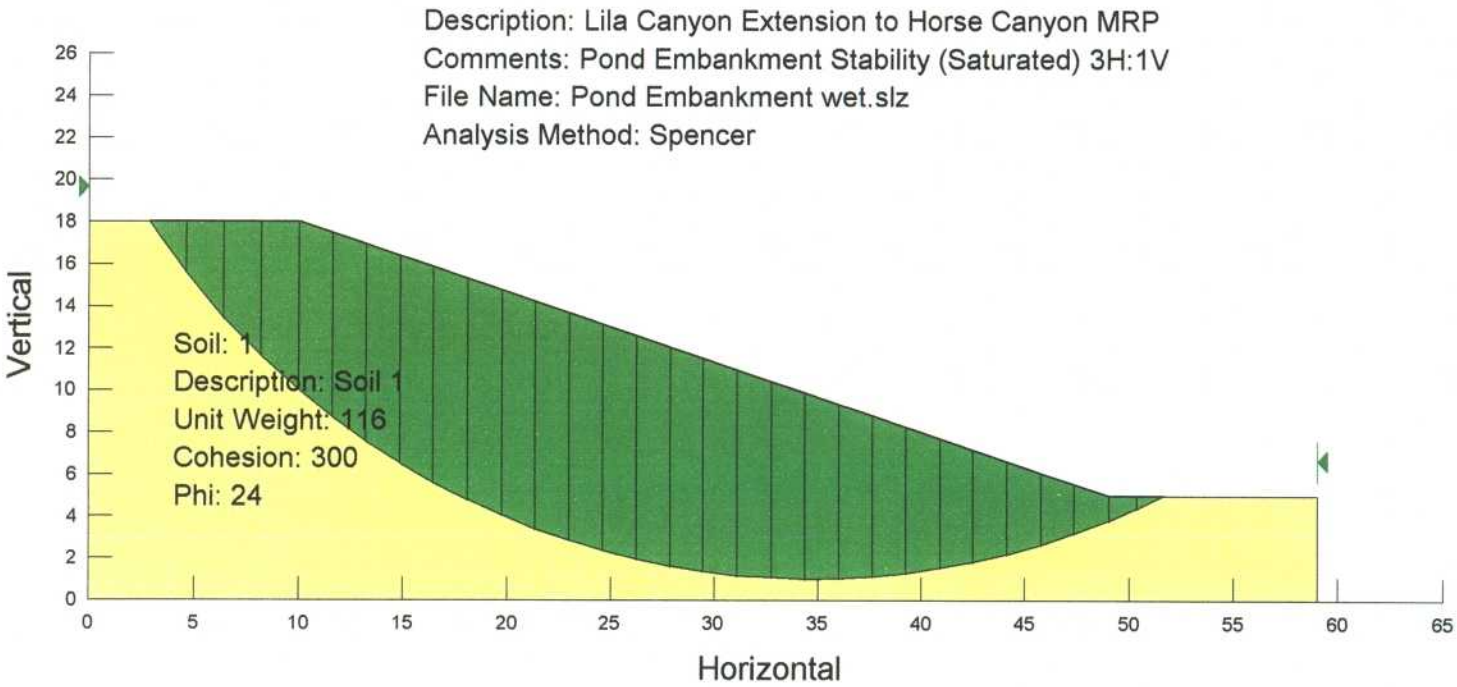
Slope Height	-	13'
Slope Angle	-	18.4° (3H:1V)
Soil Density	-	113 lbs/ft^3
Soil Cohesion	-	220 psf dry / 300psf saturated
Internal Friction Angle	-	41° dry / 24° saturated

The calculated Factor of Safety for the pond embankment is 4.35 for dry conditions and 3.10 for saturated conditions. This also exceeds the regulatory requirement of 1.30.


4.750
4.600
4.650
5.050
4.579


Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Pond Embankment Stability (Dry) 3H:1V
File Name: Pond Embankment.slz
Analysis Method: Spencer
Soil: 1
Description: Soil 1
Unit Weight: 116
Cohesion: 220
Phi: 41
Vertical
Horizontal
0
2
4
6
8
10
12
14
16
18
20
22
24
26
0
5
10
15
20
25
30
35
40
45
50
55
60
65


3.700
3.422
3.450
3.700


Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Pond Embankment Stability (Saturated) 3H:1V
File Name: Pond Embankment wet.slz
Analysis Method: Spencer
Soil: 1
Description: Soil 1
Unit Weight: 116
Cohesion: 300
Phi: 24
Vertical
Horizontal
0
2
4
6
8
10
12
14
16
18
20
22
24
26
0
5
10
15
20
25
30
35
40
45
50
55
60
65

Sudden Drawdown Protection

The sediment pond will be protected from failure from sudden drawdown by the following primary measures:

(1) Proper construction/compaction of the embankment as per engineering requirements in Appendix 7-4;

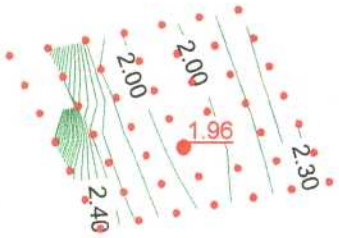
(2) Majority of pond is incised and therefore cut into natural ground with 2H:1V slopes for stability;

(3) Safety Factor calculations show the pond to be stable under both saturated and dry conditions; therefore, transition from one state to the other should not affect stability to the extent to cause failure;

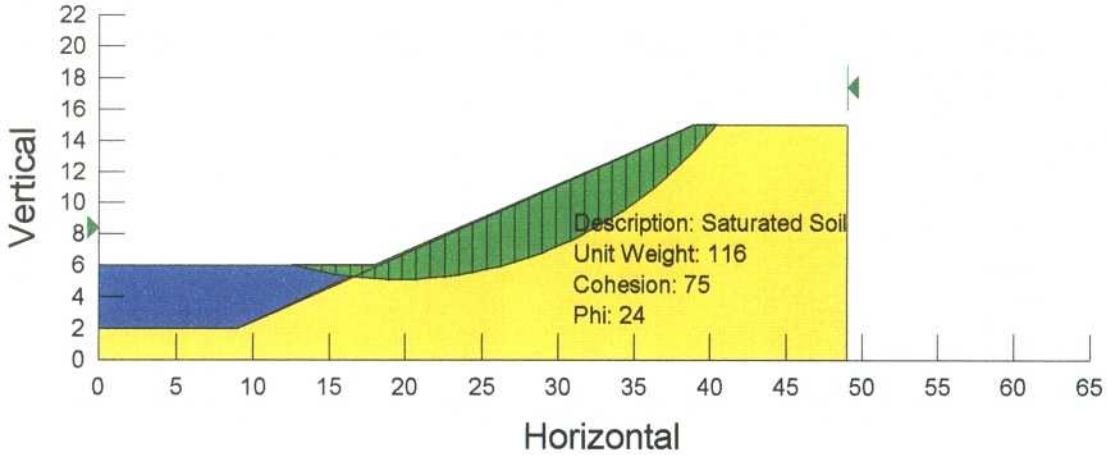
(4) Pond embankment will be vegetated wherever feasible;

(5) It should also be noted that the pond design has been reviewed and approved by the State Engineers Office.

Using Geosystems Software SB-Slope Version 3.0 stability analysis for sudden drawdown conditions were run. Assuming a 10 foot sudden drop in water elevation, and a soil cohesion value one fourth of the measured value, the Factor of Safety would be 1.96. This reduced cohesion value was used for conservative purposes. The actual factor of safety would be considerably higher.

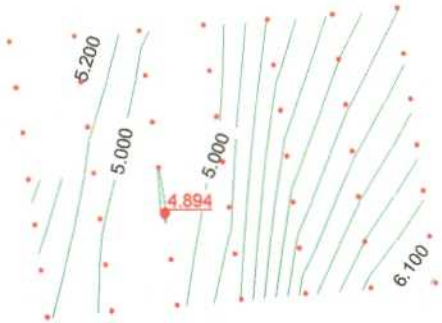


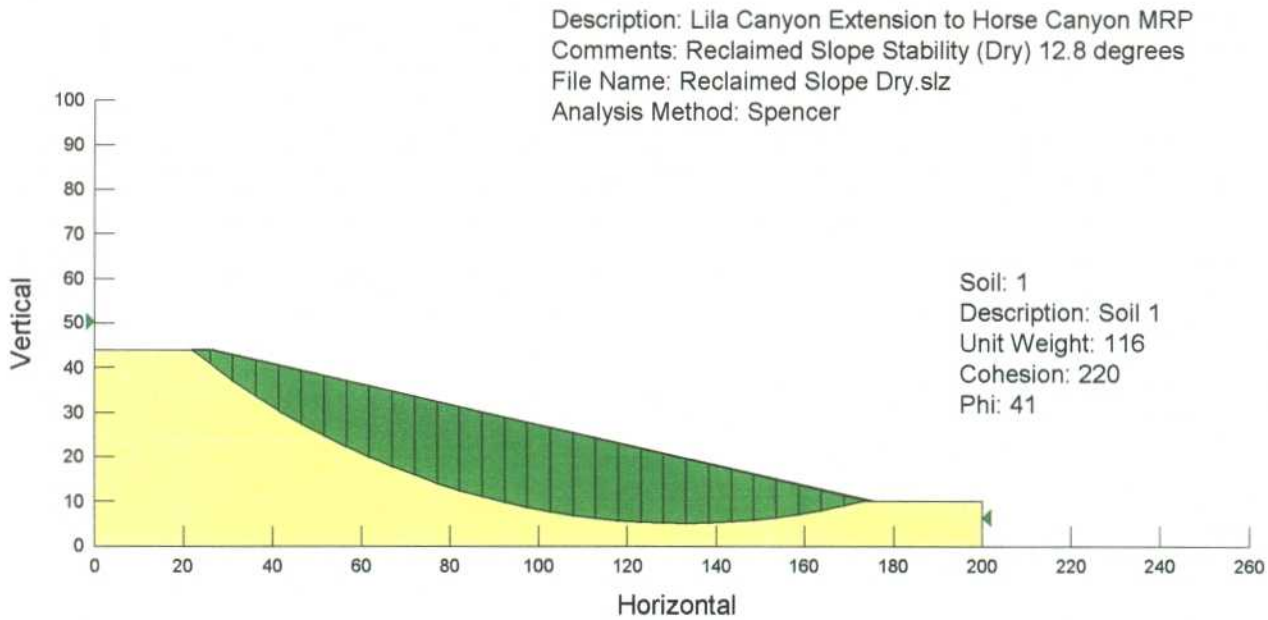
Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Pond Embankment Stability (Sudden Draw Down) 3H:1V
File Name: Pond Sudden Draw Down.stz.slz
Analysis Method: Spencer



Reclaimed Slope

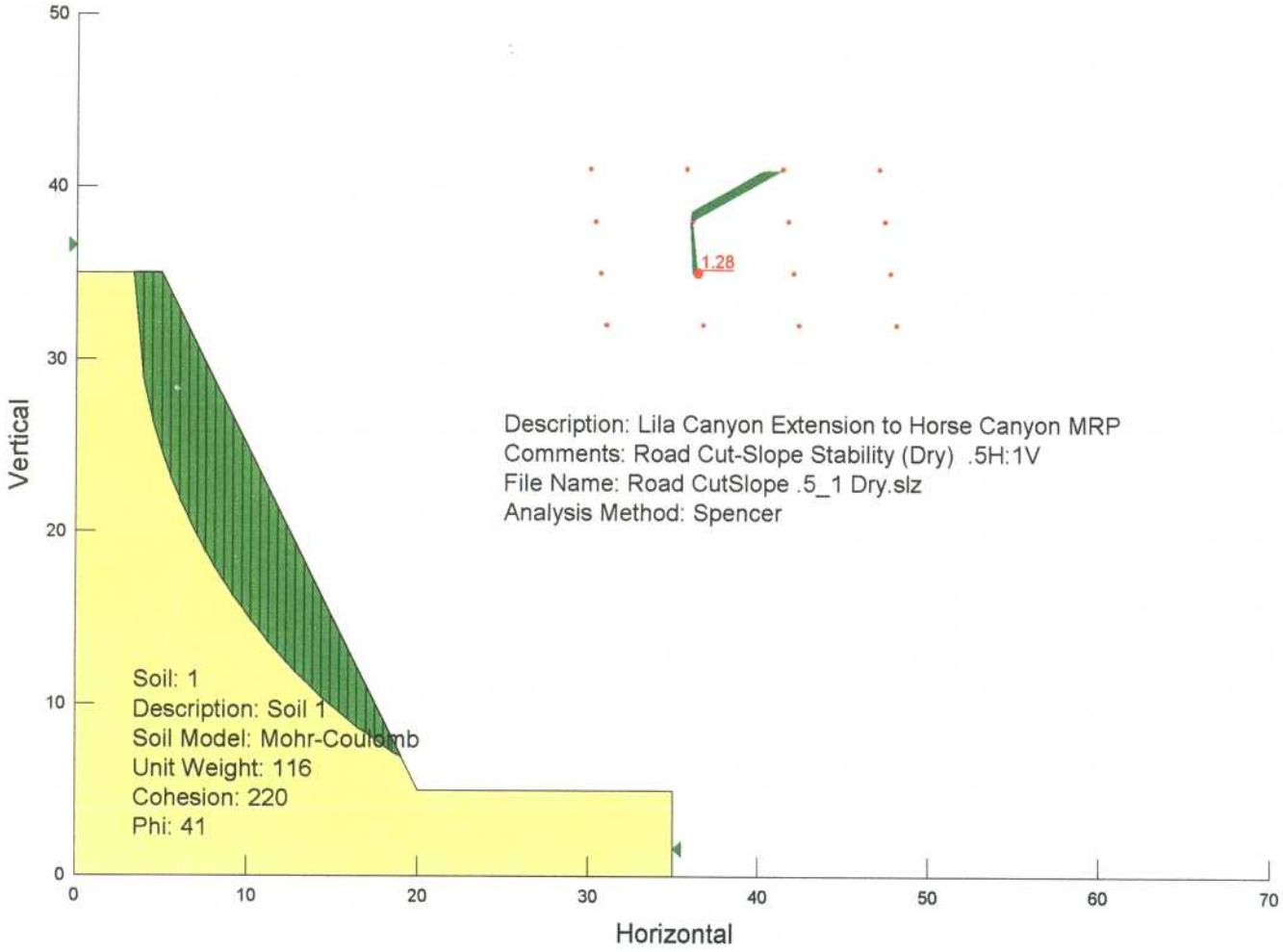
The proposed reclamation profile is shown on Plate 5-7C. A section of this profile, approximately 260' in length was selected for the stability calculation. This section is designated E-E' on Plate 5-7C and in Figure 3 of this Appendix. The section shows a maximum slope height of 34 feet at a slope angle of 12.8°. Density, cohesion and internal friction angles were assumed to be the same as the native soil for these calculations.

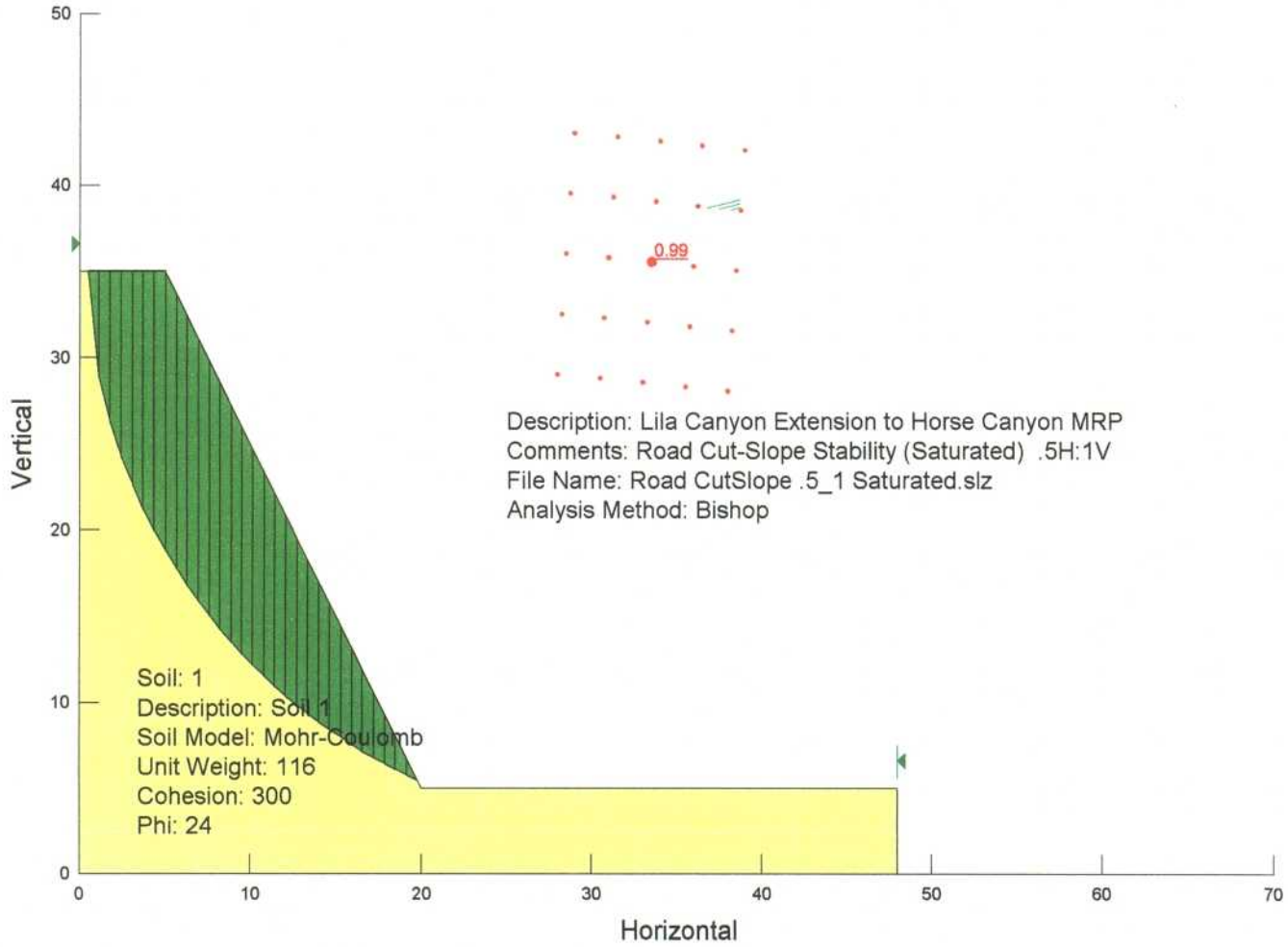

5.200
5.000
5.000
4.894
6.100


Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Reclaimed Slope Stability (Dry) 12.8 degrees
File Name: Reclaimed Slope Dry.slz
Analysis Method: Spencer
Soil: 1
Description: Soil 1
Unit Weight: 116
Cohesion: 220
Phi: 41
Vertical
Horizontal
0
10
20
30
40
50
60
70
80
90
100
0
20
40
60
80
100
120
140
160
180
200
220
240
260

Steeper cut-slopes .5H:1V

A stability analysis was determined for slopes with a .5H to 1V. It was determined that the safety factor for a slope of ½ Horizontal to 1 Vertical was 1.28 for a dry slope and .99 for a saturated slope indicating some instability in the saturated state.


1.28
Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Road Cut-Slope Stability (Dry) .5H:1V
File Name: Road CutSlope .5_1 Dry.slz
Analysis Method: Spencer
Soil: 1
Description: Soil 1
Soil Model: Mohr-Coulomb
Unit Weight: 116
Cohesion: 220
Phi: 41
Vertical
Horizontal
0
10
20
30
40
50
60
70


0.99
Description: Lila Canyon Extension to Horse Canyon MRP
Comments: Road Cut-Slope Stability (Saturated) .5H:1V
File Name: Road CutSlope .5_1 Saturated.slz
Analysis Method: Bishop
Soil: 1
Description: Soil 1
Soil Model: Mohr-Coulomb
Unit Weight: 116
Cohesion: 300
Phi: 24
Vertical
Horizontal
0
10
20
30
40
50
60
70

Summary

Factors of Safety have been calculated for the proposed portal access road, sediment pond and reclaimed slope, using the most conservative soil parameters taken from test pits on the proposed site.

Road cut safety factors range from 1.83 for dry conditions to 1.46 for saturated conditions. Road embankment factors of safety are 2.45 for dry and 1.63 for saturated conditions. These calculations show the proposed road design will exceed the 1.30 Factor of Safety required by the regulations.

The sediment pond incised (cut) slopes were shown to have a Factor of Safety of 3.34 for dry conditions and 2.80 for saturated conditions. Embankment stability shows a safety factor of 4.58 for dry conditions and 3.42 for saturated conditions. These calculated safety factors also exceed the regulatory requirement.

In addition to the Safety Factor calculations, discussion was also provided for methods of protecting the sediment pond from failure due to sudden or rapid draw down.

The reclaimed slope was shown to have a Factor of Safety of 4.89 for dry conditions and 3.12 for saturated conditions. These safety factors exceed the 1.30 regulatory requirements for reclaimed slopes.

Table 1

SUMMARY OF LABORATORY TEST RESULTS

Test Pit	Standard Proctor Values		Direct Shear Test Values			
	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Moist Conditions [a]		Saturated Conditions [b]	
TP-1	113.0	14.5	38	510	25	490
TP-3	116.0	15.0	41	220	24	300
TP-4	113.5	13.5	43	450	41	300

(a) Samples compacted to 92% of the Standard Proctor dry density at the optimum moisture content and tested under consolidated-undrained (CU) unsaturated conditions with vertical effective pressures of 500, 1000, and 2000 psf.

(b) Samples compacted to 92% of the Standard Proctor dry density at the optimum moisture content and tested under consolidated-undrained (CU) saturated conditions with vertical effective pressures of 500, 1000, and 2000 psf.

Reclamation and Enhancement Plan Associated with the Lila Canyon Mine Site

I. Description of Existing Area

The Lila Canyon Mine constitutes approximately 42.6 acres within the disturbed area boundary. For the purpose of reclamation, the total area is divided into two units. The upper unit consists of the water treatment area and the portal pad. The lower unit consists of the majority of the facilities; bath house, parking, shop, and coal handling structures, (See Plate 5-2 Surface Facilities). In addition to the above, there is a spoil/refuse disposal area and a sediment pond. The actual disturbance, pads, silos, coal processing structures, parking constitute a total of 25.3 acres. The pond is the only structure that will remain through phase 2 bond liability.

This new disturbance constitutes a loss of approximately 40 acres of critical high value big game winter range. In addition, it distracts from the general aesthetics of the upper reaches of Lila Canyon.

The following reclamation plan is designed to rehabilitate this area to such a degree that the appearance would be aesthetically compatible with the adjacent undisturbed area and reestablish a desirable and diverse vegetative cover that will enhance wildlife habitat and domestic grazing.

II. Demolition and Clean Up

After abandonment the area will be cleared of all mine related material and structures. The majority of the coal handling equipment; belt lines, conveyors, and some of the metal fab buildings, will be sold as used equipment and removed prior to demolition. The balance of the structures will be demolished utilizing heavy equipment such as; dozers, loaders, trackhoes, various shears for steel dismantling etc. The trash (non metal, non concrete material) will be removed from the site and hauled to an approved land fill. Any contaminated soil or debris, such as coal refuse, that has petroleum additives would be hauled to an approved disposal site. The balance of the non-combustible, non-ferrous debris such as concrete would be buried on site.

All material with salvage value would be removed by a licensed salvage company.

III. Reclamation Plan

Following the cessation of mining, the portal cuts can be brought back to approximate original contours.

implements the site seed bed preparation, the hydro-seeder can spray over the hoe or utilize a hose line to apply the seed in combination with 500#/acre wood fiber-mulch and 100#/acre of a tac agent. Following the seeding the entire area is then over sprayed with 1500 to 2000 pounds of wood fiber mulch per acre.

An additional 100#/acre of tac and a fertilizer choice and application rate to be determined by the testing in section 243., would be added to this mulch slurry. The lower area would be hydro-seeded and mulched utilizing the same procedures with the exception the operation can occur as each area is ready and should interfere with adjacent earthmoving activities.

Depending on weather conditions the hydro-mulched areas should be allowed to harden off (dry on the surface) from 24 to 72 hours before the area is walked on.

B. Methodology-Seedling Planting

Woody plants (shrubs are a component in final reclamation seed mix. Two years following reclamation an ocular estimate of the reclaimed site will be conducted. If it appears that the woody plant density is lacking, containerized or bare rooted stock may be planted to supplement stocking. The species and numbers will be determined from the evaluation of the ocular estimates. The operator will follow R645-301-357.311.

The planting procedures as outlined must be strictly adhered to in order to insure a reasonable degree of success. The following is a list of key points:

1. Live Seedlings - ideally dormant planting stock

2. Stock - primarily root mass kept moist at all times

3. Position of seedlings to maximize survival potential

4. Proper Planting Procedure (Figure 4)

    A. Straight and natural root alignment (no"J" roots)

    B. Firm soil placement length of root mass (no air pockets)

    C. The root collar needs to be ½ to 1 inch below grade (soil depth)

The actual planting of seedling can follow the seeding mulching anywhere from 24 hours up to two years with little or no adverse results. Ideally, planting should occur as late as possible in the fall prior to the first snow or as early in the spring as the site is accessible.

that must be remove is disposed of in dry areas underground and will never reach the surface. A minor amount will be included with the mine-run coal as dilution rock.

Results of acid and toxic testing completed on drill holes S-24 and S-25 can be found in Appendix 6-2. Testing was completed for the strata immediately above and below the coal seam as well as for the rock slope material. These tests were run on drill holes and at the original projected slope location. The present proposed slope location is approximately three miles to north but located in the same strata. Except that the present projected slopes will start at the top of the Mancos shale and will be driven up to the coal seam but not beyond as was originally proposed by Kaiser.

Kaiser Steel's Sunnyside Mine mined coal in the same horizons as those in the Lila Extension. With over 100 years of mining experience at the Sunnyside Mine operation, there has been no proven problems with acid-forming alkaline or toxic materials in production or waste disposal. The above statement is made based on history, data substantiating this assertion is beyond the scope of this MRP and is not included.

A small amount of acid- and toxic- drainage occurred at the base of the Sunnyside Mine refuse pile. The Lila Canyon refuse pile is not at all designed like the Sunnyside pile. Acidic water has seeped from the base of a refuse pile at Sunnyside. Even with the seepage there were no offsite problems or impacts because of the buffering environment. The refuse piles

at Sunnyside contained reject material from the washing of coal. This reject would have an elevated sulfur content much higher than Lila. The Sunnyside piles were above ground, Lila is totally incised, below the surface. The events at Sunnyside that lead to the seepage of acidic water from the bottom of the refuse pile cannot happen at Lila.

Appendix 5-7 states: "Since coal washing is not proposed, the refuse will not contain consolidated reject, which is higher in sulfur. The refuse pile is completely incised and will be compacted and covered with 4' of material. Thus eliminating the potential of water percolation causing problems. Drainage over the compacted pile with 4' of cover will be diverted into the sediment pond."

Table 6-6
Typical Engineering Properties of Rocks
stratum immediately above and below coal seam

Hole #	Remarks	Depth	Compressive Strength (psi)	Tensile	Lat. Pressure (psi)	Young's Mod $x10^6$	Poission's Ratio	Apparent Sp Grav.	Shear Strength (psi)	Coef. of Int. Fric.
S-18	Roof	1861.1-1863.8	11170	507	0	1.83	0.16	2.332	2607	.79843
	Roof	" - "	12392		500	2.14		2.255		
	Roof	" - "	15493		1000	2.66		2.222		
	Roof	" - "	19394		2000	3.13		2.226		
	Roof	1878.1-1879.9	15391	687	0	1.75	0.10	2.362		
	Roof	" - "	14935		0	2.89	0.13	2.545		
	Roof Base	1883.8-1884.8	15977	693	0	1.93	0.12	2.364		
	Floor	1905.0-1907.7	15708	1175	0	3.23	0.07	2.577		
	Floor	" - "	27057		500	3.69		2.581		
	Floor	" - "	27060		1000	4.31		2.593		
	Floor	" - "	22514		2000	4.55		2.578		
S-22	Roof	1392.2-1395.0	7899	440.5	0	1.73	0.30	2.285		
	Roof	" - "	12906		500	2.34		2.229	1755	1.01703
	Roof	" - "	14841		1000	2.78		2.210		
	Roof	" - "	16582		1500	2.77		2.235		
	Roof	1406.1-1409.3	8738	475.5	0	2.00	0.26	2.262		
	Roof	" - "	14490		500	2.46		2.277	1848	1.08903
	Roof	" - "	19093		1000	3.00		2.187		
	Roof	" - "	18419		1500	3.51		2.200		
	Roof	1414.0-1417.7	11215	607	0	2.18	0.26	2.375		
	Roof	" - "	9331		0	2.47	0.15	2.385		
	Roof	1415.8-1417.7	12706	718	0	2.63	0.12	2.242		
	Floor	1430.3-1434.0	10789	663	0	2.86	0.20	2.474		
	Floor	" - "	13642		500	3.43		2.503	2688	0.80750
	Floor	" - "	17655		1000	3.85		2.517		
	Floor	" - "	18279		2000	2.67		2.500		
	Floor	1434.0-1435.9	10477	1076	0	1.83	0.10	2.519		
	Floor	1436.0-1438.1	12519	689	0	2.15	0.21	2.559		
	Floor	1438.1-1440.0	3538		0	2.9	0.44	1.374		
	Floor	1440.0-1442.0	10975	602	0	2.12	0.22	2.272		
	Floor	" - "	10766		0	2.16	0.23	2.259		

6.6 GEOLOGIC EFFECTS OF MINING

6.6.1 MINING HAZARDS

Mining hazards other than those normally associated with underground coal mining are not anticipated. Conditions are not expected to be significantly different than those associated with the Geneva, Columbia, and Sunnyside mines.

Water

Subsurface water inflow associated with fault or fracture systems are possible, however, this potential is not expected to be significant in the Lila Extension. Minor water inflows from the Geneva Tunnels is anticipated.

Gas

Gas in the Geneva mine was not a problem although an increase was detected as mining reached deeper levels over 2,000 feet. In view of the relatively low cover over the Lila Extension coal, and proximity up dip to the outcrop, methane is not anticipated to be a problem.

Seismic Disturbances

Coal mine bump phenomenon has long been observed in the Columbia, Geneva, and Sunnyside mines. In the Lila Extension where faults are closely spaced, highly stressed rock and coal are likely to occur.

6.6.2 SURFACE HAZARDS

Surface subsidence can be expected in the Lila Extension. The impact will vary with depth of overburden and mining methods, i.e. full extraction versus leaving of supports which will affect coal recovery.

6.6.3 IMPACTS OF MINING

6.6.3.1 Subsurface Water

Occurrences of groundwater in the Geneva Mine are similar to conditions at Sunnyside and are projected to be similar in the Lila Canyon Extension. Little or no water is observed in the raise areas within .25 to 1 mile of the coal outcrop. Flows of water encountered while mining were reduced to seeps or dry up in a short period of time. This water is thought to be in place with little or no recharge. Drill holes in the South Lease property below Williams Draw did not encounter groundwater within 1 to 1.25 miles of the coal outcrop. For this reason subsurface water is not expected near the cliff escarpment.

Mining of the exploration test entry from the Geneva Mine during years 1957 to 1962 encountered in-place water in the Sunnyside coal seam. This water was allowed to collect in short cuts made into the down dip entry which was sufficient to keep excess water from working areas. The exploration entry (Geneva Tunnel) was terminated when the Entry fault was

encountered. More than two months was spent drilling to ascertain the nature of the fault and locate the coal seam. There is no mention in the records of excess water or that water was encountered in the Entry fault area.

As a result of the above paragraph the quantity of water along faults is thought to be much less than originally anticipated.

In the Geneva Mine water flows and seeps were reported to be 1 to 24gpm. As mining progresses down dip, localized fracture systems and faults may contain some small amounts of water.

6.6.3.2 Toxic Wastes

Rock occurring above and below the coal seam other than that closely associated with the coal is not expected to be brought to the surface. Such waste rock, if removed, will be disposed of in worked-out areas of the mine.

A minor amount of rock will be included with the mine run coal as dilution rock, some of which will be rejected as waste from the rotary breaker. This reject material will be stockpiled in a designated area on the surface. As discussed in Section 6.5.5.1, toxic waste production is not anticipated.

6.6.3.3 Subsidence

Subsidence is expected during the life of the mine, however, there is

not anticipated major effects due to subsidence during the permit term or thereafter. Surface subsidence effects on mining are discussed in Chapter5. The subsidence control plan is all so discussed in Chapter 5.

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Lila Canyon Extension

Chapter 7
Hydrology

Volume 6 of 7

Table of Contents

700. HYDROLOGY . . . . . Page -1-
710. Introduction . . . . . Page -1-
711. General Requirements . . . . . Page -1-
712. Certification . . . . . Page -1-
713. Inspection . . . . . Page -1-
720. Environmental Description . . . . . Page -2-
721. General Requirements . . . . . Page -2-
722. Cross Sections and Maps . . . . . Page -4-
723. Sampling and Analysis . . . . . Page -5-
724. Baseline Information . . . . . Page -6-
725. Baseline Cumulative Impact Area Information . . . . . Page -16-
726. Modeling . . . . . Page -17-
727. Alternate Water Source Information . . . . . Page -17-
728. Probable Hydrologic Consequences (PHC) Determination Page -18-
729. Cumulative Hydrologic Impact Assessment (CHIA) . . . . . Page -23-
730. Operation Plan . . . . . Page -24-
731. General Requirements . . . . . Page -24-
732. Sediment Control Measures . . . . . Page -42-
733. Impoundments . . . . . Page -44-
734. Discharge Structure . . . . . Page -46-
735. Disposal of Excess Spoil . . . . . Page -46-
736. Coal Mine Waste . . . . . Page -46-
737. Noncoal Mine Waste . . . . . Page -46-
738. Temporary Casing and Sealing of Wells . . . . . Page -46-
740. Design Criteria and Plans . . . . . Page -46-
741. General Requirements . . . . . Page -46-
742. Sediment Control Measures . . . . . Page -47-
743. Impoundments . . . . . Page -54-
744. Discharge Structures . . . . . Page -55-
745. Disposal of Excess Spoil . . . . . Page -55-
746. Coal Mine Waste . . . . . Page -55-
747. Disposal of Noncoal Waste. . . . . Page -57-
748. Casing and Sealing of Wells . . . . . Page -57-
750. Performance Standards . . . . . Page -57-
751. Water Quality . . . . . Page -57-
752. Sediment Control Measures . . . . . Page -58-
753. Impoundments and Discharge Structures . . . . . Page -58-
754. Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste . . . . . Page -58-
755. Casing and Sealing of Wells . . . . . Page -58-
760. Reclamation . . . . . Page -59-
761. General Requirements . . . . . Page -59-
762. Roads . . . . . Page -59-

763. Siltation Structures . . . . . Page -59-
764. Structure Removal . . . . . Page -59-
765. Permanent Casing and Sealing of Wells . . . . . Page -60-

List of Appendices

Appendix 7-1	Baseline Monitoring
Appendix 7-2	Water Monitoring Data (Horse Canyon)
Appendix 7-3	Probable Hydrologic Consequences
Appendix 7-4	Sedimentation and Drainage Control Plan
Appendix 7-5	U.P.D.E.S. Permits
Appendix 7-6	Seep/Spring Inventory
Appendix 7-7	Surface Water Characterizations
Appendix 7-8	Monitoring Location Descriptions
Appendix 7-9	Right Fork of Lila Canyon Flow and Geomorphic Evaluation

List of Plates

Plate 7-1	Permit Area Hydrology
Plate 7-1A	Permit Area Hydrology (Geologic Map)
Plate 7-1-B	Hydro-Geologic Cross Section
Plate 7-2	Disturbed Area Hydrology & Water Shed Map
Plate 7-3	Water Rights
Plate 7-4	Water Monitoring Locations
Plate 7-5	Proposed Sediment Control
Plate 7-6	Proposed Sediment Pond
Plate 7-7	Post Mining Hydrology

List of Figures

Figure 7-1	Water Level Map - Spring and Fall 2002	End of Chapter
Figure 7-2	Seasonal Water Level Fluctuations in Piezometers	End of Chapter

List of Tables

Table 7-1	1985 Spring & Seep Survey Results	Page 9
Table 7-1A	Period of Record Monthly Climate Summary	Page 18
Table 7-2	Water Rights	Page 20
Table 7-3	Water Monitoring Stations	Page 35
Table 7-4	Surface Water Monitoring Parameters	Page 36
Table 7-5	Ground Water Monitoring Parameters	Page 37

Chapter 7

700. HYDROLOGY

710. Introduction

711. General Requirements

711.100 The existing hydrologic resources of the proposed Lila Canyon Mine area are detailed under section 720.

711.200 The proposed operations and potential impacts to the hydrologic balance are described in Sections 728 and 730.

711.300 All methods and calculations utilized to achieve compliance with hydrologic design criteria and plans are described in Section 740 and Appendix 7-4.

711.400 Applicable performance standards

711.500 Reclamation hydrology is described in Section 760 and in Appendix 7-4.

712. All cross sections, maps and plans required by R645-301-722 as appropriate, and R645-301-731.700 have been prepared and certified according to R645-301-512.

713. Impoundments will be inspected as described under Section 514.300:

A professional engineer or specialist experienced in the construction of impoundments will inspect the impoundment.

Inspections will be made regularly during construction, upon completion of the construction, and at least yearly until removal of the structure or release of the performance bond.

The qualified, registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. (See Appendix 5-2 for the inspection form).

A copy of the report will be retained at or near the mine site.

There are no impoundments at this site subject to MSHA, 30 CFR 77.216; therefore, weekly inspections are not required.

Impoundments not subject to MSHA, 30 CFR 77.216 will be examined at least quarterly by a qualified person designated by the operator for appearance of structural weakness and other hazardous conditions.

720. Environmental Description

721. General. The following information will present a description of the existing, pre-mining hydrologic resources within the proposed permit and adjacent areas. This information will be used to aid in determining if these areas will be affected or impacted by the proposed coal mining activities.

The proposed Lila Canyon Mine is located, in the southwestern portion of the Book Cliffs in Emery County, Utah, approximately 2 miles south of the old Horse Canyon Mine, formerly operated by Geneva Steel Company. The proposed mining will be in the Upper (and possibly Lower) Sunnyside Seam of the Blackhawk Formation.

Existing hydrologic resources of the area consist of: Surface water resources - intermittent and ephemeral streams; and Groundwater resources - springs and seeps and perched, isolated aquifers. These resources have been evaluated using hydrologic data from the Horse Canyon Mine, water piezometers, and seep/spring inventory data of the proposed mine and adjacent areas. Plates 7-1 and 7-1A show the

locations of the surface drainages, springs and seeps, and piezometers.

722. Cross Sections and Maps

722.100 Subsurface Water. The locations where subsurface water, including springs and seeps, have been identified are presented on Plates 6-5 and 7-1 and data results are included in Appendix 7-1. Relevant cross sections of subsurface water, geology, and drill holes are shown on Plate 6-5. Where sufficient data are available, the seasonal head differences are presented on contour maps (see Figure 7-1) and on a well hydrograph plot (see Figure 7-2).

722.200 Surface Water. Location of all streams and stockwatering ponds or tanks in the area of the mine are shown on Plate 7-1. There are no perennial streams, lakes or ponds known to exist within the proposed permit or adjacent areas.

A new diversion work has recently been constructed by the BLM at the confluence of the Right Fork of Lila Canyon and Grassy Wash. Water from this diversion is directed to the stock pond located in Section 28, T. 16 S., R 14 E. Figure 1 in Appendix 7-9 shows the location of the diversion and the alignment of the diversion channel to the stock pond. Also, the location of the overflow channel back to Grassy Wash is also presented on the figure. No other ditches or drains are known to have been constructed in the area of the mine.

722.300 Baseline Data Locations. Locations of all baseline data monitoring points are shown on Plate 7-1. Baseline water quality and quantity data is included in Appendix 7-1.

722.400 Water Wells. Six wells have been identified in the permit and adjacent areas. Two wells are located within the alluvium of lower Horse Canyon Creek. Three water Piezometers were drilled in the area, IPA #1, IPA #2 and IPA #3, to monitor mine water levels. Drill hole S-32 was drilled and converted to a water monitoring hole by Kaiser in 1981. The details of these wells are discussed in Section 724.100 of the application. The location of all these wells is shown on Plate 7-1. No information on any other wells has been identified.

722.500 Contour Maps Contour Maps of the proposed disturbed area and mining areas are included as Plates 5-2A, 5-2B, 7-1 and 7-2. These maps use U.S.G.S. based contours and accurately represent the proposed permit and adjacent areas. Disturbed area maps present greater detail from low-level aerial photography, for greater detail, and are tied to relevant U.S.G.S. elevations to ensure correlation between the maps.

723. Sampling and Analysis

All water quality analyses performed to meet the requirements of R645-301-723 through R645-301-724.300, R645-301-724.500, R645-301-725 through R645-301-731, and R645-301-731.210 through R645-301-731.223 will be conducted according to the methodology in the current edition of "Standard Methods for the Examination of Water and Wastewater" or the methodology in 40 CFR Parts 136 and 434. Water quality sampling performed to meet the requirements of R645-301-723 through R645-301-724.300, R645-301-724.500, R645-301-725 through R645-301-731, and R645-301-731.210 through R645-301-731.223 will be conducted according to either methodology listed above when feasible. "Standard Methods for the Examination of Water and Wastewater" is a joint publication of the American Water Works Association, and the Water Pollution Control Federation and is available from the American Public Health Association, 1015 Fifteenth Street, NW, Washington, D.C. 20036.

724. Baseline Information

This section presents a description of the groundwater and surface water hydrology, geology, and climatology resources to assist in determining the baseline hydrologic conditions which exist in the permit and adjacent areas. This information provides a basis to determine if mining operations can be expected to have a significant impact on the hydrologic balance of the area.

724.100 Ground Water Information. This section presents a discussion of baseline groundwater conditions in the permit and adjacent areas. The data set consists of monitoring wells, spring and seep inventory data, and mine inflow information from the abandoned

Horse Canyon Mine. Appendices 7-1 and 7-6 provide data through the 2002 sampling period. All of these data and other recent data are available in the DOGM electronic database. The data, provided in Appendices 7-1 and 7-6 and the DOGM electronic data base, were obtained from multiple sources, including (but not limited to) on-site sampling efforts, the Horse Canyon Mine P.A.P. filed by Geneva Steel and annual reports, U.S. Geological Survey publications, and various consultant reports. Since not all monitoring parties were required to adhere to UDOGM or SMCRA rules, the laboratory parameters varied between reports. However, the data are still considered valid and appropriate for determining baseline conditions within the permit and adjacent areas. The location of the sampling points are presented on Plates 7-1 and 7-1A.

History of Data Collection. The U.S. Geological Survey conducted a water quality study in Horse Canyon from August 1978 until September 1979 during the time that U.S. Steel operated the mine. Samples were taken monthly from the Horse Canyon Creek and analyzed for most major ions and cations and field parameters. Metals, eight nitrogen species and other minor chemical constituents were taken on a quarterly basis or less.

Between January 1981 and April 1983, baseline water quality data was collected for four surface water/spring sites B-1, HC-1, RF-1 and RS-2, and 3 UPDES Discharge Points, 001 (Mine Discharge), 002 (Mine Discharge) and 003 (Sewer Plant) , on the Horse Canyon permit area. Between 14 and 19 samples were taken and analyzed during the monitoring period depending on the site. The parameters that were analyzed were derived from Section 783.16 in the regulations. DOGM monitoring guidelines were not in force at that time.

Two other sites, RS-1, and RS-2, were sampled once a year during 1978, 1979, and 1980 and analyzed for most major chemical constituents. In addition, springs H-1, H-6, H-18, and H-21 were sampled once by JBR and analyzed for the major constituents in 1985. Third quarter data for 1989 were collected for B-1, HC-1, RF-1, and RS-2 and sampled for most of the parameters in DOGM's guidelines.

Sample sites B-1, HC-1, RF-1 and RS-2, along with the UPDES Discharge Points 001A and 001B, have been monitored quarterly since 1989 in accordance with the approved water monitoring plan for the Horse Canyon Mine (Part A). The results of this monitoring have been submitted to the Division each year with the Annual Report and or have been entered into the Divisions electronic data base.

Baseline monitoring was also conducted on the proposed Lila Canyon Mine extension area by Earthfax Engineering in 1993-1995. Some 60 sites were identified and monitored. This data is presented in Appendix 7-1.

The operational water monitoring program committed to the permit application was implemented in July, 2000. Data will be collected from new monitoring sites L-1-S through L-4-S. L-5-G has yet to be installed. These sites are typically dry and no quality data has been gathered as yet. Sites L-6-G through L-10-G have been monitored for baseline in 1993, 1994, and 1995. These sites, along with Piezometers IPA-1, IPA-2 and IPA-3, were monitored in December 2000 to determine if they were still viable and to establish a current baseline that will be continuous with operational monitoring.

Sites L-11-G and L-12-G were added in October 2001 to replace sites L-6-G and L-10-G. Sites L-13-S, L-14-S, and L-15-S are being used to determine flow characteristics of the Williams Draw Wash, Wash below L-12-G, and Little Park Wash.

Sites L-6-G, L-10-G and L-15-S were determined to either provide no flow data or data that was less representative than the replacement sites and will be suspended from sampling in the 1st quarter of 2003.

Wells. The wells in the mine area consist of two water supply wells, three water monitoring piezometers, and an exploration borehole converted to a monitoring well.

Two wells are located within the alluvium of lower Horse Canyon Creek, near the Horse Canyon Mine. These wells area completed in the aerially small, alluvial aquifer at the mouth of Horse Canyon which contains groundwater likely collect from infiltration of surface flows from the upper Horse Canyon area. As indicated in Section 722.400,

the well located near the main Horse Canyon surface facilities, identified as Horse Canyon well on Plate 7-1A, is still open, although not operational at this time. This well will be refurbished and used during the mining and reclamation activities, then sealed and plugged. The well located near the road junction, identified as MDC well on Plate 7-1A, is an abandoned well owned by Minerals Development Corporation. This well has been sealed to the operator's best knowledge. No hydrologic data is presently available from either of these wells.

Three water piezometers were drilled as part of plans to access the Kaiser South Lease by I.P.A. These piezometers were designated IPA-1, IPA-2 and IPA-3, and are located in the Lila Canyon Permit area (see Plate 7-1). IPA monitored these sites for water depth from 7/94 to 4/96. These monitoring results are included in Appendix 7-1 and monitoring points and measured water levels are shown on Plate 7-1. It should be noted that the monitoring of these holes was done over the 2 3/4 year period to provide baseline data for the South Lease by I.P.A. Monitoring of water depths at these points by UtahAmerican commenced in December 2000 and continued through present. As indicated by the data in Appendix 7-1, the water levels in the holes show very little fluctuation. Levels change from less than 1.2' to a maximum of 21.2' over an eight year monitoring period. Figure 7-1 and 7-2 present the seasonal fluctuations of the water levels as contour maps and hydrographs. Using these water levels, an estimate of the projected water level assuming that the zones from the individual wells are connected is shown on Plate 7-1 and the monitoring results are included in Appendix 7-1 - Baseline Monitoring.

The piezometers were installed to provide depth of water only. It is impossible to drop a bailer 1,000 and withdraw a water sample without contaminating the sample. The depth and diameter of the piezometer holes makes it impossible to use them for baseline quality.

Drill holes S-26, S-27, S-28, and S-31 were cased in 3" PVC pipe with bottom perforations for water monitoring; however, cement seals were faulty, allowing the PVC pipe to fill with cement. Drill hole S-26 was reported dry in the week prior to cementing.

It has been reported by Kaiser that holes within one and one-quarter miles east of the cliff face were drilled with air, mist and foam and did not detect any water in the subsurface with the exception of drill hole S-32. No apparent increase in fluid level could be attributed to groundwater inflow from these holes, some of which were open for two weeks. Exploration drill holes in the South Lease property south of Williams Draw did not encounter groundwater within 1 to 1.25 miles of the coal outcrop. Exploration drill holes in the South Lease property, south of Williams Draw, did not encounter groundwater within 1 to 1.25 miles of the coal outcrop.

S-32 is located approximately three miles south of Lila Canyon and is separated from Lila by at least two known fault systems. The drill log along with the Chronology of Development and Pump tests are included in Appendix 6-1. Water levels measured are shown in the `"Chronology of Development". Water quality analysis for S-32 is also included in Appendix 6-1. The location of S-32 is shown on Plate 7-1. The Permittee visited S-32 in 2002 and attempted to measure water levels, but found that piezometer S-32 was unusable.

Spring and Seep Data. JBR Consultants Group (1986) conducted a spring and seep inventory of the Horse Canyon area during the fall of 1985. During the study, no springs or seeps were located within the disturbed area or near the proposed surface facilities. Within and adjacent to the permit area, 19 springs and seeps were found. Flows occurred from either sandstone beds located over shales or from alluvium. The flow rates from the springs varied from less than 1 gpm to about 10 gpm. Table 7-1 shows the flow rates and field data for each site. Sample results are listed in Appendix 7-6.

Based on the data, nine of the springs occurred from alluvial deposits in the stream channels or in colluvium. Nine of the remaining springs discharge from sandstone located above less permeable shale. Spring (H-92) was developed by excavating into bedrock. The discharge from this spring is through a pipe.

An additional spring and seep survey was conducted in the area, including the proposed Lila Canyon Mine area, by Earthfax Engineering in 1993 through 1995. Results of this survey are included in Appendix 7-1 of this permit. This is the most consistent

and most recent data; therefore, this data has been used for baseline monitoring in Appendix 7-1.

All of the spring and seep sites identified from the various surveys are presented on Plate 7-1A. The geologic source for the springs can be determined by comparing Plates 6-1 and 7-1 and 7-1A. Additionally, the elevation of the sampling points can be estimated from the topographic base map. All groundwater use (seeps and springs) within the permit and adjacent areas is confined to wildlife and stock watering.

Table 7-1
1985 Spring and Seep Survey Results

Spring ID	Temp (C°)	pH	Conduct. (umhos.)	Flow (gpm)	Occurrence	Use	Sampled
H-1	7	8.1	950	2	SS over	wildlife	yes
H-2	10	8.0	1111	2	Colluvium	wildlife	no
H-3	-	-	-	<<1	Alluvium	wildlife	no
H-4	9	7.7	1229	1	Colluvium	wildlife	no
H-5	10.5	7.7	1359	1	Alluvium	wildlife	no
H-6	9	7.9	1366	10	SS over	cattle	yes
H-7	9.5	7.6	1985	<1	SS	cattle	no
H-8	12	7.8	1997	<1	SS	wildlife	no
H-9	11	7.7	1919	2	Alluvial	cattle	no
H-10	11	7.9	2150	1	Alluvial	cattle	no
H-11	9.5	7.8	1227	2.5	Alluvium	cattle	no
H-13	11	7.1	1596	4.5	Colluvium	cattle	no
H-14	7	7.5	2040	2	SS over	cattle	no
H-18	7	7.9	1381	9	Alluvium	wildlife	yes
H-19	8	8.2	645	3.5	SS over	developed	no
H-20	14	8.3	777	2.5	SS over	none	no
H-21	14	8.3	968	6	SS over	wildlife	yes
H-22	5	8.3	322	1	SS over	none	no

Table 7-1
1985 Spring and Seep Survey Results

Spring ID	Temp (C°)	pH	Conduct. (umhos.)	Flow (gpm)	Occurrence	Use	Sampled
H-92	-	-	-	<<<1	SS over	none	no

It should be noted that a number of sample sites and monitoring holes have been noted in previous submittals. Sites A-26 and A-31 were mentioned in the Horse Canyon Mine Plan; however, these sites were drilled in 1981, and no data is available as to location and/or water quality data. These sites are considered non-usable for this plan. Sites H-21A, H-21B, H-18A, H-18B, HC-1A and an unidentified spring 1000' southwest of HCSW-2 have been mentioned; however, no sample data or pertinent information is available for these sites, and they have been removed from Plates 7-1 and 7-1A. Plates 7-1 and 7-1A has therefore been revised to show only seep/spring and other pertinent hydrologic data points for which adequate, reliable data is available for the plan.

Water rights for the mine and adjacent areas are addressed in Section 722.200 of this P.A.P.

Mine Inflow Information. Based on the historic record, water was encountered underground in the Horse Canyon Mine, resulting in outflows from portal areas of approximately 0.2 cfs or 90 gpm. The size of the flows from pumping or from old portal discharges is more the result of the large size of the mine (approx. 1500 ac), rather than the result of intercepting a localized high flowing aquifer. If the flow is distributed over the mine area, the average inflow is about 0.6 gpm per acre. The water encountered was likely discharge from perched aquifers or saturated sandstone lenses encountered during mining, not uncommon in mines in the Blackhawk Formation.

According to mining records of U.S. Steel (previous owner), groundwater was monitored within the Horse Canyon mine in several locations. Generally, the underground flows occurred from roof drips or areas where entries encountered sandstone lenses. Flows which issued from rock slopes and gob areas, where roof collapse may have occurred, were small, indicating that limited water inflow from overlying strata occurred.

During the period from 1957 to 1962, an exploration test entry was mined south from the Geneva Mine into the Lila Canyon Area. This entry encountered in-place water, which was allowed to collect in short cuts made into the down dip entry which was sufficient to keep excess water from working areas. The exploration entry was terminated when the Entry fault was encountered (see Plate 7-1). More than two months was spent drilling to ascertain the nature of the fault and locate the coal seam. During this period, there is no mention in the records of excess water or that water was encountered in the Entry fault area.

There is no estimate of water quantity and quality retrieved while mining the exploration entry other than mentioned above. However, water flow and seeps were reported to be in the range of 1 to 24gpm.

Only when the mine neared the Sunnyside Fault was significant water encountered. The water was initially pumped for use in the water supply system for the mine. When inflows increased beyond in-mine needs, to keep the workings near the Sunnyside Fault from flooding, the mine pumped water collected from this area from the workings during the period 1980 through 1983, prior to suspending operations.

The rate of inflow into the mine is not precisely known. In U.S. Steel's Permit Application Package (PAP) (1983) they estimated the average discharge from the mine to be 0.2 cfs. Lines and Plantz (1981, p. 32) also estimated the discharge from the mine to be 0.2 cfs and mentioned that the discharge was intermittent. It is not known, however, if this represents a constant average flow or the average flow rate during discharge periods. The mine was using an unknown volume of water within the mine for dust suppression and other operational needs.

According to the I.P.A. Mining and Reclamation Plan for Horse Canyon, Kaiser Coal re-entered the mine in 1986. They found that at the intersection of the Main slope and 3rd level, at the rotary car dump, there was water in the bottom of the dump. The water level in the dump was described in the Horse Canyon P.A.P. as being "about 30 feet below the floor (personnel communication, 1990)". U.S. Steel monitoring site 2 Dip, a sump where water collected, is very near this location and has an elevation of 5,827 feet. Therefore, the water

level in the rotary dump would be at a level of about 5,800 feet. No other water levels were obtained during 1986.

In 1993, BXG also re-entered the Horse Canyon Mine. They reported water levels at approximately 5870. It is not known if this reported level was for the same locations. Due to the extended period without pumping, this water level is probably representative of the level of water collected in the rest of the mine. Therefore, to be conservative it is assumed that the Geneva exploration entries driven south from the Horse Canyon Mine into the proposed Lila Canyon mining area do contain water since the tunnels elevation is approximately 5855 feet.
The Horse Canyon Mine has been closed and the surface area reclaimed. With no significant inflow to the old workings, no discharges are occurring from any of the portal areas nor are expected in the future. It is known however, that water has collected in the old entries. As future mining activities, for the proposed Lila Canyon Mine, will be occurring near this area of collected water in the old workings, it is likely that some or all of this water will be intercepted by the proposed Lila Canyon Mine (see Plate 7-1). Water may then have to be pumped from the mine. Because of undulationing floor and unknown void areas, it is impossible to determine the amount of water that would be pumped. The rate of pumping, if any, would be determined by the water discharge system design. All water discharged from the mine would be discharged at UPDES Site # 002A which is Site L-5-G, and will meet all UPDES standards. DOGM has specified planning to include a mine discharge of 500 gpm maximum.

An inspection of the Horse Canyon area following mining has shown no diminution of reasonably foreseeable use of aquifers. Since mining ceased in 1983, subsidence should have occurred within two years. However, no deterioration of the aquifers in the area was identified. Mining has not yet begun on the Lila Canyon site; however, since the structure and groundwater regime is similar to the Horse Canyon area, no diminution or deterioration of groundwater resources is expected in this area.

Occurrences of ground water in the Lila Canyon Mine are expected to be similar to the Geneva Mine (Horse Canyon). Inflows of water

encountered while mining reduced to seeps or dried up in a short period of time.

Groundwater Systems

In the Lila Canyon Lease area, the groundwater regime consists of two separate and distinct multilayered zones. The upper most zone consists of the Wasatch Group which consists of the Colton Formation and the undifferentiated Flagstaff Limestone-North Horn Formation. The lower zone consists of the Mesa Verde Group which contains the Price River Formation, Castlegate Sandstone, and the Blackhawk Formation (where the coal seams are located). The Mesa Verde Group is underlain by the Mancos Shale.

Geologic conditions in the permit and adjacent areas are described in detail in Chapter 6 of this P.A.P. Formal aquifer names have not been applied to any groundwater system in the permit and adjacent areas because the geometry, continuity, boundary conditions, and flow paths of the groundwater systems in the area are not fully understood. However, the data do suggest that groundwater systems in each of the bedrock groups are sufficiently different from each other to justify the informal designation of groundwater systems based on bedrock lithology. Thus, the informal designation of the Upper zone - Colton and Flagstaff/North Horn and the Lower zone - Price River, Blackhawk, and Mancos groundwater systems is adopted herein.

Groundwater in the permit and adjacent areas occurs within perched aquifers in the upper zone overlying the coal-bearing Blackhawk Formation as well as within the lower zone of the Blackhawk Formation and Mancos. Hydrogeologic conditions within the permit and adjacent areas are summarized below:

Upper Zone

Colton Formation. The Colton Formation outcrops in the northeast portion of the permit and adjacent areas. This formation consists predominantly of fine-grained calcareous sandstone with occasional basal beds of conglomerates and interbeds of mudstone and siltstone. Data presented in Plates 7-1 and 7-1A and Appendices 7-1 and 7-6 indicate that 16 springs issue from the Colton Formation within the permit and adjacent areas.

Waddell et al. (1986) evaluated the discharge of springs in the formation for the period of June to September 1980. The measured discharge rate generally declined during the 4-month period of evaluation. This suggests that the groundwater system has a good hydraulic connection with surface recharge and that most of the annual recharge quickly drains out of the system.

Groundwater issuing from the Colton Formation has a total dissolved solids ("TDS") concentration of 300 to 600 mg/l (as measured by specific conductance and laboratory analyses of TDS). The pH of this water is slightly alkaline (7.5 to 8.1). Insufficient data are available to describe seasonal variations in these parameters.

The water is a calcium-magnesium-bicarbonate type (see Appendix 7-1). The data also indicated total iron concentrations of <0.04 to 4.89 mg/l. Total manganese concentrations ranged from <0.01 to 1.29 mg/l.

Undifferentiated Flagstaff-North Horn Formation. The Flagstaff-North Horn Formation outcrops across much of the northern and central portion of the permit area. This formation consists of an interbedded sequence of sandstone, mudstone, marlstone, and limestone. Most springs and a major portion of the volume of groundwater discharging from the permit and adjacent areas issue from the Flagstaff-North Horn Formation. According to Plates 7-1 and 7-1A and Appendices 7-1 and 7-6, 36 springs issue from the Flagstaff-North Horn Formation within the permit and adjacent areas.

Groundwater discharge rates for springs issuing from the Flagstaff-North Horn Formation are greatly influenced by seasonal variations in precipitation and snowmelt, with most discharge corresponding to the melting of the winter snow pack during the spring months. Discharge is highest following the spring snowmelt and decreases to a trickle by the fall (Appendices 7-1 and 7-6). Many springs issuing from the Flagstaff-North Horn Formation have been noted to dry up each year.

Waddell et al. (1986), found that most of the annual recharge to the Flagstaff-North Horn Formation drains out of the system within about two months, while the remainder of the annual recharge drains out prior to the next snowmelt recharge event.

The groundwater regime in the Flagstaff-North Horn Formation appears to be influenced predominantly by the combined effects of lithology and topographic expression. Because the Flagstaff-North Horn Formation forms the upland plateau of the permit and adjacent areas, this formation is capable of receiving appreciable groundwater recharge from precipitation and snowmelt.

Waddell et al. (1986) concluded that the Flagstaff-North Horn groundwater system is perched. They indicate that approximately 9 percent of the average annual precipitation recharges the Flagstaff-North Horn groundwater system and that recharge water entering the Flagstaff-North Horn Formation moves downward until it encounters low permeability shale or claystone layers in the lower portion of the formation, where almost all of the water is forced to flow horizontally to springs.

Data presented in Appendices 7-1 and 7-6 indicate that groundwater issuing from the Flagstaff-North Horn Formation has a TDS concentration range of 400 to 700 mg/l. This water tends to be slightly alkaline and, similar to conditions encountered in the overlying Colton Formation, is of the calcium-magnesium-bicarbonate type.

The data presented in Appendices 7-1 and 7-6 indicate that the total iron concentration of groundwater discharging from springs in the Flagstaff-North Horn Formation is generally less than 0.04 to 0.15 mg/l. Total manganese concentrations in Flagstaff-North Horn groundwater are generally less than 0.03 mg/l. These data do not exhibit seasonal trends.

Lower Zone

Price River Formation. The Price River Formation consists of interbedded mudstone and siltstone with some fine-grained sandstone and carbonaceous mudstone. Within the permit area, 17 springs have been found issuing from the Price River Formation as indicated based on data presented in Plates 7-1 and 7-1A and Appendices 7-1 and 7-6. Based on specific conductance measurements collected from these springs, the TDS concentration of water issuing from the Price River Formation varies from about 750 to 850 mg/l. The water is slightly alkaline, with a pH of 7.9 to 8.9.

The IPA monitoring wells (Plate 7-1) were completed within the first formation with identifiable water above the coal seam, the Price River Formation. Data collected from the wells (Appendix 7-1) indicate that water levels in IPA 2 and 3 varied by approximately 2 feet during the period of July 1994 through April 1996, but showed no consistent trend. IPA 1 showed a rise of 5.6 feet over the same period. Measurements collected in 2001 indicated that the water levels in IPA 2 and 3 were 1 to 2 feet higher than the last time it was measured nearly 5 years earlier, while IPA 1 showed a rise of 16 feet. For the period since 2001, no trend has been identified for IPA 2 and 3, while IPA 1 has continued a slow increase. Although an in water levels has occurred during the period of record, this increase is not considered significant.

Assuming that the wells are completed in the same saturated zone, the piezometric surface shows that groundwater in the upper Price River Formation would be moving to the northeast, into the Book Cliffs (see Plate 7-1 and Figure 7-1). The gradient of the surface is approximately 0.011 ft/ft. The seasonal fluctuations between fall and spring are almost undistinguishable. Based on the tabulated data (Appendix 7-1), the fluctuation range is less than 0.5 feet between summer and fall readings. Figures 7-1 and 7-2 attempt to show these variations in contour map and well hydrographs.

Castlegate Sandstone. The Castlegate Sandstone consists of a fine- to medium-grained sandstone that is cemented with clay and calcium carbonate. The outcrops of this sandstone form prominent cliffs in the area. No springs were identified in this formation, suggesting that it is not a significant aquifer. The absence of springs is of great significance, since this formation is situated between the overlying Upper groundwater zone and the underlying lower zone (in the Blackhawk Formation). The absence of springs indicates that there is separation between the upper and lower groundwater zones. The absence of springs is most likely the result of two factors: 1) clay horizons in overlying formations inhibit vertical recharge from groundwaters in the Flagstaff-North Horn Formation, and 2) the exposed recharge area of the Price River Formation and Castlegate Sandstone is limited primarily to areas of steep cliff faces.

Blackhawk Formation. The Blackhawk Formation underlies the Castlegate Sandstone and consists of interbedded sandstone,

siltstone, shale, and coal. The lower Sunnyside coal seam, to be mined by UtahAmerican, is located in the upper portion of the Blackhawk Formation.

Across the formation some of the individual sandstone bodies are discontinuous. This results in areas that are saturated; i.e. sandstone lenses; and areas that are dry; i.e. siltstone and shale sections. This discontinuous nature results in the typical pattern found in the mines of the Wasatch Plateau and the Book Cliffs. As mining advances an isolated area of saturation (perched aquifer) is encountered by the entry or by roof bolting or fractures due to subsidence. As the water from the saturated zone drains into the mine it starts at an initially high rate and over time as the limited extent of the zone is emptied, the rate of flow decreases. Some zones which are laterally connected are able to reach a consistent inflow which is a balance for the recharge to the system with the outflow to the mine entry.

The hydraulic conductivity of the lower zone is believed to be about 0.01 to 0.02 feet per day, similar to values reported by Lines (1985) from the Wasatch Plateau for similar lithologies. Structural dip in the Lila Canyon area is about 6 to 7 degrees. The gradient of the lower zone in the Horse Canyon/Lila Canyon area is probably less than 2 degrees.

The water monitoring wells show water levels above the lower zone containing the coal seam in area of the mine; however, the zones recorded are not connected to the lower groundwater zone. As reported in the Castlegate Sandstone section, no springs or water bearing zones were identified in the spring and seep inventories or in the drilling of the water monitoring wells in the formation. Therefore, indicating that the monitored zones are perched and are isolated from the lower groundwater zone.

It is possible that mining will intercept some water as it progresses down dip. However, as discussed previously regarding mine water inflows to the Horse Canyon Mine, it is expected that water quantities and quality will be similar to that encountered in the Horse Canyon Mine. While some pumping is likely for water from the isolated saturated zones within the lower groundwater zone; since the water in the upper groundwater zone appears to be perched aquifers 200

to 500 feet above the coal seams, no adverse effects on usable surface sources are expected.

No springs have been identified as issuing from the Blackhawk Formation (see Appendices 7-1 and 7-6 and Plates 7-1 and 7-1A).

The quality of groundwater in the Blackhawk Formation is assumed to be similar to water quality for data collected from leakage into the Horse Canyon Mine. These data indicate that Blackhawk Formation groundwater has a mean TDS concentration range of 1400 to 2400 mg/l and is of the sodium-bicarbonate type. These waters are chemically distinct from groundwater in overlying groundwater systems.

Quality and quantity of underground water is the most difficult to ascertain due to geologic variables such as faults, fractures, channel sands and isolation of these particular features when water is encountered in order to gain reliable samples. Underground water tends to be co-mingled with water from other places in the mine and water pumped through the mines for mine equipment and dust suppression. Thus, care needs to be taken to obtain representative samples. Specific undisturbed water samples of the subsurface inflows are not known to have been collected. However, the quality results reported in the Horse Canyon records are consistent with in-mine samples from adjacent mines.

The dissolved iron concentration of groundwater flowing into the Horse Canyon Mine has historically been less than 0.5 mg/l and is generally less than 0.1 mg/l (see Appendices 7-1 and 7-6). The total iron concentration of this water has historically been less than 0.7 mg/l and generally less than 0.1 mg/l. The total manganese concentration of Blackhawk Formation water (as measured in the Horse Canyon Mine) has historically been less than 0.05 mg/l and is typically less than 0.03 mg/l (see Appendices 7-1 and 7-6).

Mancos Shale. The Mancos Shale is exposed south and west of the permit area. This formation is a relatively impermeable marine shale and is not considered to be a regional or local aquifer. Groundwater samples collected from two monitoring sites located in Stinky Spring Canyon approximately 2 miles southeast of Lila Canyon Mine have a TDS concentration in the range of 2200 to 4200 mg/l and are of the

sodium-sulfate-chloride type (Appendix 7-1). Total iron concentrations ranged from 0.35 to 11.8 mg/l. Total manganese concentrations ranged from 0.05 to 0.29 mg/l. Chemical compositions of other parameters are consistent with waters from the Mancos Shale in the Book Cliffs area. The springs appear to be fault related (see Appendix 7-7).

Recharge and Discharge Relations

Recharge rates were calculated by Waddell and others (1986, p. 43) for an area in the Book Cliffs. Waddell estimated recharge at about 9 percent of annual precipitation. Lines and others (1984) indicate the mean annual precipitation along the Book Cliffs in the area of the Horse Canyon Mines is about 12 inches, indicating a recharge rate of just over 1 inch per year.

The recharge and discharge areas for local perched aquifers in the upper zone (Colton and Flagstaff-North Horn Formations) generally lie within the drainage areas of Horse and Lila Canyons. These local systems are complex and highly dependent on topography. Recharge water from precipitation or snow melt enters the Colton or Flagstaff-North Horn Formations and moves downward until it encounters low permeability shale or claystone layers in the formations, where almost all of the water is forced to flow horizontally to springs. The springs exhibits substantial variability in discharge in response both to spring snowmelt events and to drought and wet years. Discharge rates as great as 20 gpm have been recorded from the springs during the high-flow season, and discharge rates as low as 1 gpm are not uncommon during late summer. The effects of the drought occurring in the late 1980s and early 1990s are clearly evident in the flow records.

Recharge to the lower zone including the Price Rive, Castlegate Sandstone, Blackhawk Formation, and Mancos Shale is of limited magnitude, due primarily to the limited area of exposure on steep outcrops and the presence of low-permeability units in overlying formations. These two zones are separated by clay layers in the upper Blackhawk and Price River Formations and undifferentiated Flagstaff-North Horn Formations which contain approximately 80 percent clays, siltstones, mudstones, and shales, all highly restrictive to groundwater movement (Fisher and others, 1960).

Recharge to the lower zone probably occurs primarily from vertical movement of water through the overlying formations and is probably

greatest where surface fractures intersect the topographic highs where the upper zone formations outcrop. The rate of recharge to the lower zone is very slow. The lack of a significant recharge source results in limited discharge areas. The largest portion of recharge is in the upper Price River Formation where the greatest number of springs in the lower zone are identified.

Faults may effect flow, direction and magnitude of both lateral and vertical flows. However, the area is abundant with plastic or swelling clays that can seal faults and fractures inhibiting both lateral and vertical flows.

Assuming mass-balance and stable hydrologic conditions, recharge will equal discharge over the long term. The relatively rapid groundwater discharge from the upper zone formations as compared with the underlying lower zone formations suggest that the stratigraphically-higher water discharges are local and are not hydraulically connected with the lower zone. Waddell et al. (1986) conclude that the perched nature of the upper zone formations protect them from the influence of dewatering of the coal-bearing zone unless the upper zone is influenced by subsidence.

Groundwater resources in the permit area are limited due to the small surface area and low recharge rates. There is not enough base flow from groundwater discharge to maintain a perennial flow in Horse Canyon Creek or Lila Canyon.

The upper groundwater zone produces low volume spring flows from up-dip exposures of bedrock and overlying alluvium. Some spring discharges from this zone have been developed and are used for livestock and wildlife. The lower groundwater zone has very limited discharges that are used for wildlife, generally during the early spring. Based on the location of these lower zone points and the vertical separation (500 feet) between the coal seam and the points, there is no possibility of mining impacting the springs.

724.200 Regional Surface Water Resources. The permit area exists entirely within the Horse Canyon, Lila Canyon, and Little Park Wash watersheds. The regional drainage patterns are generally north-south with steep canyons which are incised in the Book Cliffs escarpment. Stream flows within the region, generally, are the result of snowmelt runoff or summer thunderstorms.

Permit Area Surface Water Resources

Within the permit area, the surface water resources consist of three main drainages: Horse Canyon Creek, Little Park Wash, and Lila Canyon. Horse Canyon flows to Icelander Wash which, in turn, flows to Grassy Trail Creek and the Price River. Little Park Wash flows southward to Trail Canyon and the Price River. Lila Canyon flows southwest to Grassy Wash, then south to the Marsh Flat Wash and the Price River. (see Plate 7-1)

Based on field observations (described in Appendix 7-7) and flow data obtained during the collection of water-quality samples within the permit and adjacent areas, Horse Canyon Creek is considered intermittent within the permit area. Lila Canyon and Little Park Wash appear to be ephemeral in and adjacent to the permit area. Several smaller tributaries of these streams within the permit and adjacent areas are ephemeral. However, based on the size of the drainage area (greater than 1 sq. mi.), by regulation these drainages are intermittent.

Generally, Horse Canyon, Little Park and Lila Canyon flow during the spring snowmelt runoff period and also as a result of isolated summer thunderstorms. Due to the limited drainage area and elevation of Lila Canyon, the duration of the snowmelt flows is quite short and is limited to the very early spring. Flows in Horse Canyon, generally, are limited to the early spring period (Lines and Plantz, 1981). By late spring to early summer, usually no flow is evident in Horse Canyon Creek, below the minesite or Lila Canyon.

Over the period of record, 1981 through present, there have been both wet and dry periods. From 1983 through 1984, the area had high precipitation. In the late 1990's through the present, a drought has been evident in the area. Over this period of record, the flows in the streams have increased and decreased based on the available water. Also, during both of these periods, flows in Horse Canyon Creek during the summer and fall are generally not evident below the mine site. Only flows from summer thunderstorms upstream of the site have resulted in flows below the mine. This indicates that the while surface water resources may fluctuate, the fluctuations are not great enough to change the response of the stream to overcome the hydraulic and geologic characteristics of the area.

During most years, the snowmelt peak is the highest peak flow for the drainages. Under certain circumstances, when a significant summer

thunderstorm occurs over the drainages, the runoff event can be quite large. There are no indications that any of the reaches of Lila Canyon or Little Park Wash are perennial. Since the spring of 2000, both areas have been observed numerous times (at least quarterly) and no flow has even been noted in either drainage. Normally, this would indicate an ephemeral drainage, however, since the drainage areas are greater than one square mile and exhibit no consistent flows, they are classified by regulation as intermittent.

A number of springs do exist in the Little Park Wash drainage; however, the flows from the springs dry-up, dissipate or go underground before reaching the main drainage channel. The springs and seeps in the area have been sampled, as indicated in this application, as part of the baseline and spring/seep inventories.

Precipitation in the area generally consists of either high-intensity, localized thunderstorms or area wide, frontal storms. The frontal precipitation events produce only limited amounts of flow in the local ephemeral washes. Intense rainfall may cause heavy flooding, but likely only affecting small areas. The highest concentrations of suspended sediment will occur during high-intensity runoff from thunderstorms, and the lowest concentrations will occur during base flow or snow melt events. It is anticipated that only during longer duration, high-intensity thunderstorms that flow from the ephemeral drainages within the permit area would reach the Price River. The sediment pond at the mine site is designed to contain disturbed area flows, up to the 10-yr, 24-hr event.

Surface waters in this part of the Book Cliffs drain to the Price River. The Price River flows to the Green River which, in turn, flows to the Colorado River.

Lines and Plantz (1981, p. 33) conducted three seepage surveys of Horse Canyon Creek in 1978 and 1979. The results of the surveys show no consistent trends through time. Mine discharges create difficulties in interpretation of the data because there is no indication of whether the mine was or was not discharging water at the time of the surveys.

The Lila Canyon drainage is normally dry, flowing only in response to precipitation runoff or rapid snowmelt.

The mine facilities will be located in the Right Fork of Lila Canyon. In January 2004, an assessment of the geomorphic character of the channel was conducted to address DOGM comments. A series of channel cross-section measurements were taken and the bed and bank materials visually observed. During this evaluation, it was discovered that a diversion structure had been installed just above the confluence of the Right Fork of Lila Canyon and Grassy Wash (see Appendix 7-9 and Figure 7-3). This diversion structure will divert all flow from the drainage and convey it by diversion channel to a stock pond located in the SW/4, SW/4 of Section 28, T. 16 S., R. 14 E. Subsequently, it was determined that the improvements were part of a BLM range improvement project. This structure has significantly modified the drainage pattern for this area. Flows that previously would have flowed into Grassy Wash will now be detained in the stock pond.

The closest perennial stream to the permit area is Range Creek. The drainage is located approximately 6 miles east of the proposed Lila Canyon permit area. Range Creek is in a broad, south-southeast oriented drainage that has been eroded into the Roan Cliffs. A western extension of the Roan Cliffs (Patmos Ridge) lies between Range Creek and the Book Cliffs. The proposed Lila Canyon operation is on the west side of Patmos Ridge. The Colton Formation is exposed at the surface from Patmos Ridge east to the main body of the Roan Cliffs, and between these two escarpments Range Creek has eroded into but not through the Colton Formation. Approximately eleven miles southeast of the permit area, just upstream of Turtle Canyon, Range Creek has eroded through the Colton, Flagstaff, and North Horn Formations, but it reaches the Green River without having eroded through the Upper Price River Formation. The nearest Blackhawk outcrop is 10 miles south, along the Price River.

As a result of the six miles horizontal distance from proposed permit area to Range Creek and the isolating effects of the over 1,000 feet of low-permeability, isolating strata, it is not likely that the Lila Canyon Mine will adversely effect Range Creek. Due to these conditions, no baseline or other sampling has been gathered nor anticipated on Range Creek.

The Horse Canyon drainage is monitored in accordance with the approved monitoring plan for the permit. There have been no

samples taken in the Lila Canyon or Little Park Wash drainages because no flow has been observed.

U.S. Steel conducted water quality monitoring of the Horse Canyon drainage. These monitoring efforts were conducted prior to the development of DOGM's present Water Monitoring Guidelines, and as a result the data is quite limited. The most recent results of these water monitoring efforts are presented in Appendix 7-2 and historic results are included in the DOGM electronic database.

724.300 Geologic Information Detailed geologic information of the permit and adjacent areas is included in Section 600, with specific strata analyses, as required, in Section 624.

724.310 Probable Hydrologic Consequences. The geologic data indicate that no toxic- or acid-forming materials are known to exist in the coal or rock strata immediately below or above the seam (see Section 624.300). The probable hydrologic consequences of the proposed operation will be discussed in Section 728 and Appendix 7-3 of this application.

724.320 Feasibility of Reclamation. The geologic data in Section 600 provides sufficient detail to allow: the evaluation of whether toxic- or acid-forming materials are expected to be encountered in mining; subsidence impacts; whether surface disturbed areas are designed to be constructed in a manner that will allow for reclamation to approximate original contour; and whether the operation plans have been design to ensure that material damage to the hydrologic balance does not occur outside of the permit area. These issues are evaluated in the R645 rules and discussed in Section 728 of this application.

724.400 Climatological Information

724.410 Climatological Factors

724.411 Precipitation The closest weather recording station to the Lila Canyon Mine is located at Sunnyside, Utah. Based on the relatively close proximity and similar locations (west exposure of the Book Cliffs) the data from this station will be used to verify precipitation amounts and other weather conditions for the Lila Canyon Mine.

Precipitation data from the Sunnyside station has been gathered from 1971 to 2000, showing an average annual precipitation of 14.74 inches. The information was downloaded from the Western Regional Climate Center, as shown on Table 7-1A.

A rain gauge will be installed at the site, once construction and operations start, to comply with the reporting requirements of the air quality permit.

724.412 Winds. The average direction of the prevailing winds is West to East, and the average velocity is 2.74 knots.

724.413 Temperature. Mean temperatures in the proposed mine area range from a high of 58.0 degrees F to a low of 33.4 degrees F. See Table 7-1A.

724.420 Additional Data. Additional data will be supplied if requested by the Division to ensure compliance with the requirements of R645-301 and R645-302.

724.500 Supplemental Information N/A - The determination of the PHC in Section 728 does not indicate that adverse impacts on or off the proposed permit area may occur to the hydrologic balance, or that

acid-forming or toxic-forming material is present that may result in the contamination of ground-water or surface-water supplies.

Table 7-1A

Sunnyside, Utah (428474)
Period of Record Monthly Climate Summary

Period of Record: 1971 - 2000

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Average Max. Temp(F)	33.7	38.4	44.1	54.0	63.5	76.2	82.4	80.3	71.3	58.3	42.8	34.9	56.8
Average Min. Temp(F)	13.9	17.5	21.8	30.0	38.3	47.2	53.6	52.2	44.7	34.6	22.8	15.3	32.8
Average Total Precip (in.)	0.80	1.01	1.30	1.22	1.22	0.85	1.46	1.50	1.80	1.67	1.14	0.78	14.74

Unofficial values based on averages/sums of smoothed daily data, Information is computed from available daily data during the 1971-2000 period. Smoothing, missing data and observation-time changes may cause these 1971-2000 values to differ from official NCDC values. This table is presented for use at locations that don't have official NCDC data. No adjustments are made for missing data or time of observation. Check NCDC normals table for official data.

724.700 Valley/Stream N/A - The proposed plan does not include mining or reclamation operations within a valley holding a stream or in a location where the permit area or adjacent area includes a stream which meets the requirements of R645-302-320.

725. Baseline Cumulative Impact Area Information

725.100 Hydrologic and Geologic Information Hydrologic and geologic information for the mine area is provided in Sections 600,

724 and in the PHC Determination in Appendix 7-3. This information includes the available information gathered by the applicant. Additional information is available for the areas adjacent to the proposed mining and adjacent areas from state and federal agencies.

725.200 Other Data Sources As indicated above, additional information is available for the cumulative impact area. In addition to the base line data for the proposed mining, additional pertinent hydrologic data is available from adjacent mines and permits and government reports.

725.300 Available Data Necessary hydrologic and geologic information is assumed to be available to the Division in this P.A.P.

726. Modeling Where ever possible actual surface and ground water information is supplied in this application. Storm 6.2, a program to calculate runoff flows was used to calculate runoff from some disturbed area drainage areas. A simulation of transmission losses to determine potential impacts from mine water discharge to the Price River and fishery will be completed prior to Mining.

727. Alternate Water Source Information A search was conducted of the State of Utah Water Rights files for all rights occurring within, and adjacent to, the permit area for a distance of one mile. The location of those rights are shown on Plate 7-3. A description of each of the rights is tabulated in Table 7-2.

Any State-Appropriated water supply that may be damaged by mining operations will either be repaired or replaced. As soon as practical, after proof of damage by mining in Lila Canyon, of any State-Appropriated water supply, UEI will replace the water. Water replacement may include sealing surface fractures, piping, trucking water, transferring water rights, or construction of wells. The preferable method of replacement will be sealing of surface fractures effecting the water supply. As a last resort UEI will replace the water by transferring water rights or construction of wells.

As noted in the table, the majority of rights are owned by UEI for industrial use. Other rights owned by the B.L.M. or individuals are primarily for stockwatering.

UEI owns the rights to approximately 1.50 cfs in this area. Although the PHC (Appendix 7-3) indicates little, if any, adverse effects on water resources resulting from the operation, if such effects should become evident, lost water sources would be replaced from the rights owned by the company.

Table 7-2

LILA CANYON MINE AREA
Water Rights

Water Right/Owner	cfs	gpm	ac.ft.	Source	Use	Point of Diversion
91-557 Hawkins, Floyd	0	-	0	So. Fork Horse Canyon Creek	Stockwatering	SW 34, T. 15 S, R. 14 E.
91-557 Hawkins, Floyd	0	-	0	So. Fork Horse Canyon Creek	Stockwatering	NE 34, T. 15 S, R. 14 E.
91-1903 State of Utah	0.08	36	0	Spring	Stockwatering	SE 35, T. 15 S, R. 14 E.
*91-148 IPA	0.30	135	0	U. G. Tunnel	Other	NW 3, T. 16 S., R. 14 E.
*91-149 IPA	0.10	45	0	U. G. Tunnel	Other	NW 3, T. 16 S., R. 14 E.
*91-150 IPA	0.10	45	0	U. G. Tunnel	Other	NW 3, T. 16 S., R. 14 E.
*91-4959 IPA	0.00	-	5.00	Redden Spring	Mining	NE 3, T. 16 S., R. 14 E.
91-2616 BLM	0	-	0	Stream	Stockwatering	NW 3, T. 16 S., R. 14 E.
*91-183 IPA	0.8	359	0	Horse Canyon Creek	Domestic, Other	SE 1/4 3, T.. 16 S., R. 14 E.
91-185 Minerals Devel. Co.	0.0190	9	0	Well	Domestic, Other	NW 9, T. 16 S., R. 14 E.
91-618 Mont Blackburn	0.0110	5	0	Mont Spring	Stockwatering	NE 11, T. 16 S., R. 14 E.
91-2615 BLM	0	-	0	Stream	Stockwatering	NW 10, T. 16 S., R. 14 E.
91-617 Mont Blackburn	0.0110	5	0	Leslie Spring	Stockwatering	NW 11, T. 16 S., R. 14 E.
91-4650 BLM	0	-	0	Tributary to Flat Wash	Stockwatering, Other	SW 9, T. 16 S., R. 14 E.

Table 7-2

LILA CANYON MINE AREA
Water Rights

Water Right/Owner	cfs	gpm	ac.ft.	Source	Use	Point of Diversion
*91-399 IPA	0.050	22	0	Unnamed Spring	Mining, Other	SE 12, T. 16 S., R. 14 E.
91-2537 BLM	0.0120	5	0	Spring	Stockwatering	SE 12, T. 16 S., R. 14 E.
91-2521 BLM	0.0110	5	0	Cottonwood Spring	Stockwatering	NE 13, T. 16 S., R. 14 E.
91-4648 BLM	0.00	-	0	Unnamed Wash	Stockwatering, Other	SW 14, T. 16 S., R. 14 E.
91-4649 BLM	0	-	0	Unnamed Wash	Stockwatering, Other	NE 23, T. 16 S., R. 14 E.
*91-810 IPA	0.050	22	0	Unnamed Spring	Mining, Other	SE 24, T. 16 S., R. 14 E.
91-2517 BLM	0.0110	5	0	Pine Spring		SE 24, T. 16 S., R. 14 E.
91-2618 BLM	0	-	0	Stream		NW 27, T. 16 S., R. 14 E.
91-2619 BLM	0	-	0	Stream		SE 28, T. 16 S., R. 14 E.
91-2620 BLM	0	-	0	Stream		SE 28, T. 16 S., R. 14 E.
91-2621 BLM	0	-	0	Stream		SW 28, T. 16 S., R. 14 E.
91-2617 BLM	0	-	0	Stream		SE 27, T. 16 S., R. 14 E.
91-4646 BLM	0	-	0	Wash	Stockwatering, Other	SW 33, T. 16 S., R. 14 E.
91-2518 BLM	0.110	5	0	Williams Spring		SE 8, T. 17 S., R. 15 E.
91-4516 BLM	0	-	0	Little Park Wash	Stockwatering, Other	SW 7, T. 17 S., R. 15 E.

Table 7-2

LILA CANYON MINE AREA
Water Rights

Water Right/Owner	cfs	gpm	ac.ft.	Source	Use	Point of Diversion
91-4705 BLM	0	-	0	Bear Canyon	Stockwatering, Other	NW 7, T. 16 S., R. 15 E.
91-4621 BLM	0.0150	7	0	Kenna Spring	Stockwatering, Other	NE 8, T. 16 S., R. 15 E.
91-4701 BLM	0	--	0	Nelson Canyon	Stockwatering, Other	NW 17, T. 16 S., R. 15 E.
91-2519 BLM	0.0110	5	0	Unnamed Spring	Stockwatering, Other	SE 18, T. 16 S., R. 15 E.
*91-808 IPA	0.050	22	0	Unnamed Spring	Mining, Other	SW 18, T. 16 S., R. 15 E.
91-2538 State of Utah	0.0120	5	0	Unnamed Spring	Stockwatering	SW 18, T. 16 S., R. 15 E.
91-4701 BLM	0	-	0	Nelson Canyon	Stockwatering, Other	SE 17, T. 16 S., R. 15 E.
91-2539 BLM	0.0120	5	0	Pine Spring	Stockwatering	SW 19, T. 16 S., R. 15 E.
91-4703 BLM	0	-	0	Nelson Canyon	Stockwatering, Other	NW 21, T. 16 S., R. 15 E.
91-4703 BLM	0	-	0	Trib. to Nelson	Stockwatering, Other	NE 29, T. 16 S., R. 15 E.
91-4381 State of Utah	0.0150	7	0	Spring	Stockwatering,	NW 32, T. 16 S., R. 15 E.
91-2520 BLM	0.0110	5	0	Unnamed Spring	Stockwatering	NW 32, T. 16 S., R. 15 E.
*91-809 IPA	0.0500	22	0	Unnamed Spring	Mining, Other	SE 31, T. 16 S., R. 15 E.
91-2535 BLM	0.0120	5	0	Unnamed Spring	Stockwatering	SE 31, T. 16 S., R. 15 E.

728. Probable Hydrologic Consequences (PHC) Determination

728.100 PHC The Probable Hydrologic Consequences (PHC) Determination is provided as a separate document in Appendix 7-3. This determination indicates minimal (or no) negative impacts of the mining or reclamation operation on the quality and quantity of surface and ground water under seasonal flow conditions for the proposed permit and adjacent areas.

728.200 Basis for Determination The PHC is based on baseline hydrologic, geologic and other information such as public records and adjacent mine plan data statistically representative of the site (see Appendix 7-3).

With underground mining, there always exists a potential for impacting surface or ground water resources; however, as indicated in Section 525, subsidence effects are expected to be minimal due to the amount of cover and massive rock stratas between the mining and the surface. Effects on underground water are also expected to be minimal, since this water is not presently issuing to the surface, and any necessary discharges of the water would be in accordance with U.P.D.E.S. requirements.

Water in this area is primarily used for stock or wildlife watering. Any impacts to the small surface springs or seeps as a result of mining would likely be offset by the emergence of new seeps or springs due to fracturing, mine water discharge or replacement of water rights as described under Sections 525, and 731.800.

728.300 Findings

728.310 Adverse Impacts. Potential adverse impacts of the operation on the hydrologic balance include:

(1) Increased sediment loading;

(2) Diminution or interruption of water supplies on water rights;

(3) Discharge (pumping) of contaminated ground water;

(4) Erosion and streamflow alteration;

(5) Deterioration of water quality.

Each of the above potential impacts has been evaluated in the PHC (Appendix 7-3). Based on information provided in this plan to mitigate or otherwise control these impacts, the Probable Hydrologic Consequences determination is that of minimal (or no) negative impacts. (see Appendix 7-3)

728.320 Acid/Toxic Forming Materials (see Appendix 7-3)

728.330 Impacts On:

728.331 Sediment Yield (see Appendix 7-3)

728.332 Water Quality Parameters (see Appendix 7-3)

728.333 Flooding and Streamflow Alteration In the event that sufficient volumes of water are encountered underground that necessitate pumping, the applicant will take the following steps:

(1) Water will be held in sumps as long as possible to promote settling;

(2) Water will be sampled prior to discharge to ensure compliance with UPDES standards;

(3) Prior to mining receiving channel morphology parameters and erosion impacts will be evaluated prior to discharging to any drainage and at least quarterly during pumping to determine

what, if any, streamflow alteration is occurring;

(4) If adverse impacts to the receiving stream are noted, steps will be taken, with Division input and approval, to minimize or eliminate those impacts.

(Also see Appendix 7-3)

728.334 Water Availability (see Appendix 7-3)

728.335 Other Characteristics (see Appendix 7-3)

728.340 Surface Mining Activity N/A - Underground Mine

728.400 Permit Revision To be reviewed by the Division.

729. Cumulative Hydrologic Impact Assessment (CHIA)

729.100 CHIA Assessment provided by Division.

729.200 Permit Revision To be reviewed by the Division.

730. Operation Plan

731. General Requirements This will be an underground mine with approximately 48 acres of surface disturbance for mine site facilities and roads. Runoff from the disturbed minesite area is proposed to be controlled by a system of ditches and culverts which will convey all disturbed area runoff to a sediment pond for final treatment prior to discharge.

This permit application includes a plan, with maps and descriptions, indicating how the relevant requirements of R645-301-730, R645-301-740, R645-301-750 and R645-301-760 will be met. Each of

these sections are addressed in this Chapter, along with relevant Maps and Appendices.

731.100 Hydrologic-Balance Protection

731.110 Ground-Water Protection In order to protect the hydrologic balance, coal mining and reclamation operations will be conducted according to the plan approved under R645-301-731 and the following:

731.111 Ground-Water Quality Ground-water quality will be protected by the plan described in Section 731 and the following:

(1) Minimizing surface disturbance and proper handling of earth materials to minimize acidic, toxic or other harmful infiltration to ground-water systems;

(2) Testing (as-necessary) to ensure stockpiled materials are non-acid and non-toxic;

(3) Controlling and treating disturbed area runoff to prevent discharge of pollutants into ground-water, by the use of diversions, culverts, silt fences, sediment ponds and by chemical treatment if necessary;

(4) Minimizing and/or treating mine water discharge to comply with U.P.D.E.S. discharge standards;

(5) Establishing where ground-water resources exist within or adjacent to the permit area through a Baseline Study (done) and monitoring quality and quantity of significant sources through

impletation of a Water Monitoring Plan (proposed);

(6) Proper handling of potentially harmful materials (such as fuels, grease, oil, etc.) in accordance with an approved Spill Prevention Control and Countermeasure Plan (SPCC).

731.120 Surface-Water Protection In order to protect the hydrologic balance, coal mining and reclamation operations will be conducted according to the plan approved under 731 and the following:

731.121 Surface-Water Quality Surface-water quality will be protected by handling earth materials, ground-water discharges and runoff in a manner that minimizes the formation of acid or toxic drainage; prevents, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow outside the permit area; and, otherwise prevent water pollution.

Surface-water quality protection is proposed to be accomplished by the plan described in Section 731 and the following methods:

(1) Minimizing surface disturbance and proper handling of earth materials to minimize acidic, toxic or other harmful infiltration to ground-water systems;

(2) Testing (as-necessary) to ensure stockpiled materials are non-acid and non-toxic;

(3) Controlling and treating disturbed area runoff to prevent discharge of pollutants into surface-water, by the use of diversions, culverts, silt fences, sediment ponds, and by chemical treatment if necessary;

(4) Minimizing and/or treating mine water discharge to comply with U.P.D.E.S. discharge standards;

(5) Establishing where surface-water resources exist within or adjacent to the permit area through a Baseline Study (done) and monitoring quality and quantity of significant sources through impletation of a Water Monitoring Plan (proposed);

(6) Proper handling of potentially harmful materials (such as fuels, grease, oil, etc.) in accordance with an approved Spill Prevention Control and Countermeasure Plan (SPCC).

731.122 Surface-Water Quantity Surface water quantity and flow rates will be protected as described in Section 731.

731.200 Water Monitoring The water monitoring program was implemented in July, 2000. Baseline data will be collected (as possible) from new monitoring sites L-1-S through L-4-S. These sites are typically dry and no quality data has been gathered as yet. Sites L-6-G through L-10-G have been monitored for baseline in 1993, 1994, and 1995. These sites, along with IPA-1, IPA-2 and IPA-3, were monitored in December 2000 to determine if they were still viable and to establish a current baseline that will be continuous with operational monitoring.

Preceding each five year permit renewal, ground (springs) and surface waters will be sampled for baseline parameters. Baseline analysis on ground water will be collected at a low flow period. Analysis on surface waters will be conducted on samples collected at either high or low flow periods.

731.210 Ground-Water Monitoring The proposed ground-water monitoring plan is based on results of the Baseline Study and PHC determination. Based on

results of these studies, the only ground water expected in the permit area is that which has been identified as springs or seeps, and that which may be expected from perched aquifers encountered by the proposed mining. Since no portals are presently discharging on, or adjacent to, the permit area, and since mining has not started, no underground water is presently available for sampling; selected springs are proposed for sampling under the Ground Water Monitoring Plan.

If ground water is encountered in the future mining of a quantity which requires discharge, the water will be monitored in accordance with requirements of this section and a monitoring plan will be proposed at that time.

For purposes of the water monitoring program, springs and seeps are considered ground water and will be monitored as such.

731.211 Ground-Water Monitoring Plan Based on information in the PHC determination (Appendix 7-3), and as indicated above, the only ground water resources on or adjacent to the permit area that can be monitored at this time; are springs and seeps. See Appendix 7-6 for a detailed description of the water monitoring locations.

There are a total of ~~17~~13 ground water monitoring sites proposed for this property. (See Table 7-3). Station L-5-G is the potential mine discharge point, and will be monitored at least monthly, or as occurs, in accordance with U.P.D.E.S. Permit requirements. (See Table 7-4) Stations L-5-G, L-7-G, L-8-G, L-9-G, L-11-G, and L-12-G are significant springs or seeps located over the area of proposed mining. These springs will be monitored on a quarterly basis for parameters listed in Table 7-5.

Station L-6-G (Table 7-3) is in the vicinity of 2 listed springs, Mont Spring and Leslie Spring. These springs are within the same small drainage, and may in fact be

the same spring. Close examination of spring/seep and baseline monitoring stations show only one site in this drainage with any consistent flows - site H-18; therefore, this site was originally chosen to monitor the Mont and Leslie Spring area. However in recent years L-6-G has been dry and Location L-11-G has been added to replace site L-6-G. Sampling at L-6-G will be suspended as of the First Quarter of 2003.

Monitoring site L-7-G is intended to monitor a listed site known as Cottonwood Spring. Once again, a close examination of water rights information along with spring/seep and baseline monitoring has shown only one site in this area with any consistency - site #9; therefore, this is the site chosen for monitoring of Cottonwood Spring.

L-8-G is an unnamed spring that matches Earthfax sample site 10.

L-9-G is known as Pine Spring. There have been numerous seep/spring notations in the immediate area, but the only consistent flowing site is Earthfax site 16(Z); this is the site that will be monitored for Pine Spring.

L-10-G is also an unnamed spring that matches Earthfax sample site 14. Since this site is located over 1 mile south of the permit area, it has been replaced with L-12-G which is a more appropriate site to monitor. Monitoring of site L-10-G will be suspended as of the First Quarter of 2003.

L-11-G is known as Mont/Leslie Spring located in the bottom of the upper reaches of Lila Canyon. In recent years L-6-G (H-18) has been dry. However, there has been some minimum flow observed approximately one hundred yards above L-6-G where L-11-G was established.

L-12-G is an unnamed spring which had been developed but is now abandoned. The seep/spring inventory data is shown in Appendix 7-1 and locations are shown on Plate 7-1. Proposed water monitoring sites are shown on Plate 7-4.

L-13-S, L-14-S, and L-15-S are sites being monitored to assist in characterization of the various drainages.

L-16-G and L-17-G are seeps being monitored in Stinky Spring Canyon. These sites were not identified during baseline surveys and are believed to exist intermittently and are not always evident. These two seeps appear to be an important source of water for Bighorn sheep specifically in the early spring.

It should be noted that data has been gathered on the various seeps/springs as part of the original baseline inventory for the South Lease by I.P.A. The data was gathered over the years 1993, 1994 and 1995 and was stopped. In the second quarter of 2001 water monitoring continued.

IPA-1, 2 and 3 are groundwater Piezometers in the Little Park Wash area. These holes will be checked quarterly for water depth only. Monitoring of these sites will continue until the mining or subsidence renders them unusable.

At a minimum, total dissolved solids or specific conductance corrected to 25 degrees C, pH, total iron, total manganese and water levels will be monitored, on all points except IPA-1, 2 and 3.

731.212 Monitoring Reports Ground-water will be monitored and data will be submitted at least every three months for each monitoring location. Monitoring submittals will include analytical results from each sample taken during the approved reporting period. When the analysis of any ground-water sample indicates noncompliance with the permit conditions, then the

operator will promptly notify the Division and immediately take the actions provided for in 145 and 731.

731.213 Waiver of Monitoring N/A - No waiver is requested.

731.214 Ground-Water Monitoring Duration Ground-water monitoring will continue through mining and reclamation until bond release. If the ground water is a discharge strictly from the mining operations, monitoring will continue, or until the ground water source is no longer accessible. Other monitoring will continue until:

731.214.1 "The coal mining and reclamation operation has minimized disturbance to the prevailing hydrologic balance in the permit and adjacent areas and prevented material damage to the hydrologic balance outside the permit area; water quantity and quality are suitable to support approved postmining land uses"; or,

731.214.2 until "Monitoring is no longer necessary to achieve the purposes set forth in the monitoring plan approved under R645-301-731.211."

731.215 Monitoring Equipment equipment, structures and other devices used in conjunction with monitoring the quality of ground water on-site and off-site will be properly installed, maintained and operated and will be removed by the operator and will be removed by the operator when no longer needed.

731.220 Surface Water Monitoring Surface water monitoring will be conducted in accordance with the plan described in this section.

Based on results of the PHC determination, base-line study and other available information, numerous small springs and seeps exist within, and adjacent to, the permit area. In addition, ephemeral drainages in the area flow in response to snow melt and precipitation events. The proposed surface-water monitoring program will monitor the

significant surface water sources, including drainages above and below the disturbed mine site area, and all point-source discharges (i.e. sediment pond). Seeps, springs and potential mine water discharge will be monitored in accordance with the Ground Water Monitoring Plan in the previous section.

It should be noted that field sheets in Appendix 7-2 refer to a point HC-2, while Bar Graphs and Spreadsheets refer to a station B-1. It has been determined that these are the same point. The site is designated B-1 on Plate 7-1, with a red HC-2 in parenthesis. The electronic data inventory (EDI) also shows both B-1 and HC-2 designations for this site.

Another HC-2 site is listed in the seep/spring inventories in Appendix 7-6 and in the baseline data in Appendix 7-1. This station is also occasionally referred to as H-2 in the seep/spring inventories (Appendix 7-6). It has been determined that the H-2 and HC-2 sites referred to in these 2 appendices are the same station. The station location is shown on Plate 7-1, where it is designated H-2 with a green (HC-2) in parentheses.

There is one other station with confusing designations in the data from Appendix 7-2 and 7-6 - station HCSW-1. This station has 3 different designations in the data - HCSW-1, HSW-1, and HC-1. The point is shown as HC-1 on Plates 7-1 and 7-4; however, a note has been added to Plate 7-1 to show the station is also called (HCSW-1), to eliminate confusion. It should also be noted that there is a seep/spring site designated as H-1 on Plate 7-1. This is not to be confused with any of the above listed HC, HSW or HCSW sites.

These are the only known duplication or wrong designation of sample site numbers. It appears that different samplers or companies conducting seep/spring inventories occasionally used different designations for the same sites - the main problem being the use of H-n or HC-n for the same location, in some instances. Every effort has been made to refine the station identifications and locations on Plate 7-1 to reflect the sampling data provided in Appendices 7-1, 7-2 and 7-6. Wherever a site has 2 different designations, both are shown with one in parentheses.

The following is a list of proposed monitoring sites:

Station No.	Location	Type
L-1-S	Lila Canyon	Intermittent/Ephemeral
L-2-S	Rt. Fork Lila (above mine)	Ephemeral Stream
L-3-S	Lila Canyon Below Mine	Intermittent/Ephemeral
L-4-S	Sediment Pond Discharge	UPDES
L-5-G	Mine Water Discharge	UPDES (Groundwater)
L-6-G (suspended)	**Sampling Suspended 1Qtr 2003**	Spring
L-7-G	Cottonwood Spring	Spring
L-8-G	Unnamed Spring	Spring
L-9-G	Pine Spring	Spring
L-10-G (suspended)	**Sampling Suspended 1Qtr 2003**	Spring
L-11-G	Lila Canyon Wash	Spring
L-12-G	Section 25 Wash	Spring
L-13-S	Little Park Wash	Intermittent/Ephemeral
L-14-S	Section 25 Wash	Intermittent/Ephemeral
L-15-S (suspended)	**Sampling Suspended 1Qtr 2003**	Intermittent/Ephemeral
L-16-G	Stinky Spring Wash	Seep
L-17-G	Stinky Spring Wash	Seep
IPA-1	Little Park Wash	Borehole
IPA-2	Little Park Wash	Borehole
IPA-3	Little Park Wash	Borehole

Sampling at Locations L-13-S, L-14-S and L-15-S will no longer be required once the washes have been characterized as Intermittent or Ephemeral.

Locations of all monitoring sites are shown on Plate 7-4 , "Water Monitoring Location Map".

Proposed monitoring methods, parameters and frequencies are described in Table 7-3, "Water Monitoring Stations", Table 7-4, "Surface Water Monitoring Parameters", and Table 7-5 "Ground Water Monitoring Parameters".

In any one quarter a minimum of three unsuccessful attempts will be made by using either 4 wheel drive vehicles or ATV's to access all water monitoring sites prior to reporting any site as "No Access". However, safety and common sense will prevail while making these attempts.

Monitoring reports will be submitted to the Division at least every 3 months, within 30 days following the end of each quarter.

731.221 Surface-Water Monitoring Plan The proposed surface-water monitoring plan is detailed in Section 731.220. This plan is based on

PHC determination and analysis of all baseline hydrologic, geologic and other information in this permit application. The plan provides for monitoring of parameters that relate to the suitability of the surface water for current and approved postmining land uses and to the objectives for protection of the hydrologic balance as set forth in 751 (see Table 7-4).

731.222 Surface-Water Monitoring Parameters The surface-water monitoring parameters are shown in Table 7-4. Water monitoring locations and sample frequencies are described in Table 7-3 and on Plate 7-4 .

The plan will provide data to show impacts to potentially affected springs, seeps, impoundments and drainages within and adjacent to the permit area, by comparison with relevant baseline data and with applicable effluent limitations.

731.222.1 Non-point Source Locations The parameter list in Table 7-4 provides monitoring for all parameters required by this section. The monitoring locations and frequencies described in Table 7-3 show that all significant springs, seeps, impoundments and drainages that could potentially be impacted by the mining and reclamation operations will be monitored on a regular basis.

731.222.2 Point-source Discharges Point-source discharge monitoring will be conducted in accordance with 40 CFR Parts 122 and 123, R645-301-751 and as required by the Utah Division of Environmental Health for Utah Pollutant Discharge Elimination System (U.P.D.E.S.) permits. A U.P.D.E.S. discharge permit application has been submitted to the Division of Environmental Health for the proposed sediment pond and mine water for the Lila Canyon operation. Existing U.P.D.E.S. permit applications for the Lila Canyon Mine are provided in Appendix 7-5.

731.223 Reporting As indicated in Section 731.220, surface-water monitoring data will be submitted at least every 3 months for each monitoring location. When analysis of any surface water sample indicates non-compliance with the permit conditions, the company will promptly notify the Division and immediately

take actions to identify the source of the problem, correct the problem and, if necessary, to provide warning to any person whose health and safety is in imminent danger due to the non-compliance.

731.224 Duration Surface-water monitoring will continue through mining and reclamation until bond release. Locations, parameters and/or sampling frequency (other than U.P.D.E.S. discharge points) may be modified by the Division if:

731.224.1 "The operator has minimized disturbance to the hydrologic balance in the permit and adjacent areas and prevented material damage to the hydrologic balance outside the permit area; water quantity and quality are suitable to support approved postmining land uses"; or,

731.224.2 "Monitoring is no longer necessary to achieve the purposes set forth in the monitoring plan approved under 731.221.

731.225 Monitoring Equipment Equipment, structures and other devices used in conjunction with monitoring the quality and quantity of surface water on-site and off-site will be properly installed, maintained and operated and will be removed by the operator when no longer needed.

731.300 Acid- and Toxic-Forming Materials Drainage from acid- and toxic-forming materials and underground development waste into surface water and ground water will be avoided by implementation of a Spill Prevention Control and Countermeasure (SPCC) Plan and by the following:

731.311 Identification/Burial of Acid- or Toxic-Forming Materials Potentially acid- or toxic-forming materials will be identified by use of Material Safety Data Sheets (MSDS), or by direct sampling and analysis in the case of underground development waste.

Any material which exhibits acid- or toxic-forming characteristics will be properly stored, protected from runoff, removed to an approved disposal site or buried on site beneath a minimum of 4' of non-acid, non-toxic material.

Table 7-3
Lila Canyon Mine
Water Monitoring Stations

Station	Location	Type	Frequency	Remarks
L-1-S	Lila Canyon	Int. Stream	Monthly	At mine Site
L-2-S	Rt. Fork Lila (above mine)	Ephemeral Stream	Monthly	RF Above Mine Site
L-3-S	Lila Canyon (below mine)	Int. Stream	Monthly	RF Below Mine Site
L-4-S	Sediment Pond	Discharge	Monthly or as occurs	Per UPDES Permit
L-5-G	Mine Water	Discharge	Monthly or as occurs	Per UPDES Permit
L-6-G	Lila Canyon	Spring	Sampling Suspended 1Qtr 2003	Replaced by L-11-G Water Right 91-617
L-7-G	Little Park	Spring	Quarterly	Cottonwood Spring Sample Site 9 Water Right 91-2521
L-8-G	Little Park	Spring	Quarterly	Unnamed Spring Sample Site 10 Water Right 91-2538
L-9-G	Little Park	Spring	Quarterly	Pine Spring Sample Site 16Z Water Right 91-2539
L-10-G	Williams Draw	Spring	Sampling Suspended 1Qtr 2003	Replaced by L-12-G Water Right 91-809

Table 7-3
Lila Canyon Mine
Water Monitoring Stations

Station	Location	Type	Frequency	Remarks
L-11-G	Lila Canyon	Spring	Quarterly	Mont/Leslie Spring Replaces L-6-G Water Right 91-618
L-12-G	Section 25 Spring	Spring	Quarterly	Replaces L-10-G
L-13-S	Little Park Wash	Dry Wash	Monthly	At Road Crossing
L-14-S	Section 25 Wash	Dry Wash	Monthly	At Road Crossing
L-15-S	Williams Draw Wash	Dry Wash	Sampling Suspended 1Qtr of 2003	At Road Crossing
L-16-G	Stinky Spring Wash	Seep	Quarterly	Top of Mancos
L-17-G	Stinky Spring Wash	Seep	Quarterly	Top of Mancos
IPA-1	Little Park	Borehole	Quarterly	Water Level Only
IPA-2	Little Park	Borehole	Quarterly	Water Level Only
IPA-3	Little Park	Borehole	Quarterly	Water Level Only

NOTE: Sites L-13-S, L-14-S, and L-15-S will no longer be monitored after the washes have been characterized.

Table 7-4
Lila Canyon Mine
Surface Water Monitoring Parameters
Operational and Post-Mining

Field Measurements	Reported As
Water Level or Flow	Depth, Flow
pH	Standard Units
Specific Conductivity (ohms/cm)	umhos/cm @ 25° C
Temperature	° C
Dissolved Oxygen	mg/l
Laboratory Measurements	**Reported As**
Total Dissolved Solids	mg/l
Total Settleable Solids	(UPDES)
Total Suspended Solids	mg/l
Total Hardness ($CACO_3$)	mg/l
Total Alkalinity	mg/l
Carbonate (CO_3^{-2})	mg/l
Bicarbonate $(HC)_3^{-1}$)	mg/l
Calcium (Ca) (Dissolved)	mg/l
Chloride (Cl^-)	mg/l
Iron (Fe) (Dissolved)	mg/l
Iron (Fe) (Total)	mg/l
Magnesium (Mg) (Dissolved)	mg/l
Manganese (Mn) (Dissolved)	mg/l
Manganese (Mn) (Total)	mg/l
Potassium (K) (Dissolved)	mg/l
Sodium (Na) (Dissolved)	mg/l
Sulfate (SO_4^{-2})	mg/l
Oil and Grease (As required)	mg/l
Cations	meq/l
Anions	meq/l

Table 7-5
Lila Canyon Mine
Ground Water Monitoring Parameters
Operational and Post-Mining

Field Measurements	Reported As
Water Level or Flow	Depth, Flow
pH	Standard Units
Specific Conductivity	umhos/cm @ 25° C
Temperature	° C
Laboratory Measurements	**Reported As**
Total Dissolved Solids	mg/l
Total Hardness ($CACO_3$)	mg/l
Total Alkalinity	mg/l
Carbonate (CO_3^{-2})	mg/l
Bicarbonate $(HC)_3^{-1}$)	mg/l
Calcium (Ca) (Dissolved)	mg/l
Chloride (Cl^-)	mg/l
Iron (Fe) (Dissolved)	mg/l
Iron (Fe) (Total)	mg/l
Magnesium (Mg) (Dissolved)	mg/l
Manganese (Mn) (Dissolved)	mg/l
Manganese (Mn) (Total)	mg/l
Potassium (K) (Dissolved)	mg/l
Sodium (Na) (Dissolved)	mg/l
Sulfate (SO_4^{-2})	mg/l
Oil and Grease (As required)	mg/l
Cations	meq/l
Anions	meq/l

731.312 Storage of Acid- or Toxic-Forming Materials Storage of potentially acid- or toxic-forming materials, such as fuel, oils, solvents and non-coal waste will be in a controlled manner, designed to contain spillage and prevent runoff to surface or ground water resources.

All oils and solvents will be stored in proper containers within enclosed structures. Fuels will be stored in appropriate tanks, enclosed within concrete or earthen bermed areas designed to contain any spillage.

Non-coal waste (garbage) will be stored in a designated location, in dumpsters, and removed to an approved landfill (East Carbon Development Contractors - ECDC) on a regular, as-needed basis.

Unused or obsolete equipment or supplies will be stored in a designated area. Drainage from the storage area will be directed to the sediment pond as shown on the Sediment Control Map, Plate 7-5.

Underground development waste (if any) will also be stored in a designated area. Such waste will be tested for acid- or toxic-forming potential, and if found to be acid- or toxic-forming, the waste site will be protected from surface runoff by the use of earthen berms.

731.320 Storage, Burial, Treatment All storage, burial and treatment practices will be as described in this permit, and consistent with applicable material handling and disposal provisions of the R645-Rules.

731.400 Transfer of Wells There are presently three Piezometers on this permit. When these Piezometers are no longer required, they will be sealed in a safe, environmentally sound manner in accordance with regulations (see Section 631.200).

There are presently no plans to transfer any wells to any other party.

731.500 Discharges The only proposed discharges from this operation will be from the sediment pond and/or underground mine water. Each of these potential discharges would be monitored and controlled within requirements of approved U.P.D.E.S. Discharge Permits

731.510 Discharges into an Underground Mine There are no plans to discharge any water into an underground mine. This section is not applicable.

731.512 Types of Discharge The only planned discharges from this site are water, in the form of sediment pond discharge or underground mine water discharge.

731.512.1 Water See Section 731.512.

731.512.2 Coal Processing Waste N/A - There are no plans to process coal or discharge coal processing waste from this site.

731.512.3 Fly Ash from a Coal-Fired Facility N/A - There are no plans for a coal-fired facility at this time.

731.512.4 Sludge from Acid-Mine-Drainage Treatment N/A There are no plans for an acid-mine-drainage treatment facility at this time.

731.512.5 Flue-gas Desulfurization Sludge N/A - There are no plans for flue-gas desulfurization at this site.

731.512.6 Inert Materials N/A - There are no plans to use or discharge inert materials used for stabilizing underground mines.

731.512.7 Any underground mine development wastes that cannot be left and permanently stored underground will be brought to the surface and stored in a controlled, designated location. Final disposal of such material will depend on its volume, physical and chemical characteristics and potential for use in reclamation. There are presently no plans to return such material underground; however, if this does become necessary in the future, complete plans will be submitted for disposal at that time.

731.513 Water from Underground Workings Based on historical data from other mines in the area, some mine water can be expected to be encountered during the mining operation. Typically, such water is stored in "sumps" or designated areas in the mine and used for mining operations or discharged to the surface. A sump is an underground storage area that is used to temporarily store water before it is used underground or pumped to the surface for discharge. The main purpose of a sump is to remove sediments. The sump will also remove oil/grease if they were to get into the water. The size of a sump can vary from a few hundred gallons to several thousand gallons. The size normally depends on the space available and the amount of water needed for mining operations.

In order to more accurately define the potential impact of the mine on ground water, underground usage discharge amounts, if they were to occur, would be documented. This information along with the surface monitoring program will provide the best information available as to the potential impact of the mine on ground water.

IPA Piezometers 1-3 will still be monitored quarterly if possible. The three Piezometers were monitored on December 22, 2000. The water level probe during this period was unable to reach the depth required to measure the water level of IPA-1 and IPA -3. Another attempt will be made to enter these Piezometers when the sites are accessible.

The water level of IPA-2 was very consistent with the last reading taken on April 29, 1996. This well (IPA-2) is the farthest west of the three Piezometers and is up dip from the other two. Any impact to ground water would be noticed very quickly at IPA-2. This information from IPA-2 along with the past baseline data on the three Piezometers and the in mine water monitoring program mentioned above, would provide an accurate evaluation of potential ground water impacts.

At the present time, there are no plans to divert water from the underground workings of this operation to any other underground workings.

If it became necessary to discharge water from the mine, this water would be discharged in accordance with the UPDES permit application in Appendix 7-5. The water would be discharged into the North Fork of Coleman Wash (Lila Canyon). Refer to Plate 7-5.

731.520 Gravity Discharges Location of the proposed portal slopes are below the western (upper) exposure of the easterly dipping coal bed. In the area immediately around the proposed portals, no water is presently issuing from the strata above or below the coal outcrop; therefore, it is assumed any water encountered in the underground mining will not be under artesian pressure or with sufficient hydrostatic head to raise it to the portal site.

The coal seam to be mined dips away from the portal site at approximately 10%. If water is encountered in the mining, it will likely be at a static level far below the exposed outcrop or rock slopes. This may result in some possible mine discharge from pumping, but not from gravity.

731.521 Portal Location The proposed access portals are below the characteristics will be properly stored, protected from runoff, removed to an approved disposal site or buried on site beneath a minimum of 4' of non-acid, non-toxic material. coal outcrop, as shown on Figure 7-1, Plates 5-5 and 7-5. The fan is to be located above, at the outcrop. The rock slopes will slope up to the east at approximately 12% to contact the coal seam; however, the coal seam is dipping down to the east in this area. The approximate point of contact between the rock slopes and the coal seam will be 1227' from the surface at an elevation of 6300'. Ground water levels in the mining area, based on the 3 water monitoring holes and other geologic data, appear to be nearly static at elevation 5990 in this area (see Figure 7-1 and Plate 7-1).

Water level in the mine would have to raise approximately 310' to reach the rock slope/coal seam contact and result in a gravity discharge. Water monitoring results and other historical data in the area do not indicate this is likely to occur.

731.522 Surface Entries after January 21, 1981 This is not known to be an acid-producing or iron-producing coal seam; however, proposed portals are located to prevent gravity discharge from the mine (see Section 731.521).

731.600 N/A - There are no proposed coal mining or reclamation operations within 100 feet of a perennial or intermittent stream. Section 731.600 is not applicable.

731.700 Cross Sections and Maps The following is a list of cross-sections and maps provided in this section of the P.A.P.

Plate 7-1	Permit Area Hydrology Map
Plate 7-2	Disturbed Area Hydrology/Watershed
Plate 7-3	Water Rights Locations
Plate 7-4	Water Monitoring Location Map
Plate 7-5	Proposed Sediment Control Map
Plate 7-6	Proposed Sediment Pond
Plate 7-7	Post-Mining Hydrology

All required maps and cross-sections have been prepared by, or under the supervision of, and certified by a Registered Professional Engineer, State of Utah.

731.710 General Area Hydrology Plate 7-1.

731.720 Plate 7-2.

731.730 Water Monitoring Map Plate 7-4.

731.740 Sediment Pond Map Plate 7-6.

731.750 Plate 7-6.

731.760 Other Maps (See Section 731.700 for a complete list of maps provided in this section).

731.800 Water Rights and Replacement (See Section 727)

732. Sediment Control Measures

732.100 Siltation Structures The only proposed siltation structure for this site is the sediment pond. All disturbed area runoff is proposed to be directed to this pond for final treatment prior to discharge.

The sediment pond will be constructed and maintained in compliance with applicable regulations. Details of the proposed pond are discussed in the following section and in Appendix 7-4.

732.200 Sedimentation Ponds As discussed above, all disturbed area runoff is proposed to be directed to a sediment pond for final treatment prior to any discharge. The proposed sediment pond will be located at the low point of the disturbed area, as shown on Plate 7-5.

732.210 Sediment Pond Details The proposed sediment pond is considered temporary, and will be removed during final reclamation. The pond is designed in compliance with the requirements of the following sections, as required:

356.300 - The pond will be maintained until the disturbed area has been stabilized and revegetated. Removal shall not be any sooner than 2 years after the last augmented seeding;

356.400 - Upon removal, the pond area will be reclaimed and reseeded according to the reclamation plan;

513.200 - N/A - The proposed sediment pond does not meet the size or other qualifying criteria of MSHA, 30 CFR 77.216(a);

763 - Refer to this regulation addressed later in this chapter.

Design details for the sediment pond and site drainage control are addressed in Appendix 7-4 of this P.A.P.

732.220 MSHA Requirements This section does not apply since there are no plans for construction of coal processing waste dams or embankments at this site. The proposed pond does

not meet the size or other qualifying criteria of MSHA, 30 CFR 77.216(a).

732.300 Diversions There is one undisturbed diversion planned for this site. This diversion consists of a bypass culvert beneath the sediment pond, which will allow undisturbed runoff to bypass the site without mixing with disturbed area runoff.

Other diversions planned consist of disturbed area ditches and culverts, as shown on Plate 7-5. Design details for all diversions are provided in Appendix 7-4.

All diversions will be constructed and maintained to comply with the requirements of R645-301-742.100 and R645-301-742.300. Details are described under those respective sections of this chapter.

732.400 Road Drainage All roads will be constructed, maintained and reconstructed to comply with R645-301-742.400. Specific information to road drainage is provided under that section of this chapter.

732.410 Alteration or Relocation of Natural Drainages There are no plans to construct roads which will require alteration or relocation of natural drainageways, other than by providing culverted crossings over ephemeral drainages. There are no plans to alter or relocate any intermittent or perennial drainages in conjunction with road construction.

Road construction and design details are provided in Chapter 5 of this P.A.P. Road drainage and culvert design details are provided in Appendix 7-4.

732.420 Culverts Culvert details are provided in Appendix 7-4. All undisturbed culvert inlets will be provided with headwall protection, consisting of inlet sections, rock or concrete.

733. Impoundments The only water impoundment proposed for this site is the sediment pond. Design details for the pond are provided in Appendix 7-4 and on Plate 7-6.

733.100 General Plans The general plan for this site is to drain runoff from the disturbed area into a single sedimentation pond for treatment prior to discharge. Site drainage and design details are described in Appendix 7-4. The general plan includes the following, at a minimum:

733.110 Certification The sediment control plan and proposed sediment pond designs have been prepared and certified by a Registered Professional Engineer, State of Utah.

733.120 Maps and Cross Sections Sediment pond locations, design plans and cross sections are provided on Plates 7-5 and 7-6, respectively.

733.130 Narrative A complete description of the proposed sediment pond along with volumes and design/construction details in provided in Appendix 7-4.

733.140 Survey The proposed sediment pond is not located within a potential subsidence area from past underground mining operations.

733.150 Hydrologic and Geologic Information Relevant hydrologic and geologic information for the sediment pond is provided in Appendix 7-4.

733.160 Certification Statement All proposed sediment pond structures are provided with this submittal. The structure will be constructed prior to construction of the mine site area, but not before receiving Division approval.

733.200 Permanent and Temporary Impoundments As indicated earlier, the proposed sediment pond is classed as temporary.

733.210 Design Requirements The proposed sediment pond is temporary; therefore, the pond is not designed to meet requirements of MSHA 30 CFR 77.216.

The proposed pond is not located where failure would expect to cause loss of life or serious property damage. As shown in Appendix 7-4, the proposed pond embankment will have a

minimum of 3H : 1V on the inside slope and 2H : 1V on the outside. These slopes, along with the 95% compaction requirement, will ensure a static safety factor in excess of 1.3, as required.

733.220 Permanent Impoundment Section 733.220 is not applicable since the impoundment will be temporary.

733.230 Temporary Impoundment The proposed sediment pond is a temporary impoundment, and will be removed when reclamation sediment control and revegetation criteria are met, in accordance with Phase II Bond Release criteria.

733.240 Inspections/Potential Hazards As indicated under Section 515.200, if any examination or inspection shows a potential hazard exists, the person who examined the impoundment will promptly notify the Division of the finding and emergency procedures formatted for public protection and remedial action.

734. Discharge Structure All discharges from sedimentation ponds, diversions and culverts will be protected from erosion by the use of adequately sized rip-rap, concrete or other approved protection. Details for outlet protection for all drainage control structures are provided in appendix 7-4. All discharge structures have been designed according to standard engineering design procedures.

735. Disposal of Excess Spoil No excess spoil production is anticipated.

736. Coal Mine Waste Any areas designated for the disposal of coal mine waste will be constructed and maintained to comply with R645-301-746. Details are described under that section.

737. Noncoal Mine Waste Storage and final disposal of noncoal mine waste are described under section 747.

738. Temporary Casing and Sealing of Wells There are no wells proposed to be used to monitor ground water conditions associated with this permit or operation.

740. Design Criteria and Plans Design criteria and plans for this permit are detailed in Appendix 7-4. The following section will describe the general drainage and sediment control plan.

741. General Requirements The proposed operation is an underground mine with a relatively small surface disturbance for transportation, support and coal handling facilities. The proposed surface facilities will comprise a disturbed area of approximately 39.81 acres. Access roads and utility lines will consist of approximately 10 acres of additional disturbance along a BLM Right-of-Way designated as a "Transportation Corridor".

The majority of undisturbed runoff from areas above the proposed mine site will be diverted beneath the site via an undisturbed diversion culvert. Runoff from the disturbed mine site area will be directed to a sediment pond, designed to contain and treat the runoff from a 10 year - 24 hour precipitation event for the contributing watershed. Disturbed area runoff will be directed to the sediment pond via a combination of properly sized ditches and culverts. The general drainage control plan for the mine site is shown on Plate 7-5. The complete Drainage Design and Control Plan is provided in Appendix 7-4 of this P.A.P.

742. Sediment Control Measures See Appendix 7-4 for Sediment Control Measure details.

742.100 General Requirements

742.110 Designed/Constructed/Maintained Appropriate sediment control measures will be designed, constructed and maintained using the best technology currently available to:

742.111 "Prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area;"

This will be accomplished by the construction of undisturbed diversions to allow most undisturbed runoff to by-pass the site and by routing all disturbed runoff to a sediment pond for treatment prior to discharge.

742.112 "Meet the effluent limitations under R645-301-751;"

Any discharge from the sediment pond will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

742.113 "Minimize erosion to the extent possible:" This will be accomplished by proper routing of drainage, and by the use of energy dissipators and/or erosion protection at all sediment pond, ditch and culvert outlets and in ditches where erosive velocities are expected.

742.120 Sediment Control Measure Sediment control measures within and adjacent to the disturbed areas are detailed in Appendix 7-4. These measures include, but are not limited to:

742.121 As discussed in Appendix 7-4, runoff from the disturbed area will be captured in a sediment pond and/or treated as necessary to meet effluent limitations prior to discharge.

742.122 As discussed in Appendix 7-4, the majority of undisturbed drainage from above the mine site will be diverted via designed undisturbed diversions.

742.123 Undisturbed diversions will consist of properly designed and protected channels and/or culverts as described in Appendix 7-4.

742.124 The primary means of velocity reduction is planned to be the use of rip-rap; however, other methods such as straw dikes, check dams and/or vegetative filters may be employed during the operational or reclamation phases as determined necessary, and with Diversion approval.

742.125 There are no plans to treat runoff with chemicals. Based on extensive experience with runoff in this area, effluent requirements for discharge can normally be met by containment and settling in a sediment pond.

742.126 It is expected that water will be encountered in the underground mining; however, this water will be used for mining needs and only discharged when no further storage is available underground. Any discharge of mine water will meet applicable effluent limitations. Such water will be sampled (and treated if necessary) prior to discharge.

742.200 Siltation Structures As described in Appendix 7-4 the sediment pond will provide for sediment removal for most of the surface facility disturbance. An alternate sediment control method of berms and silt fences will be used at the fan site. The description of this alternate sediment control method is also described in Appendix 7-4. This is necessary due to its remote location and rough terrain. Other sediment structures that might be used around the surface facilities are temporary sediment traps such as straw dikes and/or catch basins.

742.210 General Requirements Siltation structures will be designed, constructed and maintained in accordance with the following regulations.

742.211 Siltation structures will be constructed using the best technology currently available to prevent additional contributions of suspended solids and sediment to streamflow outside the permit area to the extent possible. Sediment control structures and details are discussed in Appendix 7-4.

742.212 The siltation structures (i.e. sediment pond) will be constructed prior to any coal mining and reclamation operations. Upon construction, the pond and any other siltation structures will be certified by a qualified

registered professional engineer to be constructed as designed and approved in the reclamation plan.

742.213 The sediment pond will be designed, constructed and maintained in accordance with all applicable regulations. See 732.200, 733.200 and Appendix 7-4 for details.

742.214 Any discharge of water from underground workings to surface waters will meet applicable effluent limitations of 751. If such water is found not to meet those requirements, the water will be treated underground prior to discharge, or passed through a siltation structure prior to leaving the permit area.

742.220 Sedimentation Ponds The sedimentation pond will meet the following criteria:

742.221.1 The pond will be used individually;

742.221.2 The pond is located at the lower end of the disturbed area and out of any perennial stream (See Plate 7-5);

742.221.3 The sediment pond will be designed, constructed and maintained to:

742.221.31 The pond is designed to contain the runoff from a 10 year - 24 hour precipitation event for the area in addition to a minimum of 2 years of sediment storage.

742.221.32 The pond is designed to provide a minimum of 24 hour retention of the runoff from a 10 year - 24 hour precipitation event.

742.221.33 The pond is designed to contain the runoff from a 10 year - 24 hour precipitation event plus a minimum of 2 years of sediment storage.

742.221.34 A nonclogging dewatering device is proved as described in Appendix 7-4.

742.221.35 This will be accomplished by proper design, construction and maintenance of the pond as described in Appendix 7-4.

742.221.36 As discussed in Appendix 7-4, sediment will be removed when the level reaches the 2 year storage level. Since the pond is oversized, this leaves adequate room for storage of the design event.

742.221.37 The sediment pond construction ensures against excessive settlement. See "Sediment Pond Construction Requirements" in Appendix 7-4.

742.221.38 Sediment pond will be free of sod, large roots, frozen soil, and acid- or toxic forming coal processing waste. See "Sediment Pond Construction Requirements" in Appendix 7-4.

742.221.39 The sediment pond will be compacted properly. See "Sediment Pond Construction Requirements" in Appendix 7-4.

742.222 Sediment Ponds Meeting MSHA Criteria The proposed pond does not meet the size or other qualifying criteria of MSHA, 30 CFR 77.216(a). Therefore, this section is not applicable.

742.223 Sediment Ponds Not Meeting MSHA Criteria As discussed in Appendix 7-4, the pond will be equipped with a principle spillway culvert and an open channel spillway each sized to safely discharge runoff from a 25 year - 6 hour precipitation event.

742.223.1 The Principle Spillway culvert is and the Emergency Overflow Culverts will be corrugated,

metal pipe. Each one designed to carry sustained flows.

742.223.2 N/A - See 742.223.1

742.224 N/A - See 742.223.1

742.225 N/A - No exception requested.

742.225.1 N/A

742.225.2 N/A

742.230 Other Treatment Facilities No other treatment facilities are planned for this operation. Therefore, Section 742.230 is not applicable.

742.240 Exemptions No exemptions are requested at this time; however, since this is a new proposed operation, the need for Small Area Exemptions and/or Alternate Sediment Control Areas may arise in the future.

742.300 Diversions

742.310 General Requirements

742.311 All diversions are considered temporary, and will be removed upon final reclamation.

Diversions are designed to minimize adverse impacts to the hydrologic balance within the permit and adjacent areas, to prevent material damage outside the permit area and to assure the safety of the public detailed diversion designs are presented in Appendix 7-4 of this P.A.P.

742.312 See Appendix 7-4 for diversion designs.

742.313 As indicated, all diversions for the Lila Canyon Mine are temporary, and will be removed when no longer needed. Land disturbed by removal will be reclaimed in accordance with R645-301 and R645-302. Prior to diversion removal, downstream water treatment facilities will be modified or removed. See Reclamation Hydrology Section of Appendix 7-4.

742.320 Diversion of Perennial and Intermittent Steams Section 742.320 is not applicable since there are no diversions planned for perennial or intermittent streams within the permit area.

742.330 Diversion of Miscellaneous Flows All diversions within the permit area are of miscellaneous flows.

742.331 Certain miscellaneous undisturbed flows are proposed to be diverted around the disturbed area. Other flows are diverted within the disturbed area and to the sediment pond, as described in Appendix 7-4.

742.332 See Appendix 7-4.

742.333 All temporary diversions are designed to safely pass the peak runoff of a 2 year - 6 hour precipitation event, as required. See Appendix 7-4 for details.

742.400 Road Drainage

742.410 All Roads All roads are designed in accordance with requirements of 534. Drainage control for all roads is discussed in detail in Appendix 7-4. No part of any road is planned to be located in the channel of an intermittent or perennial stream. As shown on Plate 7-2, roads are located to minimize downstream sedimentation and flooding.

742.420 Primary Roads Primary road design is discussed under 534.

742.421 As described in Section 534, all primary roads are to be located, insofar as practical, on the most stable available surfaces.

742.422 There are no stream fords planned for this operation.

742.423 Drainage Control Road drainage control is discussed in Appendix 7-4.

742.423.1 Primary roads will be equipped with adequate drainage control, including ditches, culverts and relief drains. The drainage control system is designed, and will be constructed and maintained, to pass the peak runoff safely from a 10 year - 6 hour precipitation event, as described in Appendix 7-4.

742.423.2 Culvert design and installation details are described in Appendix 7-4. Inlets and outlets are protected from erosion. Undisturbed culvert inlets are to be equipped with trash racks.

742.423.3 Drainage ditch design details are provided in Appendix 7-4.

742.423.4 There are plans to alter the drainage channel on the south boundary of the disturbed area. This drainage is an ephemeral channel with no raparian habitat. A stream alteration permit will not be required for this channel. A 60 inch culvert and a sedimentation pond will be placed in this channel. Installation of this culvert and sedimentation control plans are described in Appendix 7-4. To ensure that state of the art technology is incorporated, the final reclamation plans for the sedimentation pond area will be submitted prior to commencement of final reclamation of this area.

742.423.5 Stream channel crossings will be provided by culverts designed, constructed and maintained using current, prudent engineering practice, as described in Appendix 7-4.

743. Impoundments

743.100 General Requirements All impoundments associated with this operation are considered temporary.

743.110 Not applicable there are no impoundments planned that meet the criteria of MSHA, 30 CFR 77.216 (a).

743.120 The design of impoundments have been prepared and certified by a qualified, registered professional engineer. As described in Appendix 7-4, the proposed sediment pond will have at least 2' of freeboard above the highest flow level in the emergency spillway, which is adequate to resist overtopping by waves and by sudden increases in storage volumes.

743.130 As described in Appendix 7-4, the sediment pond will be equipped with a culvert riser principal spillway and a culvert riser emergency overflow sized to safely pass the runoff from a 25 year - 6 hour precipitation event.

743.131 The principal spillway design is discussed below.

743.131.1 The principle spillway will be constructed of corrugated metal pipe. The emergency spillway will also be constructed of corrugated metal pipe.

744. Discharge Structures

744.100 The sediment pond emergency spillway will be a vertical corrugated metal pipe. It will flow into a 60" diameter C.M.P. beneath the pond and discharge onto an engineered rip-rap apron to prevent scouring or erosion. (See Appendix 7-4).

Diversions and culvert outlets that are expected to have flow velocities in excess of 5 fps will also be equipped with erosion and velocity controls as described in Appendix 7-4.

744.200 Discharge structures have been designed and certified according to standard engineering design procedures. (See Appendix 7-4).

745. Disposal of Excess Spoil Section 745 is not applicable since there are no plans for disposal of excess spoil at the Lila Canyon operation.

746. Coal Mine Waste The area designated for coal mine waste disposal is within an existing depression area which is located beneath and around the proposed coal storage pile area as shown on Plates 5-2, 7-2 and 7-5. This disposal area will be used for disposal of the rock slope material, reject from coal processing, coal contaminated waste from the mine (i.e. roof falls, etc.) and/or sediment pond waste.

The designated waste area will be within the disturbed area and drained to the sediment pond, and will be constructed according to Division and MSHA requirements. Coal mine waste disposal is discussed in detail under Section 536 of this permit.

746.100 General Requirements

746.110 All coal mine waste will be placed in a new disposal area within the permit area as discussed in Section 536 and 746.

746.120 The area selected for coal mine waste disposal will drain to the sediment pond for final treatment to minimize adverse effects on the surface and ground water quality and quantity. (See Plates 7-2 and 7-5).

746.200 Refuse Piles. The refuse area is described under Coal Mine Waste in Section 746 and detailed in Section 536. Rock slope material will be used as fill and is referred to as refuse. No coal refuse pile is anticipated. Other than described in Section 536.

746.210 In the event a refuse pile is needed for future operations the refuse piles would be designed to meet the requirements of

the above listed Division regulations as well as applicable MSHA regulations. See Section 536 for details.

746.211 The coal mine waste disposal areas will not be located in an area containing springs, seeps or water courses. As shown on Plates 5-2 and 7-5 and described in Appendix 7-4, runoff from the areas will be drained to the sediment pond.

746.212 As described in Sections 536 and 746, the coal refuse will be placed within the mine workings, rock slope material will be placed in existing depression areas. These areas are below grade and will drain to the sediment pond. Due to the location (below grade) no berms or diversion ditches are planned for the Coal Mine Waste Area. See Appendix 7-4 for hydrologic details.

746.213 Not applicable since there are no underdrains planned for this pile.

746.220 Surface Area Stabilization

746.221 The plan for revegetation of the area is discussed in Section 536.

746.222 There are no plans for any permanent impoundments on the refuse or Coal mine waste area. Small depressions may exist for a short time until regrading is completed. These depressions are normally less than one foot in depth and not left for more than 30 days.

746.300 This section is not applicable since there are no plans to construct any impounding structures of coal mine waste or to impound coal mine waste.

746.400 This section is not applicable since there are no plans to return coal processing waste to abandoned underground workings.

747. Disposal of Noncoal Waste. Disposal of non-coal mine waste is discussed under Section 528.330 of this permit.

747.100 As indicated in Section 528.330, non-coal mine waste will be stored in a controlled manner in a designated area on site. Final disposal of all noncoal mine waste , except concrete during reclamation, will be in a state-approved solid waste disposal area (E.C.D.C.).

747.200 As shown on Plates 5-2B and 7-5, the proposed noncoal mine waste storage area is in a designated site, free of springs or seeps, and drained to the sediment pond.

747.300 There are no plans to dispose of noncoal mine waste within the permit area, except concrete during reclamation. The concrete will be buried beneath a minimum of 2' of non-acid, non-toxic material, and will not degrade surface or ground water.

748. Casing and Sealing of Wells There are only three ground water Piezometers on the site IPA-1, IPA-2 and IPA-3. They will be reclaimed according to the requirements of the Division's Performance Standards. If any additional wells are required in the future, requirements of this section will be met.

750. Performance Standards

751. Water Quality Discharges of water from this operation will be made in compliance with all Utah and federal water quality laws and regulations and with effluent limitations for coal mining promulgated by the U. S. Environmental Protection Agency set forth in 40 CFR Part 434. See Sections 731 and 742.

752. Sediment Control Measures Sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs described under Sections 732, 742, 760 and Appendix 7-4.

752.100 Siltation Structures Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs described under Sections 732, 742, 763 and Appendix 7-4.

752.200 Road Drainage Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed as described under Sections 732.400, 742.400 and 762.

752.210 Control or Prevent Erosion See Section 742.400 and Appendix 7-4.

752.220 Control or Prevent Additional Disturbance See Section 742.400 and Appendix 7-4.

752.230 Effluent Standards See Section 742.400 and Appendix 7-4.

752.240 Degradation of Ground Water Systems See Section 742.400 and Appendix 7-4.

752.250 Altering Normal Flow of Water See Section 742.400 and Appendix 7-4.

753. Impoundments and Discharge Structures Impoundments and discharge structures will be located, maintained, constructed and reclaimed as described in Sections 733, 734, 743, 745, 760 and Appendix 7-4.

754. Disposal of Excess Spoil, Coal Mine Waste and Noncoal Mine Waste Disposal areas for excess spoil, coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed to comply with Sections 735, 736, 745, 746, 747 and 760.

755. Casing and Sealing of Wells Not applicable since no wells planned for this site.

760. Reclamation Reclamation hydrology is detailed in Appendix 7-4.

761. General Requirements Upon completion of operations, the disturbed area will be reclaimed. All drainage and sediment controls are considered temporary and will be removed when no longer required. The sediment pond will remain in place until Phase II Bond Release requirements have been met. At that time, the pond will be removed and the area will be reclaimed in accordance with the approved plan.

762. Roads All roads within the disturbed area are temporary, and will be removed and reclaimed upon completion of operations. An access road will be left in place to reach the sediment pond; however, this road will also be removed and reclaimed when the sediment pond is removed.

762.100 Upon removal of roads, culverts and diversions will also be removed and the natural drainage patterns will be restored.

762.200 Cut and fill slopes will be reshaped according to the approved reclamation plan. This reshaping will be compatible with the postmining land use and will complement the drainage pattern of the surround terrain. Road reclamation is described in Section 550.

763. Siltation Structures. See Appendix 7-4 for details on removal of siltation structures.

763.100 Siltation Structures will be Maintained. As indicated in Section 761, the sediment pond will remain in place until the stability and vegetation requirements for Phase II Bond Release are met. This will be a minimum of 2 years after the last augmented seeding. At this time, the pond will be removed and the area reclaimed.

763.200 Structure is Removed Upon removal of the sediment pond, the area will be regraded and revegetated in accordance with the approved reclamation plan and Sections 358, 356 and 357.

764. Structure Removal A timetable for reclamation activities is provided in Section 542.100.

765. Permanent Casing and Sealing of Wells There are only three ground water Piezometers on the site IPA-1, IPA-2 and IPA-3. They will be reclaimed according to the requirements of the Division's Performance Standards. If any additional wells are required in the future, requirements of this section will be met.

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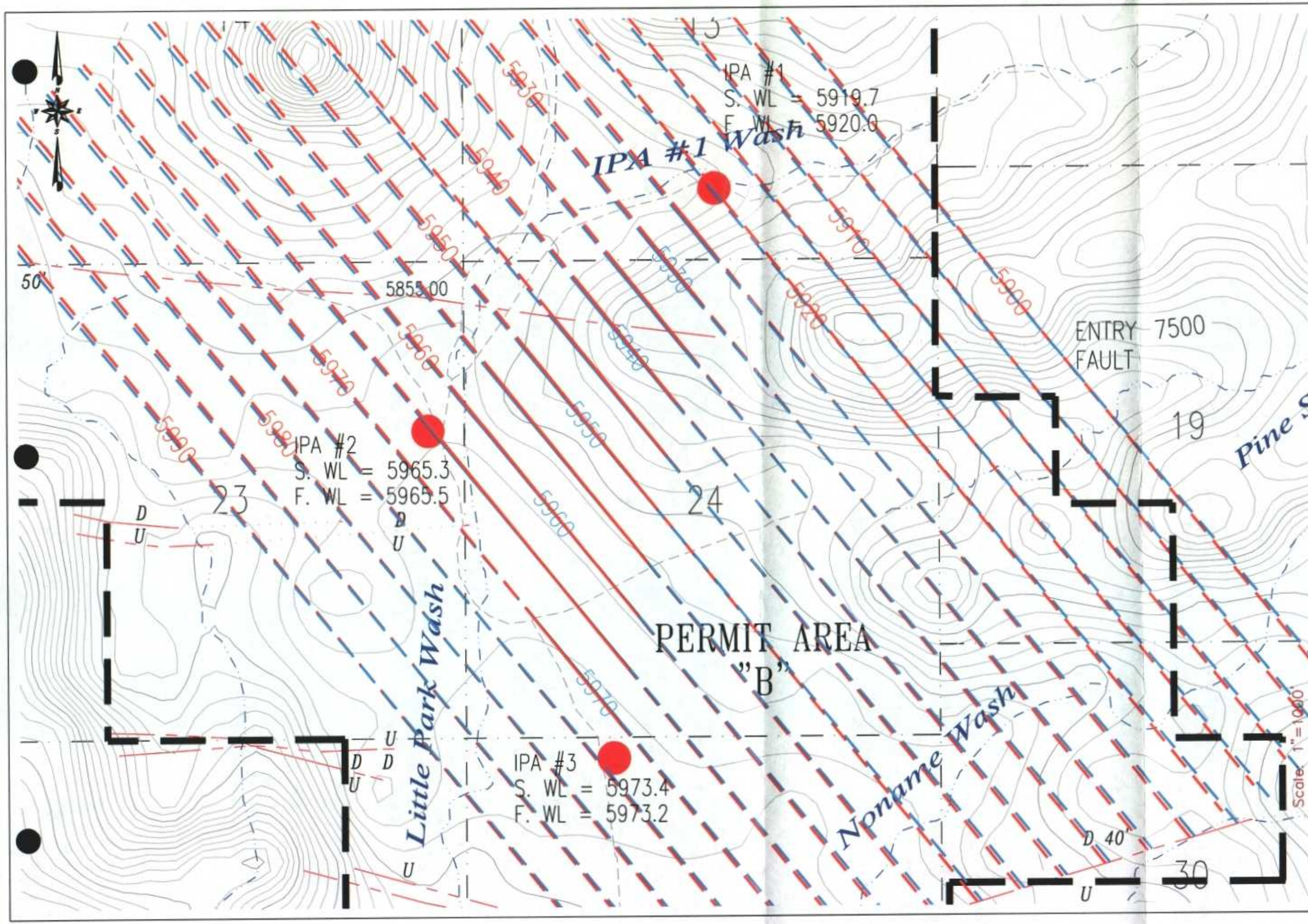


LILA CANYON MINE
Price, Utah

UtahAmerican
Price, Utah

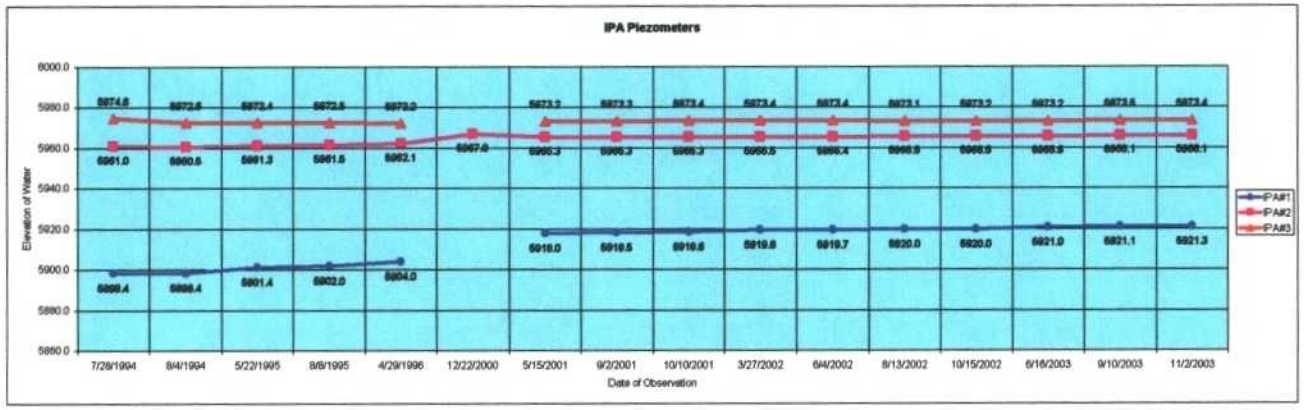
FIGURE 7-1. WATER LEVEL MAP
SPRING AND FALL 2002

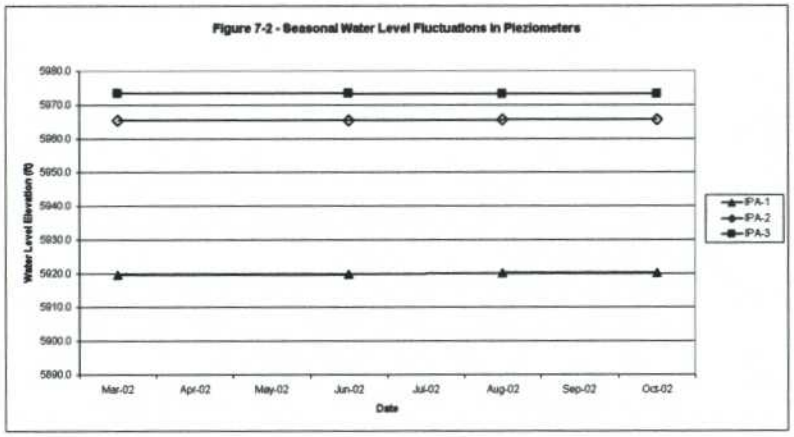
LEGEND
Spring WL
Fall WL

HD

IPA Piezometers
Water Depths

		IPA#1			IPA#2			IPA#3		
Season	Date	Depth to Water	Top of Casing	Water Level	Depth to Water	Top of Casing	Water Level	Depth to Water	Top of Casing	Water Level
Summer	7/28/1994	1134.1	7032.5	5898.4	905.5	6866.5	5961.0	837.9	6812.5	5974.6
Summer	8/4/1994	1134.1	7032.5	5898.4	906.0	6866.5	5960.5	839.9	6812.5	5972.6
Spring	5/22/1995	1131.1	7032.5	5901.4	905.2	6866.5	5961.3	840.1	6812.5	5972.4
Summer	8/8/1995	1130.6	7032.5	5902.0	905.0	6866.5	5961.5	840.0	6812.5	5972.5
Spring	4/29/1996	1128.5	7032.5	5904.0	904.4	6866.5	5962.1	840.3	6812.5	5972.2
Winter	12/22/2000				899.5	6866.5	5967.0			
Spring	5/15/2001	1114.5	7032.5	5918.0	901.2	6866.5	5965.3	839.3	6812.5	5973.2
Fall	9/2/2001	1114.1	7032.5	5918.5	901.2	6866.5	5965.3	839.2	6812.5	5973.3
Fall	10/10/2001	1113.9	7032.5	5918.6	901.2	6866.5	5965.3	839.2	6812.5	5973.4
Spring	3/27/2002	1112.9	7032.5	5919.6	901.0	6866.5	5965.5	839.1	6812.5	5973.4
Summer	6/4/2002	1112.8	7032.5	5919.7	901.1	6866.5	5965.4	839.1	6812.5	5973.4
Summer	8/13/2002	1112.5	7032.5	5920.0	901.0	6866.5	5965.5	839.4	6812.5	5973.1
Fall	10/15/2002	1112.5	7032.5	5920.0	901.0	6866.5	5965.5	839.3	6812.5	5973.2
Spring	6/16/2003	1111.6	7032.5	5921.0	901.0	6866.5	5965.5	839.3	6812.5	5973.2
Summer	9/10/2003	1111.4	7032.5	5921.1	900.4	6866.5	5966.1	839.0	6812.5	5973.5
Fall	11/2/2003	1111.2	7032.5	5921.3	900.4	6866.5	5966.1	839.1	6812.5	5973.4





Water Quality and Flow Summaries - Surface and Groundwater

Horse Canyon Mine

(N = number of samples)

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Parameter	Units	Sample Site RS-2				Sample Site B-1				Sample Site RF-1				Sample Site HC-1				Sample Site 2WB				Sample Site 1E2			
		Mean	Max	Min	N	Mean	Max	Min	N	Mean	Max	Min	N	Mean	Max	Min	N	Mean	Max	Min	N	Mean	Max	Min	N
Flow	gpm	23.92	34.0	9	25	236	630	0	18	11.36	25	0	22	20.95	65	0	19	3.39	7	3	22	1	1	1	19
ph	stand	7.95	8.36	7.37	27	8.13	8.40	7.8	15	8.20	8.60	7.60	22	8.05	8.48	7.7	22	7.9	8.2	7.4	22	7.95	8.5	7.5	22
Temp	°C	9.00	10.0	8.0	7					11.00	11.00	11.00	2	13.83	20.0	10.0	6								
Conductivity	uohms	2414	2700	2200	7					2500	2700	2300	2	3767	3900	3600	6								
Dissolved O_2	ppm	6.47	8.10	4.2	7					4.4	4.9	3.9	2	5.77	7.4	4.3	6								
Acidity as CaC03	mg/l	2.69	10.0	0.0	18	.75	6.0	0.0	14	2.21	14.0	0.0	19	1.47	10.0	0.0	15	2.05	12.0	0.0	22	2.65	14.0	0.0	22
Alkalinity as CaC03	mg/l	432	532	79	18	394	1095	292	14	408	537	46	19	429	985	211	15	204	350	124	22	316	439	216	22
Aluminum	mg/l	.063	.310	.00	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Antimony as Sb	mg/l	.02	.06	0.0	3																				
Arsenic	mg/l	0.0	0.0	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Barium	mg/l	.029	.21	0.0	10					0.0	0.0	.0.	2	0.0	0.0	0.0	6								
Beryllium	mg/l	.007	.02	0.0	3																				
Bicarbonate	mg/l	518.3	581	338	8					424	513	336	2	486	537	424	6								
Boron	mg/l	.198	.315	0.09	10					.18	.18	.18	2	.24	.4	.16	6								
Cadmium	mg/l	0.0	0.0	0.0	10					0.0	0.0	0..0	2	0.0	0.0	0.0	6								
Calcium	mg/l	63.14	168.0	30.2	10					48	52	44.8	2	63.35	83.9	41.1	6								
Carbonate	mg/l	8.27	78.0	0.0	10					44	72	16	2	6.8	19	0.0	6								
Chloride	mg/l	22	30	19.7	10					24.2	26.3	22	2	32.3	43	13	6								
Chromium	mg/l	0.0	0.0	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Cobalt	mg/l	.003	.003	0.0	3																				
Copper	mg/l	.003	.02	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Fluoride	mg/l	.37	.52	.10	10					.63	.78	.48	2	.61	1.01	.14	6								

Germanium	mg/l	0.0	0.0	0.0	3																				
Hardness	mg/l	402	460	310	8					410	433	387	2	717	872	271	6								
Iron disol	mg/l	.052	.39	0.0	14	.443	.92	.02	12	.206	1.9	0.0	17	.052	.14	.01	13	.125	.42	.02	20	.606	10.55	.002	20
Iron total	mg/l	.293	4.21	0.0	29	1.006	14.8	0.06	15	141	3000	.02	22	2.447	49.3	.02	22	.22	.64	.05	22	.743	13.2	0.0	22
Lead	mg/l	0.009	.003	0.0	8					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Magnesium	mg/l	61.18	102	.8	10					70.45	70	70.1	2	78.58	133	33	6								
Manganese	mg/l	0.0	0.0	0.0	7					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Manganese Total	mg/l	.014	.05	0.0	23	.076	.515	.01	15	.047	.36	0.0	20	.136	1.45	.01	16	.021	.03	.003	22	.02	.115	0.0	22
Mercury	mg/l	0.0	0.0	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Molybdenum	mg/l	.016	.16	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Nickel	mg/l	0.0	0.0	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Arsenic	mg/l	.27	.68	0.0	8					.32	.44	.20	2	.08	.28	0.0	6								
Nitrate	mg/l	.70	3.46	0.0	10					.06	.12	0.0	2	.27	1.24	0.0	6								
Nitrite	mg/l	0.0	.02	0.0	10					.01	.02	0..0	2	.01	.03	0.0	6								
Phosphate	mg/l	.013	.06	0.0	10					0.0	0.0	0.0	2	.002	.01	0.0	6								
Potassium	mg/l	4.25	12.4	0.0	8					2.3	2.8	1.0	2	6.35	8.1	2.6	6								
Selenium	mg/l	0.0	0.0	0.0	10					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
silver	mg/l	0.0	0.0	0.0	3																				
sodium	mg/l	185.59	408	140	10					179.5	180	179	2	204	224	184	6								
Sulfate	mg/l	306	475	79	10					298	308	288	2	485	617	232	6								
Sulfite	mg/l	0.0	0.0	0.0	8					0.0	0.0	0.0	2	0.0	0.0	0.0	6								
Susp Solids	mg/l	16	113	0.0	10	88.3	640	3	15	120.3	1648	0.0	20	151.2	2152	1.0	16	14	59	1.0	22	8.6	20	1.0	22
TDS	mg/l	930	1380	774	29	1910	2708	362	15	964	1609	847	22	1386	1760	800	22	2435	3928	2060	22	2106	2825	1430	22
Total Nitrogen	mg/l	.11	.22	0.0	3																				
Vanadium	mg/l	.08	.25	0.0	3																				
Zinc	mg/l	.019	.12	0.0	10																				

NOTE: 0 = below detection limit - see analysis for detection limit

Appendix 7-3

Probable Hydrologic Consequences Determination

Updated February 2004

Probable Hydrologic Consequences Determination

General

The best available data to assist in making a determination of probable hydrologic consequences of the proposed operation comes from the adjacent Horse Canyon Mine, and Columbia Mines. The Columbia Mine has been closed since the late 1960's, and the Horse Canyon Mine has been closed since the mid-1980's. The Horse Canyon Mine has also been reclaimed under SMCRA.

Data gathered from these mines and the surrounding hydrologic regime has been used in this determination, as well as baseline data gathered in the area of the proposed Lila Canyon Mine Extension.

Pertinent water monitoring data for the Horse Canyon Mine and Lila Canyon Extension is included in Appendices 7-1, 7-2, and 7-6 of this application and Appendix VII-1 of the Horse Canyon MRP. Additional recent monitoring data area available from the DOGM electronic database. Baseline geologic information is presented in Chapter 6 of this P.A.P. Baseline hydrologic information is presented in Sections 724.100 and 724.200 of this P.A.P.

Mining in the Horse Canyon area began in the late 1930's. Detailed hydrologic information was first gathered in the late 1970's. It is impossible to precisely describe the area's pre-mining hydrology. The conditions represented by these data help to define the hydrology about the time SMCRA was passed.

Analysis of Data

Potential impacts of coal mining on the quality and quantity of surface and groundwater flow may include:

- Contamination from acid- or toxic-forming materials;
- Increased sediment yield from disturbed areas;
- Increased total dissolved solids concentrations;
- Flooding or stream flow alteration;
- Impacts to groundwater or surface water availability;

- Hydrocarbon contamination from above ground storage tanks or from the use of hydrocarbons in the permit area;
- Contamination of surface and groundwater from road salting; and
- Contamination of surface water from coal spillage due to hauling operations.

Potential Impacts to the Hydrologic Balance. Potential impacts of the Lila Canyon Mine on the hydrologic balance of the permit and adjacent areas are addressed in the following sections:

Acid- or Toxic- Forming Materials. Information on acid-and toxic-forming materials is presented in Chapter 6. These data show that no acid- or toxic-forming materials are present at the Lila Canyon Mine.

Additionally, rocks of the Mesa Verde Group are carbonaceous, resulting in persistence of acids and related toxins in water in the mine and adjacent strata unlikely. Also, the design of the refuse pile will prevent any acid or toxic potential from material removed from the mine. Based upon the hydrology, geology, and climate of the area probability of acid or toxic impacts from materials removed from the mine or from mine water discharge is unlikely. Thus, no significant potential exists for the contamination of surface and groundwater in the permit and adjacent areas by acid- or toxic-forming materials.

Sediment Yield. The potential impact of mining and reclamation on sediment yield is an increase in sediment in the surface waters downstream from disturbed areas. Sediment-control measures (such as sedimentation ponds, diversions, etc.) will be installed to minimize this impact. These facilities will be regularly inspected (see Section 514) and maintained to ensure that they remain in proper operating condition.

All construction and upgrading activities will be undertaken during periods of dry weather, commencing in late spring and lasting through fall. For both the mining and reclamation periods, it is expected that construction, upgrading, or regrading activities would cause an increase in sediment load to the stream. Temporary sediment controls will be used whenever possible to lessen the impact of construction activities.

Sediment yields may increase locally due to subsidence. Subsidence cracks which intersect stream channels with steep gradients could, for a short period of time,

cause an increase in the sediment yield of the stream. However, this sediment increase would cause the crack to quickly fill, recreating pre-subsidence stream channel conditions. Thus, the potential impact to sediment yield from subsidence in the permit area would be minor and of short duration.

Various sediment-control measures will be implemented during reclamation as the vegetation becomes established. As discussed in Section 542.200 of this P.A.P., these measures will include installation of silt fences and straw-bale dikes in appropriate locations to minimize potential contributions of sediment to the Right Fork of Lila Canyon. These measures will reduce the amount of erosion from the reclaimed areas, thereby precluding adverse impacts to the environment.

Acidity, Total Suspended Solids, and Total Dissolved Solids. Probable impacts of mining and reclamation operations on the acidity and total suspended solids concentrations of surface and groundwater in the permit and adjacent areas were addressed previously in this section. Since the proposed Lila Canyon Mine has not started, there is no specific data available on Lila mine water. Therefore, quality information was obtained from the adjacent Horse Canyon Mine workings.

Data presented in Appendices 7-1 and 7-6 and summarized in Section 724.100 of this P.A.P. indicate that the average TDS concentration of water in the Blackhawk Formation (as measured in inflow to the nearby Horse Canyon Mine) is approximately 2000 mg/l and is of the sodium-bicarbonate type. As noted in Section 724.200, the TDS concentration of water in the Right Fork of Lila Canyon is unknown, but likely to be similar to the flows in Horse Canyon Creek which are in the range from 1200 to 1500 mg/l. The dominant ions in this water are calcium and bicarbonate during high-flow periods, whereas the dominant ions during low-flow periods are sodium, magnesium, sulfate, and bicarbonate.

These data suggest that the TDS concentration of water in the Right Fork of Lila Canyon can be expected to increase by a factor of 1.5 for the water discharged from the mine to the drainage. It should be noted that it is anticipated that the Lila Canyon Mine will use powdered limestone or dolomite (i.e., calcium-magnesium-carbonate) for rock dust. It is not anticipated that gypsum rock dust (calcium-sulfate) will be used in the mine. Hence, dissolution of rock dust by water in the mine should not influence the chemical type of water in the drainage if mine water is discharged to the Right Fork of Lila Canyon.

As indicated in the P.A.P., the total iron and manganese concentrations in discharges from the mine are not significantly elevated to an effect downstream

uses. Also, as discussed in Appendix 7-9, the mine water discharge is expected to affect only the 3.4 mile downstream from the mine.

Lila Canyon drainage, as part of the lower Price River basin, is classified according to Section R317-2-13 of the Utah Administrative Code (Standards of Quality for Waters of the State) as a class 2B (secondary contact recreation use), 3C (nongame fish and other aquatic life use), and 4 (agricultural use) water. No TDS standards exist for class 2B and 3C water. The TDS standard for class 4 water is 1,200 mg/l. Hence, if discharges occur from the Lila Canyon Mine to the Right Fork of Lila Canyon, the data indicate that the TDS concentration of these discharges will not exceed the applicable water-quality standard.

It should also be noted that the dissolved iron standard for class 3C water is 1.0 mg/l. No dissolved iron standard exists for class 2B or 4 waters. The data presented above indicate that potential discharge water from the mine will not exceed the dissolved iron standard of Lila Canyon. No standards exist in the R317 regulations for total iron, dissolved manganese, or total manganese. However, the data presented above indicate that potential discharges from the mine to the Right Fork of Lila Canyon will meet the effluent limitations of 40 CFR 434.

No hydrologic impacts have been noted at the adjacent Horse Canyon Mine due to subsidence. Although tension cracks may locally divert water into deeper formations, resulting in increased leaching of the formation and increased TDS concentrations, the potential of this occurring is considered minimal. This conclusion is based on experience at the Horse Canyon Mine and on the fact that the shale content of the North Horn Formation, the Price River Formation, and the Blackhawk Formation should cause these subsidence cracks to heal quickly where they are saturated by groundwater flow. Thus, potential impacts on TDS concentrations would be minor and not of significant concern.

Flooding or Streamflow Alteration. Runoff from all disturbed areas will flow through a sedimentation pond or other sediment-control device prior to discharge to the Right Fork of Lila Canyon. Three factors indicate that these sediment-control devices will minimize or preclude flooding impacts to downstream areas as a result of mining operations:

1. The sedimentation pond has been designed and will be constructed to be geotechnically stable. Thus, the potential is minimized for breaches of the sedimentation pond to occur that could cause downstream flooding.

2. The flow routing that occurs through the sedimentation pond and other sediment-control devices reduces peak flows from the disturbed areas. This precludes flooding impacts to downstream areas.

3. By retaining sediment on site in the sediment-control devices, the bottom elevations of the Right Fork of Lila Canyon downstream from the disturbed area will not be artificially raised. Thus, the hydraulic capacity of the stream channel will not be altered.

The volume of streamflow will increase in the Right Fork of Lila Canyon if water is discharged from the mine to the drainage. Potential impacts to the drainage channel could include the displacement of fines on the channel bottom, and minor widening of the channel. However, the degree of widening will likely be minimized by the increased vigor and quantity of vegetation which will be sustained along the stream channel by the increased availability of water. In particular, it is anticipated that a phreatophyte streambank vegetative community will develop as a result of mine-water discharges. This effect will occur for the distance downstream that surface flows can be sustained above channel transmission losses. Based on the maximum anticipated estimate of mine water discharge, it is unlikely that any flooding will occur to the downstream channel as the flow (1.1cfs) is significantly below the anticipated 2-year flood (37 cfs). Care will be taken during discharge of this water to avoid erosion at the discharge point or flooding of downstream areas. Once mining ceases, the mine will be sealed and no discharges will occur. The streamflow in the Right Fork of Lila Canyon will then return to pre-mining discharge levels.

Following reclamation, stream channels which have been altered by mining operations will be returned to a stable state (see Section 762.100). The reclamation channels have been designed to safely pass the peak flow resulting from the 10-year, 6-hour or the 100-year, 6-hour precipitation event as appropriate for the channel and in accordance with the R645 regulations. Thus, flooding in the reclaimed areas will be minimized. Interim sediment-control measures and maintenance of the reclaimed areas during the post-mining period will preclude deposition of significant amounts of sediment in downstream channels following reclamation, thus maintaining the hydraulic capacity of the channels and precluding adverse, off-site flooding impacts.

Subsidence tension cracks that appear on the surface will increase the secondary porosity of the formations overlying the Lila Canyon Mine. During the period prior to healing of these cracks, this increased percolation will decrease runoff during the high-flow season (when the water would have rapidly entered the stream channel rather than flowing into the groundwater system). During low-flow periods, the

result of this increased percolation will be an increase in the base flow of the stream. Hence, the net result will be a decrease in the flooding potential of the affected stream.

An additional flooding issue is the potential for flooding of the mine following mining and the discharge of water from the portals. Since the regional geology and hydrologic regimes of the Horse Canyon and Lila Canyon Mines are so similar, data has been extrapolated from the Horse Canyon Mine to the proposed Lila Canyon Mine. The proposed Lila Canyon Mine portals are located up-dip from areas in the mine where water may be expected; therefore, the only mine water expected to reach the surface is that which is pumped. Mine water is not expected to reach the portal level or flow from the reclaimed portal level or flow from the reclaimed portals of either the reclaimed Horse Canyon Mine or the Lila Canyon Mine based on the following information:

1) Mine water level information gathered in 1986 and 1993 indicates that there has been little rise in the water level since mining activities ceased.

2) The Sunnyside Fault is not a large producer of water. As an example, the Columbia Mine located north of the Horse Canyon Mine also encountered the Sunnyside Fault zone and has been closed since the late 1960's. If water inflow rates were high, the mine workings would have flooded, developing a head differential between the Columbia Mine and the Horse Canyon Mine (pumped). If the fault zone were a good conductor of water, the inflow to the Horse Canyon Mine would have been high, driven by the head from the flooded Columbia Mine Workings. However this was not the case and the water levels have not flooded much beyond the water levels in the Horse Canyon Mine while it was pumped. Suggesting that there is no head to cause a flooding rise and that the Sunnyside Fault is not a significant conduit for water flow.

3) Sieler and Baskins (1986) showed that the water quality for natural waters generally drops significantly when exposed to mine workings (gob, etc). The water quality of the mine water samples from the Horse Canyon Mine sump locations (2 Dip, Main Slope, 2E-B) as compared to the water quality of springs in the lower stratigraphic section of the Horse Canyon permit area show little difference in TDS. This indicates that majority of the water in the mine is not the result of inflow along the

fault zone from the Columbia Mine. Suggesting that the fault zone is a poor conductor of water for the poorer quality water expected from the flooded Columbia Mine workings or that the Columbia Mine workings have not flooded much beyond the water levels in the Horse Canyon Mine while it was pumped.

4) The three Piezometers, IPA-1, 2 and 3 shown on Plate 7-1, suggest that the gradient is down dip away from the portal area. The Piezometer readings can be found in Appendix 7-1.

5) The coal mined at Horse Canyon (as well as that at Lila Canyon) is underlain by a marine sheet sandstone (Sunnyside, see Geology, Chapter VI). Lines (1985) did extensive petrographic work on porosity and permeability in the formation (see Table 1). If the water level in the mine were to ever approach the level of the portal, the Sunnyside marine sandstone would likely discharge water, preventing any head development behind the portal closures.

6) Much of the Horse Canyon Mine floor has been fractured by the effects of pillar removal, especially near the outcrop. Fracturing develops secondary porosity and enhances the permeability of the underlying Sunnyside marine sandstone. This would function as a means to dissipate any head which might otherwise develop on the portals. The proposed longwall mining in the Lila Canyon Mine is also expected to produce floor fracturing.

7) There is a difference in elevation of about 400 to 500 feet between the lowest portal and the approximate water level in the Horse Canyon mine (1986 and 1993). If the water level in the mine continues to rise, the head differential between the discharging aquifer and the mine will decrease. The decrease in head will have the direct effect of decreasing the inflow rate into the mine. Additionally, the volume of water required to "fill the mine" would also have to fill the strata above the mine, which has been dewatered throughout the history of the mine.

Based on these factors it is unlikely that the groundwater level in the lower groundwater zone will ever rise to the level of the portal, at any portal location for either the Horse Canyon or Lila Canyon Mines. Hence, there should be no natural

discharge of groundwater through any of the sealed portals. To verify this, stand pipes will be incorporated into the grading plans for the portals so that water levels can be checked annually.

Groundwater and Surface Water Availability. Potential impacts to the availability of surface and groundwater from the Lila Canyon Mine operations include both decreased and increased stream flows and spring discharges caused by mine-related subsidence, bedrock fracturing, and aquifer dewatering. These potential impacts are discussed below.

Potential for Decreased Spring and Stream Flows

To date, while surface subsidence has been identified as a result of coal mining in the nearby Horse Canyon Mine, no impact or disruption of spring and seep of stream flows have been identified. Bedrock fracturing routinely occurs in the rock units overlying the mined coal seams. Given the limited number of springs and limited groundwater resources of the Blackhawk, Castlegate, and Price River Formations in the permit and adjacent areas, subsidence or fracturing would affect the hydrologic balance in the area only if zones of increased vertical hydraulic conductivity were created which extended through the Price River Formation into the North Horn and Flagstaff Formations.

Several lines of evidence suggest that mining-related subsidence and bedrock fracturing have not resulted in decreased stream flows or groundwater discharge in the vicinity of the nearby Horse Canyon Mine. Although considerable seasonal and climatic variability are noted in the hydrographs of springs in the permit and adjacent areas, data for both Horse Canyon Creek and springs which overlie the Horse Canyon Mine workings do not show discharge declines which may be attributed to either subsidence or bedrock fracturing (see Appendices 7-1 and 7-6).

Active groundwater systems in the Flagstaff-North Horn Formation are separated from the Blackhawk Formation by the Price River Formation and Castlegate sandstone. As discussed in Section 724.100, this formation contains very few springs and is not considered to be a major groundwater resource. Past mining in the Horse Canyon Mine has not increased the rate of spring discharge from the Price River Formation, indicating that groundwater is not being diverted into this formation. The absence of increased saturation in the Price River Formation due to coal mining indicates that vertical zones of artificially-increased hydraulic conductivity do not extend into the Price River Formation and from thence into the active groundwater systems of the North Horn and Flagstaff Formations.

Data presented in Appendices 7-1 and 7-6 and summarized in Section 724.100 indicate that the lower groundwater system, in the vicinity of mined coal seams, contains groundwater which is compartmentalized both vertically and horizontally. Coal mining locally dewaters isolated, overlying saturated rock layers in the Blackhawk Formation but does not appear to draw additional recharge from overlying or underlying zones.

Additionally, the springs which supply most of the local flow discharge from the Flagstaff-North Horn or Colton Formations. This formation or aquifer is perched from the underlying lower groundwater zone and the intervening formations contains swelling clays which tend to heal small fractures. Also, since the perched aquifer materials are lenticular, there is a greater probability that fractures in one area will not drain all the different perched aquifers because they are not interconnected.

The strong vertical gradients in Blackhawk Formation rock layers underlying actively mined coal seams in the Horse Canyon Mine and the absence of significant discharge into the mine from these layers indicates that mining does not draw groundwater from the underling portions of the Blackhawk and Mancos Shale. Additionally, the distinctive solute composition of Mancos Shale groundwater has not been observed inside the Horse Canyon Mine.

From the above discussion, it appears that the Horse Canyon Mine has not decreased groundwater discharge in overlying or underlying groundwater systems. Hence, it is unlikely that coal mining will effect the discharges of any spring as a result of mining in the Lila Canyon permit and adjacent areas.

The closest perennial stream to the permit area is Range Creek. The drainage is located approximately 6 miles east of the proposed Lila Canyon permit area (see Plates 6-1 and 7-1B). Range Creek is in a broad, south-southeast oriented drainage that has been eroded into the Roan Cliffs. A western extension of the Roan Cliffs (Patmos Ridge) lies between Range Creek and the Book Cliffs. The proposed Lila Canyon operation is on the west side of Patmos Ridge. The Colton Formation is exposed at the surface from Patmos Ridge east to the main body of the Roan Cliffs, and between these two escarpments Range Creek has eroded into but not through the Colton Formation. Approximately eleven miles southeast of the permit area, just upstream of Turtle Canyon, Range Creek has eroded through the Colton, Flagstaff-North Horn Formations, but it reaches the Green River without having eroded through the Upper Price River Formation. The nearest Blackhawk outcrop is 10 miles south, along the Price River (see Plate 7-1B).

The maximum extent of subsidence is within the permit boundary making it improbable that it could effect Range Creek or any contributing watershed to Range Creek.

Due to the large distance from the proposed permit area, and the 1,000 feet or more of low permeability strata between the coal seam containing Blackhawk formation, and the Colton Formation where Range Creek lies, no baseline or other sampling has been gathered nor anticipated on Range Creek. For the above reasons Lila Canyon extension does not present any Probable Hydrologic Consequences to Range Creek.

The contamination, diminution, or interruption of any water resources would not likely occur within the mine permit or adjacent areas. Since surface water flows only a limited part of year and will be provided protection by use of sediment controls, the major usable water resources that could potentially be effected in the area would be springs that are currently in use by wildlife and livestock. Most of these springs are located upstream of the permit area or are in areas where subsidence resulting from post-1977 mining is not documented or expected. To date no known depletion of flow and quality of surveyed springs in the Horse Canyon permit area exists, and none are expected in the Lila Canyon area, based on available data from the Horse Canyon Mine. Although pre-mining data is not available for Horse Canyon, depletion problems from subsidence are not known to have been filed and are not indicated by sampling results in Appendices 7-1 and 7-2. Therefore, it is unlikely an alternative water supply will be needed, although they have been identified in Section R645-301-727.

L-16-G and L-17-G are seeps being monitored in Stinky Spring Canyon. These sites were not identified during baseline surveys and are believed to exist intermittently and are not always evident. These two seeps appear to be an important source of water for Bighorn sheep specifically in the early spring. Due to the springs location, outside the permit area, outside the limit of subsidence, within the Central Graben, and being 500 to 600 feet below the coal seam, there is no potential for Lila Canyon Mine to negatively impact this spring or recharge sources.

Potential for Increased Stream Flows

If sufficient water is encountered in the Lila Canyon Mine workings to require discharge of that water to the surface, the flow of the Right fork of Lila Canyon will be increased. It is difficult to estimate the maximum potential discharge from the mine, however, DOGM has determined that a maximum discharge rate of 500 gpm should be used for design purposes. It should be emphasized that this estimate is considered to be conservatively high. The adjacent Horse Canyon Mine had a

maximum discharge of 90 gpm. Also, the amount of water which will be discharged from the mine will equal the inflow minus that which is consumed in the mining operation (dust suppression and evaporation). Based on experience at the Soldier Canyon Mine farther to the north in the Book Cliffs, the rate of water to be consumed in the Lila Canyon Mine is estimated to be 15,000,000 gallons per year (approximately 30 gpm).

If water does need to be discharged, it will be sampled and discharged in accordance with the approved UPDES Discharge Permit. If the quality parameters of the mine water do not meet UPDES standards, the water will be treated prior to discharge. Treatment may include holding/settling in the mine, pumping to retaining or sediment ponds, chemical treatment or other approved means to prevent non-compliant discharge.

Based on the results of the evaluation presented in Appendix 7-9, the discharge of this amount of water from the mine is not expected to have a significant impact on the downstream resources. Based on the results from Appendix 7-9, the mine discharge flow will be lost due to transmission losses and percolation within 3.4 miles from the discharge point. Therefore, the discharge will not reach the Price or Colorado Rivers. The discharge of the water will have a positive impact on the vegetation and wildlife of the area by providing a fairly constant supply of water along this limited reach of the channel.

Based on comparison of upstream and downstream data gathered on Horse Canyon Creek which incorporates the analysis from past mine discharges to the channel, water quality will not be drastically affected in the intermittent drainage in the event of discharge of mine water into the channel. The expected impacts to the channels of the Lila Canyon area are very likely to be similar to those at Horse Canyon due to the close proximity, and similarities of mining and drainage conditions.

Potential Hydrocarbon Contamination. Diesel fuel, oils, greases, and other hydrocarbon products will be stored and used at the site for a variety of purposes. Diesel and oil stored in above-ground tanks at the mine surface facilities may spill onto the ground during filling of the storage tank, leakage of the storage tank, or filling of vehicle tanks. Similarly, greases and other oils may be spilled during use in surface and underground operations.

The probable future extent of the contamination caused by diesel and oil spillage is expected to be small for three reasons. First, because the tanks will be located above ground, leakage from the tanks will be readily detected and repaired.

Second, spillage during filling of the storage or vehicle tanks will be minimized to avoid loss of an economically valuable product. Finally, the Spill Prevention Control and Countermeasure Plan which will be developed for the site will provide inspection, training, and operation measures to minimize the extent of contamination resulting from the use of hydrocarbons at the site. This plan is not required to be submitted. However, a copy will be maintained at the mine site as required by the Utah Division of Water Quality.

Road Salting. No salting of roads will occur within the permit area. Hence, this impact is not a significant concern.

Coal Haulage. Coal will be hauled over the county road from the mine portal area to Utah Highway 6 and thence to its ultimate destination. In the event of an accident which causes coal to spill from the trucks, residual coal following cleanup of the spill may wash into local streams during a runoff event. Possible impacts to the surface water are increased total suspended solids concentrations and turbidity from the fine coal particulates. The probability of a spill occurring in an area sufficiently close to a stream channel to introduce coal to the stream bed is considered small.

In addition to spills, wind may carry coal dust or small pieces of coal from the open top of the coal trucks into drainages near the roads. The impact from fugitive coal dust is considered to be insignificant due to the small amounts lost during haulage in the permit and adjacent areas.

Water Consumption. The USFWS have identified that water consumption by underground coal mining operations could jeopardize the continued existence of and/or adversely modify the critical habitat of the Colorado River endangered fish species: Colorado pikeminnow, humpback chub, bonytailed chub, and razor back sucker. The USFWS has determined that water consumption by underground operations could potentially have adverse effects on the Colorado River basin. The USFWS considers consumption to include: evaporation from ventilation, coal preparation, sediment pond evaporation, subsidence on springs, alluvial aquifer abstractions into mines, postmining inflow to workings, coal moisture loss, and direct diversions. These consumption process are discussed below.

<u>Evaporation from Ventilation</u> - evaporation rates have been estimated at 2.5 gallons per million cubic feet of ventilated air. This number is dependent on temperature and relative humidity. It is estimated that with the projected usage of 473,040 million cf/yr of air and a loss of 2.5 gallons per million c.f. Therefore, the water

consumption for evaporation would be approximately 1,183,000 gallons per year or 3.63 acre feet of water.

Coal Preparation - The operator does not anticipate any coal preparation that would result in water usage.

Sediment Pond Evaporation - The sediment pond is used to hold rain and snow runoff that flows over disturbed areas of the coal mining and reclamation operations until accumulated sediment has dropped out. At that point the water is discharged into a receiving stream. The holding time for this water is planned to be short, therefore, no significant evaporation loss is expected. This would not be considered a consumption mechanism.

Subsidence on Springs - As shown in Appendix 7-8, the springs cannot be adversely effected by subsidence because of their physical location (off the permit area) or because of the amount of cover, 1000 feet or more. In the adjacent Horse Canyon mine, which was mined for over 45 years, there have been no reported effects on springs due to subsidence.

Alluvial Aquifer Abstractions into Mines - There will be no water infiltrations from alluvial systems into the mine.

Postmining Inflow to Workings - Postmining all openings will be sealed and backfilled. The proposed mine openings for Lila Canyon are at an elevation where no surface inflow is possible. This coupled with the sealing plan for the portals makes postmining inflows virtually impossible.

Coal Moisture Loss - It has been estimated that coal moisture loss or usage to be estimated at 4.5 gallons per ton of coal mined (see Table 2). Using the estimated usage for mining with an estimated production of 4 Million tons per year a usage of 18,000,000 gal per year or 55.2 acre feet can be estimated. It should be noted that due to the extremely low hydraulic conductivity rates measured in the general area, that groundwater movement is very slow. Using the average hydraulic conductivity measured for Blackhawk Sandstone (3.0×10^{-6} cm/sec) (see Table 1) which is equal to .1 inch per day. Therefore, water encountered underground would take approximately 1,736 years to travel one mile. This water is considered relatively immobile. The water encountered and used underground would not reach the Colorado Drainage in any reasonable time, if ever, and thus water consumed underground cannot negatively effect the Colorado River Basin.

Direct Diversions - no consumption.

Adding the three losses due to mining equals 62.71 acre feet which is below the mitigation level of 100 acre feet. UEI does hold 362.76 acre feet of underground water rights to offset any consumption. Therefore, it is the opinion of UtahAmerican Energy, Inc. that water consumption by underground coal mining operation will NOT jeopardize the existence of or adversely modify the critical habitat of the Colorado River endangered fish species.

Conclusion

Based on available data and expected mining conditions, the proposed mining and reclamation activity is not expected to proximately result in contamination, diminution or interruption of an underground or surface source of water within the proposed permit or adjacent areas which is used for domestic, agricultural, industrial, wildlife or other legitimate purpose.

It should be noted that the determination of no known depletion of flow or quality is based on available data, which is primarily post-mining.

Table 2 Projected Water Usage (Quantitative Water Consumption Impact Assessment)	
1- Bath House/Office a. 150 @ 35 gpd/ea. = 5250 x 240	1,260,000 gal./yr.
2- Mining(Coal moisture loss) a. 2 Sections (1) 4 M Ton @ 4.5 gal./ton	18,000,000 gal./yr.
3- Fan (Evaporation from ventilation) a. Evaporation (1) 900,000 cfm @ 473,040 M cf/yr. (2) 2.5 gal./M c.f.	1,183,000 gal./yr.
Total Usage	20,443,000 gal./yr. (62.71 ac.ft./yr.)

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APPENDIX 7-7

Surface Water Characterizations

UtahAmerican Energy, Inc.

R. Jay Marshall P.E.

INTRODUCTION:

The following data was collected to characterize the channels and flow patterns within each drainage basin within the Lila Canyon Permit Area. Surface waters in or adjacent to the permit area were characterized as perennial, intermittent or ephemeral.

The classifications are based on water table elevations (with respect to channel surface) and biologic (flora and aquatic) communities present, or the established classification established in the definitions under R645-301-100. The major drainage basins have been broken down into channel reaches. Tables 1 and 2 along with Figure 1 combines and condenses the information presented. Photographs were taken of the stream reaches to help visualize the conditions within the various reaches. The photographs are presented in Attachment #1 to this Appendix.

General:

The mine extension area is situated in two distinct sub-basins on the Price River basin. The surface of the underground workings described in the MRP, is drained by Little Park Wash and Stinky Spring Wash (See Plate 7-3 in the MRP and Figure 1 of this Appendix). The major surface facilities will be located in the Cove area below the cliffs. The Cove area is drained by Grassy Wash.

The Little Park Wash drainage occupies approximately 48 square miles of the eastern dip slope of the Book Cliffs escarpment between Horse Canyon and the Price River 15 miles to the south. Several east-west tributaries from the steep western slope of the Roan sub-cliffs join the main Little Park Wash.

LITTLE PARK WASH: Reaches 1, 2, 3 and 8

Since the Main Little Park Wash watershed drains at least one square mile, it is considered "intermittent" by DOGM definition. However, the main Little Park Wash channel is a dry ephemeral acting stream. No springs or seeps have been noted to date in the main Little Park Wash. The east-west tributaries to the Main Little Park Wash do contain springs and are discussed as individual reaches.

Table 1

Drainage Basins in Square Miles

Drainage	Above Permit Extension (Sq. Miles)	Within Permit Extension (Sq. Miles)	Total Above & On Permit Ext. (Sq. Miles)
Little Park Wash (Less Tributaries) Reaches #1, #2, & #3	1.26	2.08	3.34
Reach #4 Cottonwood Spring	.31	.63	0.94
Reach #5 IPA #1 Wash	1.06	.75	1.81
Reach #6 Pine Spring Wash	.44	.99	1.43
Reach #7 No Name Wash	.70	.71	1.41
Reach #8 Williams Draw Wash	.2	.08	0.28
Little Park Wash Drainage Total	**3.97**	**5.24**	**9.21**
Coves			
Reach #9 Stinky Spring Wash	0	1.08	1.08
Lila (Cannot be effected, previously mined)	1.14	.57	1.71
Right Fork Lila (Drainage Less than 1Square Mile (Ephemeral)	0	.40	0.4
Coves Drainage Total	**1.14**	**2.05**	**3.19**
TOTAL PERMIT EXTENSION	**5.11**	**7.29**	**12.4**

The Main Little Park Wash is broken down into four Reaches. Reach #1, identified by the Operator, can be described as being the Left Fork of the Left Fork of Little Park Wash. Reach #2, identified by the Operator, can be described as being the Right Fork of the Left Fork of Little Park Wash. Reach #3, identified by the Operator, can be described as being the Right Fork of Little Park Wash. The main Little Park Wash has been identified by the operator as Reach #8. All reaches with associated photograph numbers and locations are shown on Figure 1. The photographs can be found in Attachment #1 to this Appendix.

Reach #1

Reach #1 can be described as being the Left Fork of the Left Fork of Little Park Wash. Reach #1 starts at the north boundary of the permit area at an elevation of 7480 feet and drops at a grade of 6.58 % to an elevation of 7,360 feet where it converges with Reach #2 forming the Main Little Park Wash. The 1,800 foot long channel is comprised mostly of sand and gravel with the sides being pinyon-juniper and sagebrush grass associations, with no riparian vegetation present. The full 1,800 feet has been classified as ephemeral acting. Fish and macro invertebrates are non existing within this reach.

There are no water shares associated with Reach #1. Reach #1 can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Photographs 18 and 25, found in Attachment #1, depict the conditions found in reach #1.

Reach #2

Reach #2, identified by the Operator, can be described as being the Right Fork of the Left Fork of Little Park Wash (Figure 1). Reach #2 starts at the north boundary of the permit area at an elevation of 7,500 feet and flows at a grade of 7.56 % to an elevation of 7360 feet where it converges with Reach #1 forming the Main Little Park Wash. The 1,900 foot long channel is comprised mostly of sand and gravel with the vegetation being mostly pinyon-juniper and sagebrush grass associations, with no riparian vegetation present. The full 1,900 feet has been classified as ephemeral acting. Fish and macro invertebrates are non existing within this reach.

There are no water shares associated with Reach #2. Reach #2 can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Photographs 20,21,22, and 26, found in Attachment #1, depict the conditions found in Reach #2.

Reach #3

Reach #3, identified by the Operator, can be described as being the Right Fork of Little Park Wash. Reach #3 starts at the north east boundary of the permit area at an elevation of 7,750 feet and flows at a grade of 10.2% to an elevation of 7,270 feet where it converges with the Main Little Park Wash, Reach #8 (Table 2). The 4,800 foot long channel is comprised mostly of sand and gravel with the upper sections being Douglas Fir and transgressing into pinyon-juniper and sagebrush grass associations, with no riparian vegetation present. The full 4,800 feet has been classified as ephemeral acting. Fish and macro invertebrates are non existing within this reach.

There are no water shares associated with Reach #3. Reach #3 can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Photographs 38, 39, 40, 41, 42, 44, 46, and 47, found in Attachment #1, depict the conditions found in Reach #3.

Reach #8

Reach #8 identified by the Operator as the Main Little Park Wash. Reach #8 starts at the confluence of Reach #1 and Reach #2.

Reach #8, the Main Little Park Wash with its tributaries, drain approximately 9.21 square miles of the Lila Canyon Permit Extension. (See Table 1). Elevation of the wash at Price River is 4,800 feet and south of Horse Canyon is 7,500 feet. The eastern slope rises to an elevation of over 9,000 feet while the western lower Book Cliffs ridge is about 6,000 to over 8,000 feet. The channel starts at an elevation of 7350 feet and flows at a grade of 3.3 % to an elevation of 6,700 feet where it leaves the permit area. The channel meanders through Holocene stream alluvium in the upper reaches and has incised a meandering channel through underlying Cretaceous rocks in the lower region below Williams Draw fault. The

TABLE 2

Channel Characterizations

Reach	Description	Photos (See Attachment #1)	Length	Gradient	Bed type	Flora Channel Embankment	Fauna (Fish and Macro Invertebrates)	Use	Effects from Mining	Length Ephemeral (Feet)	Length Intermittent or Perennial (Feet)
1	Left Fork of the Left Fork of Little Park Wash	18, 25	1823	6.6%	Sand, Gravel	Pinyon Juniper and sagebrush grass associations, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 2,000')	1823	
2	Right Fork of the Left Fork of Little Park Wash	20, 21, 22, 26	1917	7.6%	Sand, Gravel	Pinyon Juniper and sagebrush grass associations, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 2,000')	1917	
3	Right Fork of Little Park Wash	38, 39, 40, 41, 42, 44, 46, 47	4780	10.2%	Sand, Gravel	Douglas Fir in upper sections, Pinyon Juniper and sagebrush grass associations in lower sections., no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 2,000')	4780	
4A	Cottonwood Spring Wash Above L-7-G	48, 49	2420	6.6%	Sand, Gravel	Douglas Fir in upper sections, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 2,000')	2420	
4B	L-7-G to 51 [3]	8, 9, 10, 50 51	456	4%	Sand, Gravel	Douglas Fir, no Riparian Vegetation.	Non Existing	91-399 Mining (UEI)	None do to depth of coal seam (over 2,000')	205	250
4C	51 to Confluence of Little Park Wash	32	2576	4.6%	Sand, Gravel	Douglas Fir in upper sections, Pinyon Juniper and sagebrush grass associations in lower sections., no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 1,500')	2576	
5A	IPA #1 Wash above L-8-G	52	1729	7.8%	Sand, Gravel	Douglas Fir in upper sections, Pinyon Juniper in lower sections, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 3,000') and location off permit area.	1729	
5B	L-8-G [3]	53, 53A	300	10.4%	Sand, Gravel	Douglas Fir, no Riparian Vegetation.	Non Existing	91-2538 Stock Watering (State)	None do to depth of coal seam (over 2,500') and location off permit area.		300
5C	L-8-G to Confluence of Little Park Wash	54, 55, 35	6713	4.5%	Sand, Gravel	Douglas Fir in upper sections, Pinyon Juniper and sagebrush grass associations in lower sections, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 1,000')	6713	
6A	Above L-9-G		3840	14.6%	Sand, Gravel	Douglas Fir in upper sections, Pinyon Juniper in lower sections, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 2,000')	3840	
6B	L-9-G (Pine Spring) [3]	11, 12	300	6.7%	Sand, Gravel	Douglas Fir, no Riparian Vegetation.	Non Existing	91-2539 Stock Watering (BLM)	None do to depth of coal seam (over 2,000') and location off permit area.		300
6C	Pine Spring to Property boundary		8977	3.7%	Sand, Gravel	Douglas Fir in upper sections, Pinyon Juniper and sagebrush grass associations transgressing into a mature sagebrush habitat in lower sections, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 1,000')	8977	
7	No Name Wash	61, 87, 88	7540	5.7%	Sand, Gravel	Pinyon Juniper and sagebrush grass associations, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to depth of coal seam (over 1,000')	7540	
8	Main channel Little Park	23, 27, 29, 30, 31, 33, 34, 36, 56, 57, 63, 81, 82, 83, 84	20077	3.3%	Sand, Gravel	Pinyon Juniper and sagebrush grass associations transgressing into a mature sagebrush habitat in lower sections, no Riparian Vegetation.	Non Existing	No Water Shares anywhere in the Main Channel all the way to the Price River	None do to depth of coal seam (small area <500' most >1,000')	20077	
9A	Stinky Spring Wash Above Escarpment	93, 94, 95, 96, 97, 98, 99, 100	7432	7%	Sand, Gravel	Pinyon Juniper and sagebrush grass associations, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to barriers and location of the mains.	7432	
9B	Escarpment to Stinky Springs		1829	38.1%	Sand, Gravel	Pinyon Juniper and sagebrush grass associations, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None do to outcrop barrier and outside the permit area.	1829	
9C	L-16-G & L-17-G Stinky Springs [3]	42,43, 50, 52, 50A	535	15%	Sand, Gravel	Grasses and salt desert shrub, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None, outside the permit area and below the coal outcrop.	460	75
9D	Stinky Spring to Mouth	72, 75, 76	1787	8.9%	Sand, Gravel	Grasses and salt desert shrub, no Riparian Vegetation.	Non Existing	No water shares associated with this reach	None, reach is outside the permit area and beyond the outcrop.	1787	
	Total Length									**74105**	**925**
	Percent of Total Length									**98.77%**	**1.23%**

NOTE:

1) The Lila Canyon channel cannot be effected by mining from the Lila Canyon Mine. The Lila Canyon channel was previously undermined by the Horse Canyon Mine with out any negative effects.
2) The Right fork of Lila has a drainage area of less than one square mile and is considered ephemeral by definition.
3) Additional information can be found in Appendix 7-8.

channel varies in width from 50 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The stream has cut an irregular channel into the underlying rock formation to a depth of 50 feet in places. The gradient is moderate (3.3%), with mostly gravel, sand and silt filling the channel in the upper reaches and large boulders predominate in the vicinity of the Price River.

The 20,100 foot long channel flows from a pinyon-juniper and sagebrush grass associations transgressing into a mature sagebrush habitat in the lower sections, with no riparian vegetation present.

Known springs and seeps occur along the east side tributaries. (See Appendix 7-6 for Spring Descriptions) The tributaries are of moderate to steep gradients in narrow canyons, with mostly gravel to occasional rocky beds, with silt and sand where the gradient is reduced. The intermittent tributaries have headwaters in the Colton Formation outcrop in the sub-Roan cliffs, passing over the lower moderate slope-forming Flagstaff Limestone and North Horn Formations. The present known springs and seeps are associated with alluvium, sandstone and thin limestone beds of these geologic formations of Upper Cretaceous to Eocene age. (Plate 6-1) Observations of intermittent water flow associated with the springs indicate flows of 5 gallons per minute or less (Appendix 7-2). The intermittent flow of water from the springs probably never reaches the main channel of Little Park Wash even in years of high precipitation.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from the upper reaches of Little Park Wash are probably absorbed by the stream alluvium prior to reaching the Price River except in the most extreme situation.

No water shares are associated with the Main Little Park Wash anywhere within the permit area, or downstream, all the way to the confluence with the Price River.

Precipitation occurs mainly as summer showers and winter snow and ranges averages approximately 13.69 inches per year (Table 7-1A).

Two water monitoring stations are located in Little Park Wash (less tributaries). L-13-S is located at the road crossing of Lila Park Wash. Data collected at L-13-S, since December of 2000, has not reported any flow (Appendix 7-1). Indications of flow as a direct result of precipitation events

has been observed between monitoring dates. Flow was not observed from the melting of snow cover in the spring of 2001, 2002, or 2003 as might be expected.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table. Fish and macro invertebrates are non existing within this reach, with no riparian vegetation present.

The chance of subsidence negatively effecting this ephemeral channel is minimal. However, in the unlikely event that cracks, fissures or sink holes are observed as a result of subsidence the channel will be regraded, filling in the cracks, fissures or sinkholes by hand methods or light equipment depending upon inaccessibility.

Photographs 23, 27, 29, 30, 31, 33, 34, 36, 56, 57, 63, 81, 82, 83, and 84, found in Attachment #1, depict the conditions found in Reach #8.

(Reach #4) Cottonwood Spring Wash

Cottonwood Spring Wash is an east-west tributary to the Main Little Park Wash. Cottonwood Spring Wash drains approximately .94 square miles. Of the total drainage .63 square miles of drainage is within the permit area (Tables 1 & 2).

The channel cuts through the Flagstaff/North Horn, and the Upper Price River formations, from an elevation of 9,000 feet to an elevation of 7,200 feet. The channel varies in width from 10 to nearly 100 feet wide. The adjacent slopes are of moderate to vertical gradient. The channel ranges from 2,000 to over 3,000 feet above the coal seam. At this depth there is no chance that underground mining can adversely effect the channel.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Cottonwood Spring Wash reaches Little Park Wash only in the most extreme situation.

Reach #4 has been broken into three distinct sub-reaches, 4A, 4B, and 4C, each with its own characteristics. Cottonwood Spring Wash by definition and classification by the Permittee is ephemeral.

Reach #4A

Reach #4A (Table 2) has been identified as flowing from the eastern edge of the permit area to water monitoring location L-7-G. Reach #4A is shown on Figure 1.

Reach #4A starts at an elevation of 7,500 feet near the eastern edge of the permit area and drops to an elevation of 7,350 feet near L-7-G. The average grade for the 2,400 foot reach is 6.6%. The reach runs mostly through spruce-fir and contains no riparian vegetarian. The channel bed is mostly sand and gravel.

No water monitoring locations or water shares are associated with this reach. Fish and macro invertebrates are non existing within Reach #4A. This reach by definition and classification by the Permittee is ephemeral.

Reach #4A can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Photographs 48 and 49 depict the conditions found in Reach #4A.

Reach #4B

Reach #4B (Table 2) is described as the area immediately adjacent to and including L-7-G. Reach #4B is shown on Figure 1. Appendix 7-1 contains flow data and quality information, and Appendix 7-6 contains a description for L-7-G. The intermittent flow of water from the springs probably never reaches the main channel of Little Park Wash even in years of high precipitation.

Reach #4B starts at an elevation of 7,350 feet and has a minor slope over the 450 feet to where the next reach begins. The reach runs mostly through Douglas Fir with some pinyon juniper. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

Water share 91-399, associated with L-7-G, is held by the operator and has been designated for mining use. The 250 foot length of Reach #4B can be considered either intermittent or perennial.

The intermittent flow of water from L-7-G probably never reaches the main channel of Little Park Wash even in years of high precipitation.

Reach #4B can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Photographs 8, 9, 10, 50, and 51, found in Attachment #1, depict the conditions found in Reach #4B.

Reach #4C

Reach #4C (Table 2) is described as the area from L-7-G to the confluence of Little Park Wash. Reach #4C is shown on Figure 1. Fish and macro invertebrates are non existing within this reach.

Reach #4C starts near photo 51 at an elevation of 7,300 feet and drops to an elevations of 7,180 feet and has a minor slope (4.5%) over its 2,575 foot length. The reach runs mostly through pinyon juniper transgressing a sagebrush grass type vegetation at the confluence with Little Park Wash. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

No water shares are associated with #4C. This reach is considered ephemeral. Reach #4C can not be impacted by mining do to the coal seam depth being over 1,500 feet.

Photograph 32, found in Attachment #1, depicts the conditions found in Reach #4C.

(Reach #5) IPA#1 Wash

IPA#1 Wash is an east-west tributary to the main Little Park Wash (Figure 1). IPA#1 drains approximately 1.81 square miles. Of the total drainage .75 square miles of drainage is within the permit area (Table 1).

Because IPA#1 Wash drains more than one square mile it can be considered intermittent by definition.

The channel cuts through the Flagstaff/North Horn, and the Upper Price River formations, from an elevation of 9,000 feet to an elevation of 7,000 feet. The channel varies in width from 10 to nearly 100 feet wide. The adjacent slopes are of moderate to vertical gradient. The channel ranges from 1,400 to over 3,000 feet above the coal seam. At this depth there is no chance that underground mining can adversely effect the channel.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel.

Two monitoring locations, L-8-G and Piezometer IPA#1, can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-6 contains a description of both monitoring points.

Reach #5 has been broken into three distinct sub-reaches, 5A, 5B, and 5C, each with its own characteristics. IPA #1 Wash, Reach #5, by definition and classification by the Permittee is ephemeral.

Reach #5A

Reach #5A (Table 2) is described as IPA#1 Wash above L-8-G. Reach #5A is shown on Figure 1.

Reach #5A starts at an elevation of 7,450 feet and drops to an elevations of 7,300 feet and has a minor slope (7.8%) over its 1729 foot length. The reach runs mostly through Douglas Fir in the upper sections and transgresses to pinyon juniper. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

No water shares are associated with #5A. This reach is considered ephemeral. Reach #5A can not be impacted by mining do to the coal seam depth being over 3,000 feet and location off the permit area.

Photograph 52, found in Attachment #1, depicts the conditions found in Reach #5A.

Reach #5B

Reach #5B (Table 2) is described as IPA#1 Wash at L-8-G. Reach #5B is shown on Figure 1.

Reach #5B starts at an elevation of 7,300 feet and drops to an elevations of 7,270 feet and has a minor slope (10.4%) over its 300 foot length. L-8-G is located in Douglas Fir. It flows off and on for approximately 300 feet where it either evaporates or is absorbed into the alluvium The intermittent flow of water from the spring probably never reaches the main channel of Little Park Wash even in years of high precipitation. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

L-8-G has water share 91-2638 owned by the State, and designated for stock watering, associated with it. This 300 foot reach, #5B, is considered intermittent/perennial. Appendix 7-1 contains flow data and quality information. Appendix 7-6 contains a description of the water monitoring site.

Reach #5B can not be impacted by mining do to the coal seam depth being over 2,500 feet and location off the permit area.

Photographs 53 and 53A found in Attachment #1, depicts the conditions found in Reach #5B.

Reach #5C

Reach #5C (Table 2) is described as IPA#1 Wash from L-8-G to the confluence with Little Park Wash. Reach #5C is shown on Figure 1. Two hundred feet below L-8-G is where the channel changes from intermittent to ephemeral. From this point downstream the water table, with respect to the channel surface, could not be located using an 18" spade. The intermittent flow of water from the springs never reaches the main channel of Little Park Wash even in years of high precipitation.

Reach #5C starts at an elevation of 7,270 feet and drops to an elevations of 6,970 feet and has a minor slope (4.5%) over its 6,700 foot length. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Vegetation transgresses pinion-juniper, to a sagebrush grass type vegetation at the confluence with Little Park Wash.

Fish and macro invertebrates are non existing within this reach.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from IPA#1 reaches Little Park Wash only in the most extreme situation.

No water shares are associated with #5C. And the Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Reach #5C can not be impacted by mining do to the coal seam depth being over 1,000 feet.

Photographs 54, 55, and 35 found in Attachment #1, depicts the conditions found in Reach #5C.

(Reach #6) Pine Spring Wash

Pine Spring Wash is an east-west tributary to the main Little Park Wash (Figure 1). Portions of this stream reach immediately adjacent to Pine Spring can be considered intermittent by definition.

Pine Spring Wash drains approximately 1.43 square miles. Of the total drainage .99 square miles of drainage is within the permit area (Table 1).

The channel cuts through the Flagstaff/North Horn, and the Upper Price River formations, from an elevation of 8,900 feet to an elevation of 6,800 feet. The channel varies in width from 10 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The channel ranges from 1,100 to over 3,000 feet above the coal seam. At this depth there is no chance that underground mining can adversely effect the channel.

Vegetation transgresses from spruce-fir in the very most upper reaches, to pinion-juniper, and then finally to a sagebrush grass type vegetation at the confluence with Little Park Wash.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel. Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Pine Spring Wash reaches Little Park Wash only in the most extreme situation.

Three monitoring locations, L-9-G, IPA #3, and L-13-S, can be found within this reach. Appendix 7-1 contains flow data, quality information, and water depths for the monitoring locations. Appendix 7-6 contains a description of the monitoring points.

Reach #6 has been broken into three distinct sub-reaches, 6A, 6B, and 6C, each with its own characteristics. Pine Spring Wash, Reach #6, by definition and classification by the Permittee is ephemeral.

Reach #6A

Reach #6A (Table 2) is described as Pine Spring Wash above L-9-G. Reach #6A is shown on Figure 1.

Reach #6A starts at an elevation of 7,750 feet and drops to an elevations of 7,190 feet and has a slope of (14.8%) over its 3,840 foot length. The reach runs mostly through Douglas Fir in the upper sections and transgresses to pinyon juniper in the lower section. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

No water shares are associated with #6A. This reach is considered ephemeral. Reach #6A can not be impacted by mining do to the coal seam depth being over 2,000 feet.

Reach #6B

Reach #6B (Table 2) is described as Pine Spring at L-9-G. Reach

#6B is shown on Figure 1.

Reach #6B starts at an elevation of 7,190 feet and drops to an elevations of 7,170 feet and has a minor slope (6.7%) over its 300 foot length. L-9-G is located in Douglas Fir. It flows off and on for approximately 300 feet where it either evaporates or is absorbed into the alluvium The intermittent flow of water from the spring probably never reaches the main channel of Little Park Wash even in years of high precipitation. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach.

L-9-G has water share 91-2638 owned by the BLM, and designated for stock watering, associated with it. This 300 foot reach, #6B, is considered intermittent/perennial. Appendix 7-1 contains flow data and quality information. Appendix 7-6 contains a description of the water monitoring site.

Reach #6B can not be impacted by mining do to the coal seam depth being over 2,000 feet and location off the permit area.

Photographs 11 and 12 found in Attachment #1, depicts the conditions found in Reach #6B.

Reach #6C

Reach #6C (Table 2) is described as Pine Spring Wash from L-9-G to the confluence with Little Park Wash. Reach #6C is shown on Figure 1.

Four hundred feet below L-9-G is where the channel changes from intermittent to ephemeral. From this point downstream the water table, with respect to the channel surface, could not be located using an 18" spade. The intermittent flow of water from the springs never reaches the main channel of Little Park Wash even in years of high precipitation.

Reach #6C starts at an elevation of 7,170 feet and drops to an elevations of 6,840 feet and has a minor slope (3.7%) over its 8,975 foot length. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach. Vegetation transgresses pinion-juniper, to a sagebrush grass type vegetation at the confluence with Little Park Wash.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Pine Spring Wash reaches Little Park Wash only in the most extreme situation.

IPA #3, and L-13-S, can be found within this reach. Appendix 7-1 contains flow data, quality information, and water depths for the monitoring locations. Appendix 7-6 contains a description of the monitoring points

No water shares are associated with #5C. And the Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Reach #6C can not be impacted by mining do to the coal seam depth being over 1,000 feet.

(Reach #7) No Name Wash

No Name Wash is an east-west tributary to the main Little Park Wash. Portions of this stream reach can be considered intermittent by definition. No Name Wash is shown on Figure 1.

No Name Wash drains approximately 1.41 square miles. Of the total drainage .71 square miles of drainage is within the permit area (Tables 1 and 2).

The channel cuts through the Flagstaff/North Horn, and the Upper Price River formations, from an elevation of 7,120 feet to an elevation of 6,690 feet. The channel varies in width from 10 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The channel ranges from 1,100 to over 2,500 feet above the coal seam. At this depth there is no chance that underground mining can adversely effect the channel.

The gradient is extremely steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel.

Two monitoring locations, L-12-G and L-14-S can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-6 contains a description of the monitoring point. One

hundred feet below L-12-G is where the channel changes from intermittent to ephemeral. From this point downstream there are several wet spots but no flow. The water table, with respect to the channel surface, could not be located using an 18" spade in most places. Flow has been observed at the road crossing, L-14-S, in some wet years but it is currently dry. The intermittent flow of water from the springs probably never reaches the main channel of Little Park Wash even in years of high precipitation.

Vegetation transgresses from Spruce -fir in the very most upper reaches, to pinion-juniper, and then finally to a sagebrush grass type vegetation at the confluence with Little Park Wash. The reach does not contain any riparian vegetarian. Fish and macro invertebrates are non existing within this reach.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from No Name Wash reaches Little Park Wash only in the most extreme situation.

No water shares are associated with #7. And the Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Reach #7 can not be impacted by mining do to the coal seam depth being over 1,000 feet.

Photographs 61, 87, and 88 found in Attachment #1, depicts the conditions found in Reach #7.

The Cove Drainage:

Because it drains a watershed of at least one square mile, the Cove Drainage is considered "intermittent" by DOGM definition. However the Cove Drainage channel is a dry ephemeral acting stream.

The Cove Drainage, south of Horse Canyon, reaches its highest elevation of 8,500 feet at the head of Lila Canyon. Coleman Wash drains the upper reaches, joining Grassy Wash, which together with Stinky Springs Wash drains the Book cliffs escarpment in the Mine Permit Extension Area. Grassy and Stinky Spring Washes join with Marsh Flat Wash. The major dry

wash, Marsh Flat Wash, enters the Price River (elevation 4,700 feet) in Section 6, T18S, R14E, and drains approximately 31 square miles.

The major surface facilities are located in the upper portion of The Cove drainage area. The washes have cut Holocene gravels and Pleistocene pediment deposits overlying the eastern dipping Mancos Shale. The pediments are poorly to firmly cemented with caliche near the top. Sediments of silt, sand, and large boulders can be as much as 50 feet thick. The meandering V-Shaped washes incised into the Mancos Shale are narrow with a thin veneer of sand and silt. The wash slopes are moderate to steep near the cliff escarpment. The stock ponds are replenished by local rainfall. Water flowing into the pediments near the cliff escarpment probably seeps out at lower elevations above the dry washes and, therefore, is not stored.

(Reach #9) Stinky Spring Wash

Stinky Spring Wash is a north-south tributary to Grassy. The drainage can be considered intermittent by definition. Because it drains slightly more than one square mile. For the purpose of this report Stinky Spring Wash is broken down into four reaches. Reach #9A is the area above the escarpment. Reach #9B is from the escarpment to Stinky Springs. Reach #9C is Stinky Springs and Reach #9D is from Stinky Springs to the mouth of the canyon. Information on Stinky Springs Wash can be found on Figure 1.

Stinky Spring Wash drains approximately 1.08 square miles all of which is within the permit area (Table 1 and 2). Vegetation transgresses from Pinyon Juniper in the very most upper reaches, a sagebrush grass type vegetation near the escarpment to a Salt Desert Shale from the bottom of the escapement to the confluence of Grassy Wash.

Two monitoring locations, L-16-G and L-17-G, can be found within this reach. Appendix 7-1 contains flow data, quality information, and water depths for the monitoring locations. Appendix 7-6 contains a description of the monitoring points. The reach does not contain any riparian vegetarian. Fish and macro invertebrates are non existing within this reach.

Very little signs of wildlife use of this channel exists above the escarpment. However, on the escarpment and at the seep locations,

Bighorn sheep have been observed with lambs in the spring.

(Reach #9A) Above the Escarpment

Reach #9A (Table 2) is described as the area of Stinky Spring Wash above the escarpment. Reach #9A is shown on Figure 1.

At the upper end Stinky Spring Wash begins at what has been identified as a stock pond but is actually a alluvial fan composed of mostly sand. The channel starts in the Upper Price River formation and cuts through the Castle Gate Sandstone.

Reach #9A starts at an elevation of 7,080 feet and drops to an elevations of 6,560 feet and has a minor slope (7.0%) over its 7,400 foot length. The reach runs mostly through pinyon-juniper and sagebrush grass associations. The reach does not contain any riparian vegetarian. The channel bed is mostly sand and gravel. Fish and macro invertebrates are non existing within this reach. No water shares are associated with #9A.

The channel ranges from 1,000 to under 500 feet above the coal seam. The channel is located above the proposed mine but is above either a long term bleeder systems, mains, or barriers. The bleeders and the mains are designed to be mined in such a way that subsidence will not take place.

The chance of subsidence negatively effecting this ephemeral channel is minimal. However, in the unlikely event that cracks, fissures or sink holes are observed as a result of subsidence the channel will be regraded, filling in the cracks, fissures or sinkholes by hand methods due to its inaccessibility.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Photograph 93, 94, 95, 96, 97, 98, 99, and 100, found in Attachment #1, depicts the conditions found in Reach #9A.

Reach #9B Escarpment to Stinky Springs

Reach #9B (Table 2) is described as the area of Stinky Spring Wash from the escarpment to Stinky Springs. Reach #9B is shown on Figure 1 Reach #9B starts at the top of the escarpment and then drops of the face of the Book Cliffs into the Black Hawk formation and then through the Mancos Shale to Stinky Springs.

Reach #9B starts at an elevation of 6,560 feet and drops to an elevations of 5,840 feet and has a slope (38.1%) over its 1,800 foot length. The reach runs mostly through pinyon-juniper and sagebrush grass associations. The reach does not contain any riparian vegetarian. The gradient is steep in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel. Fish and macro invertebrates are non existing within this reach. No water shares are associated with this reach.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Stinky Springs Wash reaches Marsh Flat Wash only in the most extreme situation.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

The chance of subsidence negatively effecting this ephemeral channel is minimal since a outcrop barrier of 200 feet is required at the escarpment, and at the bottom of the escarpment the channel is approximately 600 feet below the coal seam. The outcrop barriers, and physical location of the coal seam in respect to the channel result in a minimal chance of subsidence negatively effecting the channel.

Reach #9C Stinky Springs

Reach #9C (Table 2) is described as the area of Stinky Springs. Reach #9C is shown on Figure 1.

Reach #9C starts at an elevation of 5,840 feet and drops to an elevations of 5,760 feet and has a slope (15%) over its 535 foot length. The reach runs mostly through pinyon-juniper and sagebrush grass associations. The reach does not contain any riparian vegetarian. The gradient is steep

in the upper reaches and moderate in the lower reaches, with mostly gravel, sand and silt filling the channel. Fish and macro invertebrates are non existing within this reach. No water shares are associated with this reach.

Two monitoring locations, L-16-G and L-17-G can be found in this reach in an area of the Central and Cliff's Grabens. The seeps are located at the contact of Blackhawk and Mancos Shale formations. Appendix 7-1 contains flow data and quality information, and Appendix 7-6 contains a description for L-16-G and L-17-G. The intermittent flow of water from the springs never reach the main channel of Grassy Wash even in years of high precipitation. No water shares are associated with #9A.

The chance of subsidence negatively effecting this ephemeral channel is minimal since the channel is approximately 600 feet below the coal seam. Stinky Springs are also located off the permit area. The physical location of the coal seam in respect to the springs results in a minimal chance of subsidence negatively effecting the channel.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Stinky Springs Wash reaches Marsh Flat Wash only in the most extreme situation.

The Permittee has classified 75 feet of this stream reach as "Intermittent/perennial" .

Photograph 42, 43, 50, 52, and 50A, found in Attachment #1, depicts the conditions found in Reach #9C.

Reach #9D

Reach #9D (Table 2) is described as the channel below Stinky Springs to the mouth of the canyon. Reach #9D is shown on Figure 1.

Reach #9D starts at an elevation of 5,760 feet and drops to an elevations of 5,600 feet and has a slope (8.9%) over its 1,787 foot length. The reach runs mostly through grasses and salt desert shrub communities. The reach does not contain any riparian vegetarian. The channel is filled with mostly gravel, sand and silt. Fish and macro invertebrates are non

existing within this reach. No water shares are associated with this reach.

The chance of subsidence negatively effecting this ephemeral channel is minimal since the channel is approximately 600 feet below the coal seam and off the permit area. The physical location of the coal seam in respect to the channel results in a minimal chance of subsidence negatively effecting the channel.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from Stinky Springs Wash reaches Marsh Flat Wash only in the most extreme situation.

The Permittee has classified this stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

Photograph 72, 75, and 76, found in Attachment #1, depicts the conditions found in Reach #9D.

Lila Canyon

Lila Canyon is an east-west tributary to Grassy Wash within the Cove drainage. Portions of this stream above Lila Canyon can be considered intermittent by definition.

Lila Canyon drains approximately 1.71 square miles. Of the total drainage .57 square miles of drainage is within the permit area (Table 1).

The channel starts in Colton formation then cuts the Upper Price River formation then through the Castle Gate Sandstone and then finally drops of the face of the Book Cliffs into the Black Hawk formation and then through the Mancos Shale where it converges with Grassy Wash. The channel elevation ranges from an elevation of 8,500 feet to an elevation of 5,400 feet. The channel varies in width from 10 to several hundred feet wide. The adjacent slopes are of moderate to vertical gradient. The channel has been previously undermined by the Horse Canyon mine with out any known negative impacts.

The gradient is extremely steep in the upper reaches and moderate

in the lower reaches, with mostly gravel, sand and silt filling the channel.

Three monitoring locations, L-1-S, L-6-G, and L-11-G can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-6 contains a description of the monitoring points. Fifty feet below L-11-G is where the channel changes from intermittent to ephemeral. From this point downstream there are several wet spots but no flow. The water table, with respect to the channel surface, could not be located using an 18" spade in most places. The intermittent flow of water from the springs reaches the main channel of Grassy Wash only in years of high precipitation.

Vegetation transgresses from Spruce Fir in the very most upper reaches to Pinyon Juniper and finally to a sagebrush grass type vegetation near the escarpment to a Salt Desert Shale from the bottom of the escapement to the confluence of Grassy Wash.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from No Name Wash reaches Little Park Wash only in the most extreme situation.

The Permittee has classified this drainage or stream reach as "Ephemeral" because of its vegetation types, tendency to flow only in response to storm events, and location above the local water table.

This channel has been previously extensively under mined by the Horse Canyon Mine without any negative effects. No additional undermining of Lila Canyon is anticipated with the new Lila Canyon Permit. Since minimal additional undermining of Lila Canyon is anticipated, the Lila Canyon Mine cannot have a negative effect of Lila Canyon due to subsidence.

Right Fork of Lila Canyon

The Right Fork of Lila Canyon is an east-west tributary to Grassy Wash within the Cove drainage. All portions are considered ephemeral by definition. The Right Fork of Lila Canyon drains approximately .4 square miles. Of drainage all within the permit area (Table 1).

The channel starts in the Castle Gate sandstone then drops over the Bookcliffs escarpment and then drains into Grassy Wash. The gradient is

nearly vertical in the upper reaches and extremely steep in the lower reaches, with mostly gravel, sand and silt filling the channel.

Two monitoring locations, L-2-S, and L-3-S can be found in this reach. Appendix 7-1 contains flow data, quality information, and water depth. Appendix 7-6 contains a description of the monitoring points. The water table, with respect to the channel surface, could not be located using an 18" spade.

Vegetation transgresses from pinion-juniper in the upper reaches to a sagebrush grass type vegetation at the confluence with Grassy Wash.

Seasonal flash floods can be expected and tend to obliterate any human activity which has occurred in the washes. The sediment laden water from the Right Fork of LIla reaches Grassy Wash only in the most extreme situation.

Fish and macro invertebrates are non existing within this reach. No water shares are associated with this reach and no riparian habitat can be found in the Right Fork of Lila.

ATTACHMENT #1
to
APPENDIX 7-7

PHOTOGRAPHS
for
Surface Water Characterizations

UtahAmerican Energy, Inc.
R. Jay Marshall P.E.

Photo #18

Photo #25

Photo #20

Photo #21

Photo #22

Photo #26

Photo #38

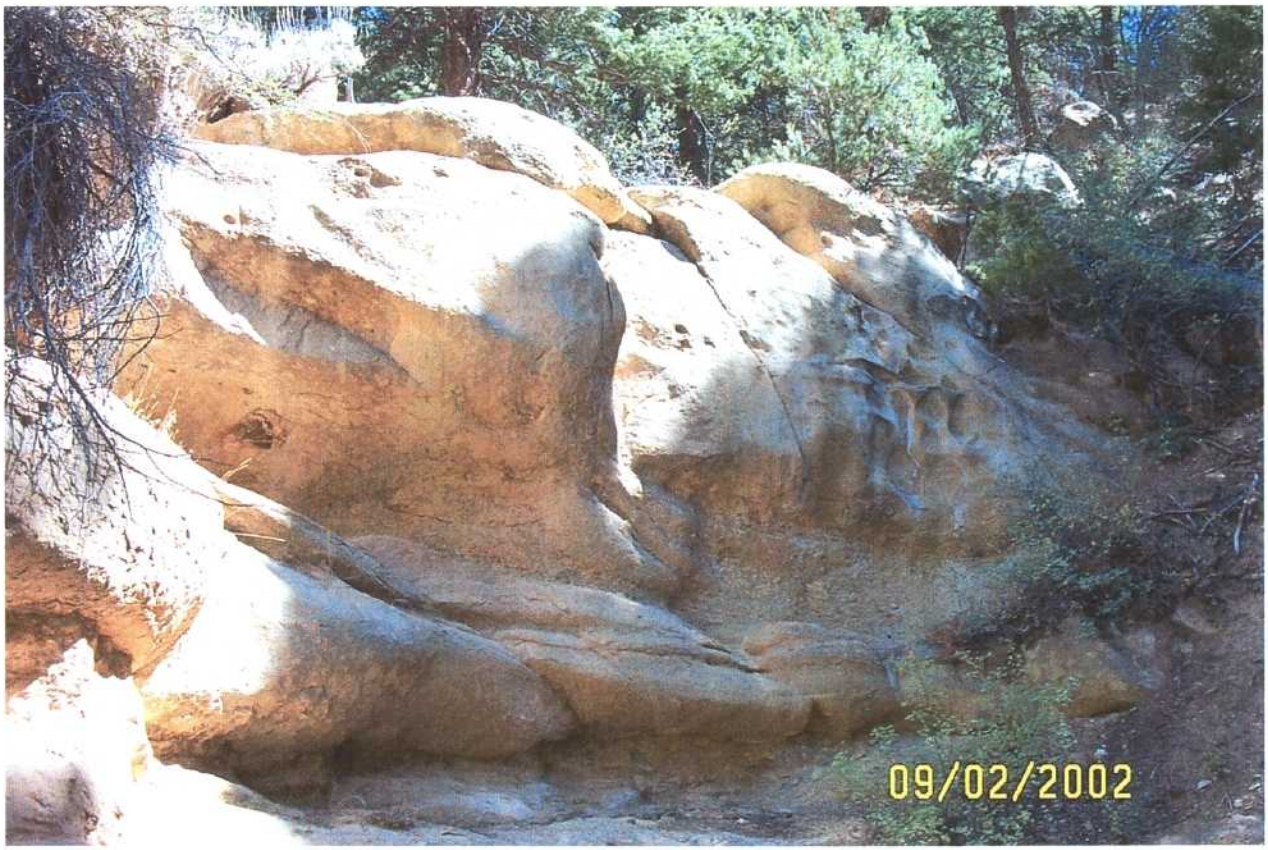

Photo #39

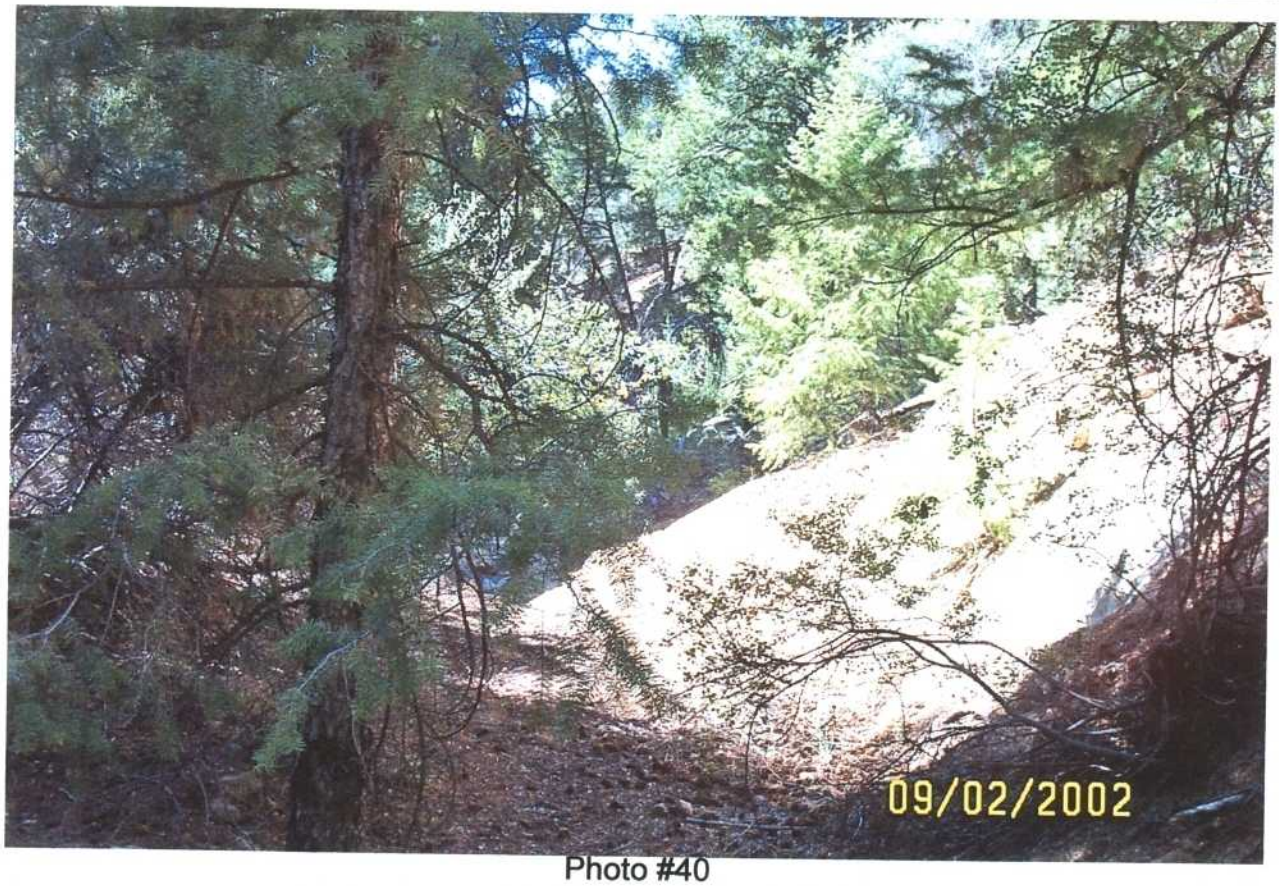

Photo #40

Photo #41

Photo #42

Photo #44

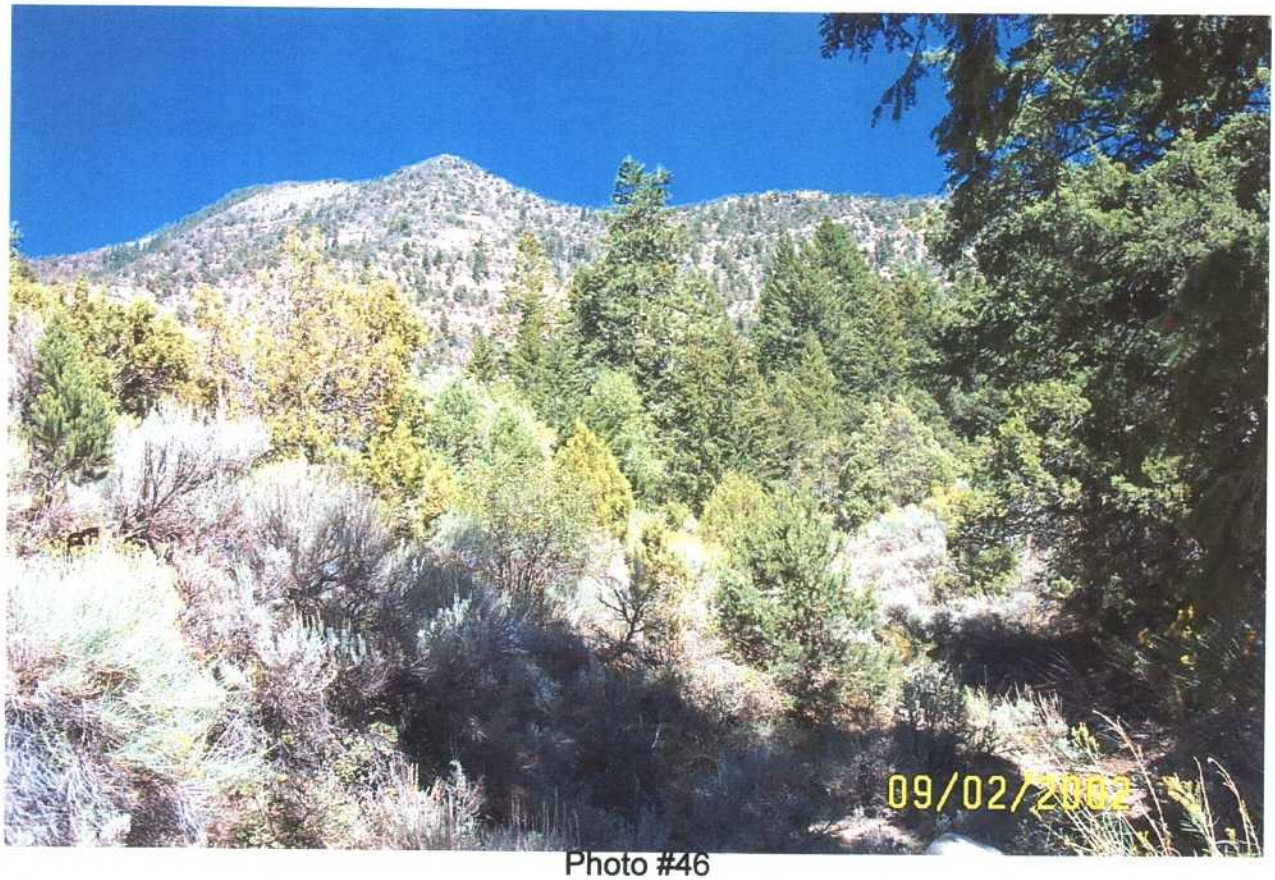

Photo #46

Photo #47

Photo #23

Photo #27

Photo #29

Photo #30

Photo #31

Photo #33

Photo #34

Photo #36

Photo #56

Photo #57

Photo #63

Photo #81

Photo #82

Photo #83

Photo #8

Photo #9

Photo #50

Photo #10

Photo #51

Photo #32

Photo #52

Photo #53A

Photo #53

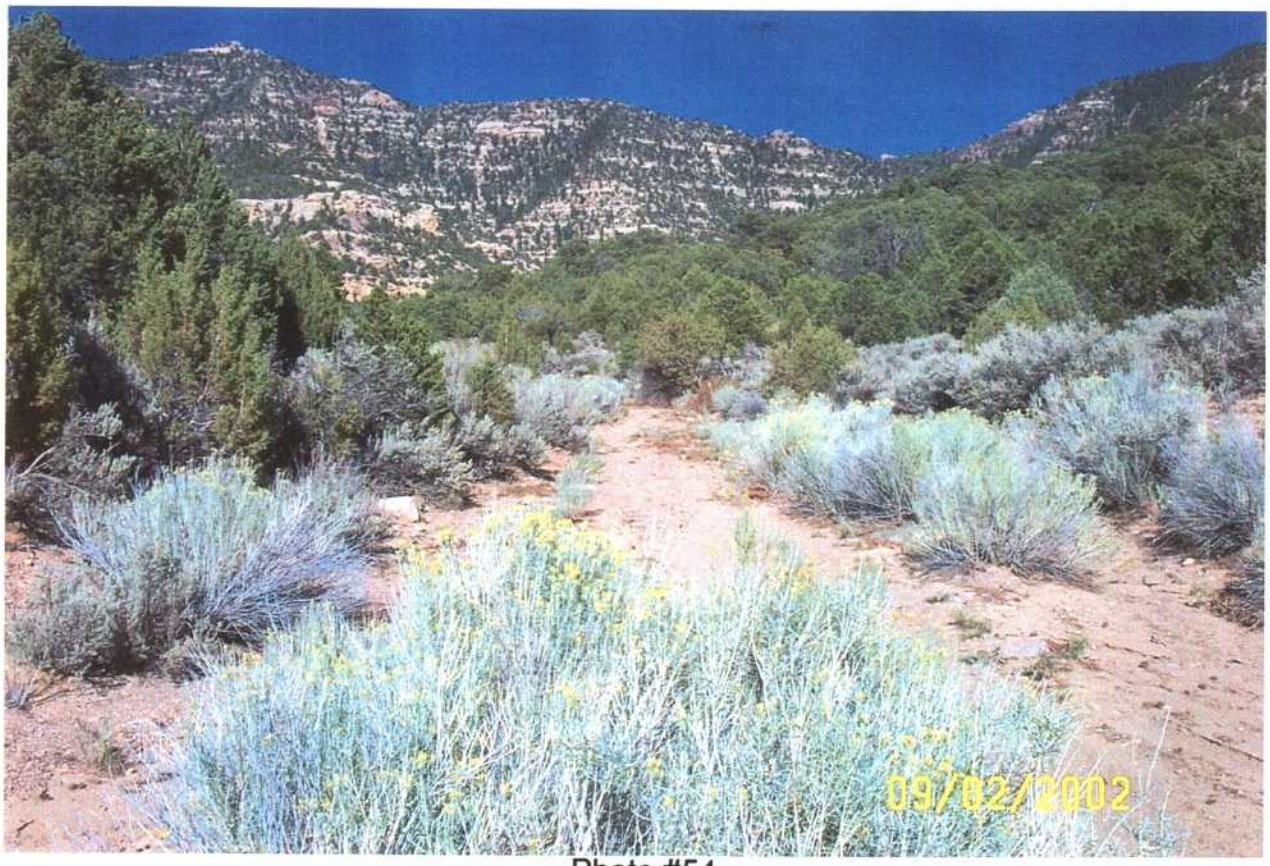

Photo #54

Photo #55

Photo #35

Photo #11

Photo #12

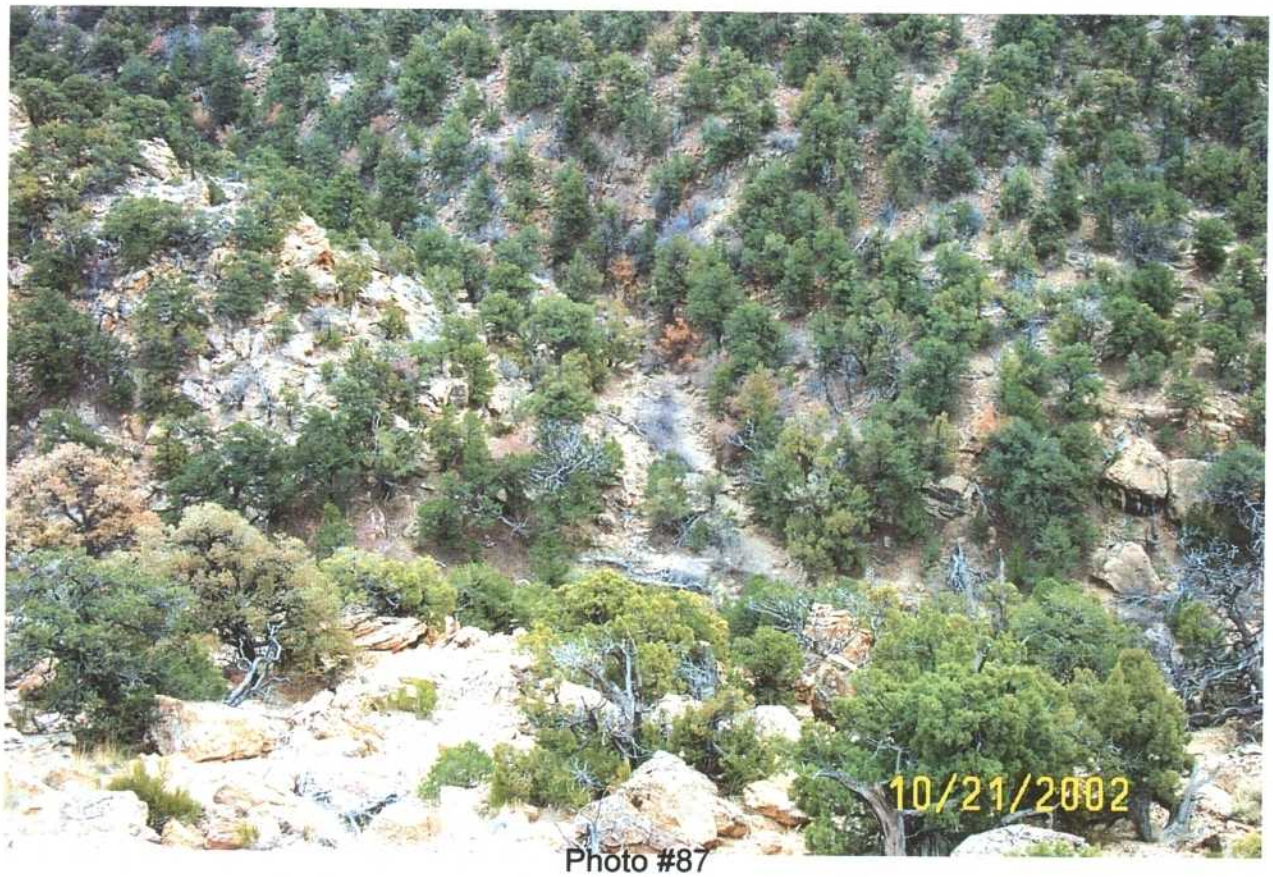

Photo #87

Photo #88

Photo #61

Photo #93

Photo #94

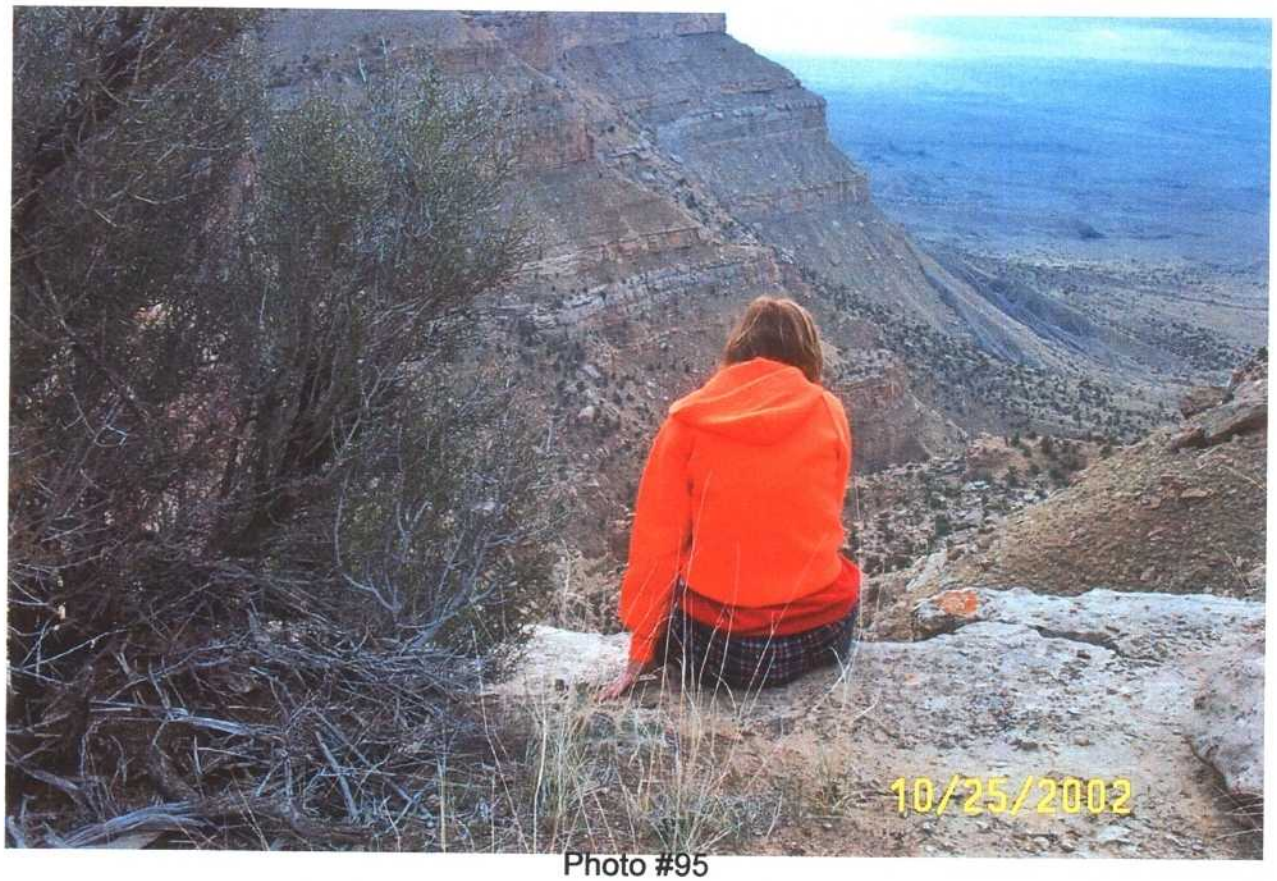

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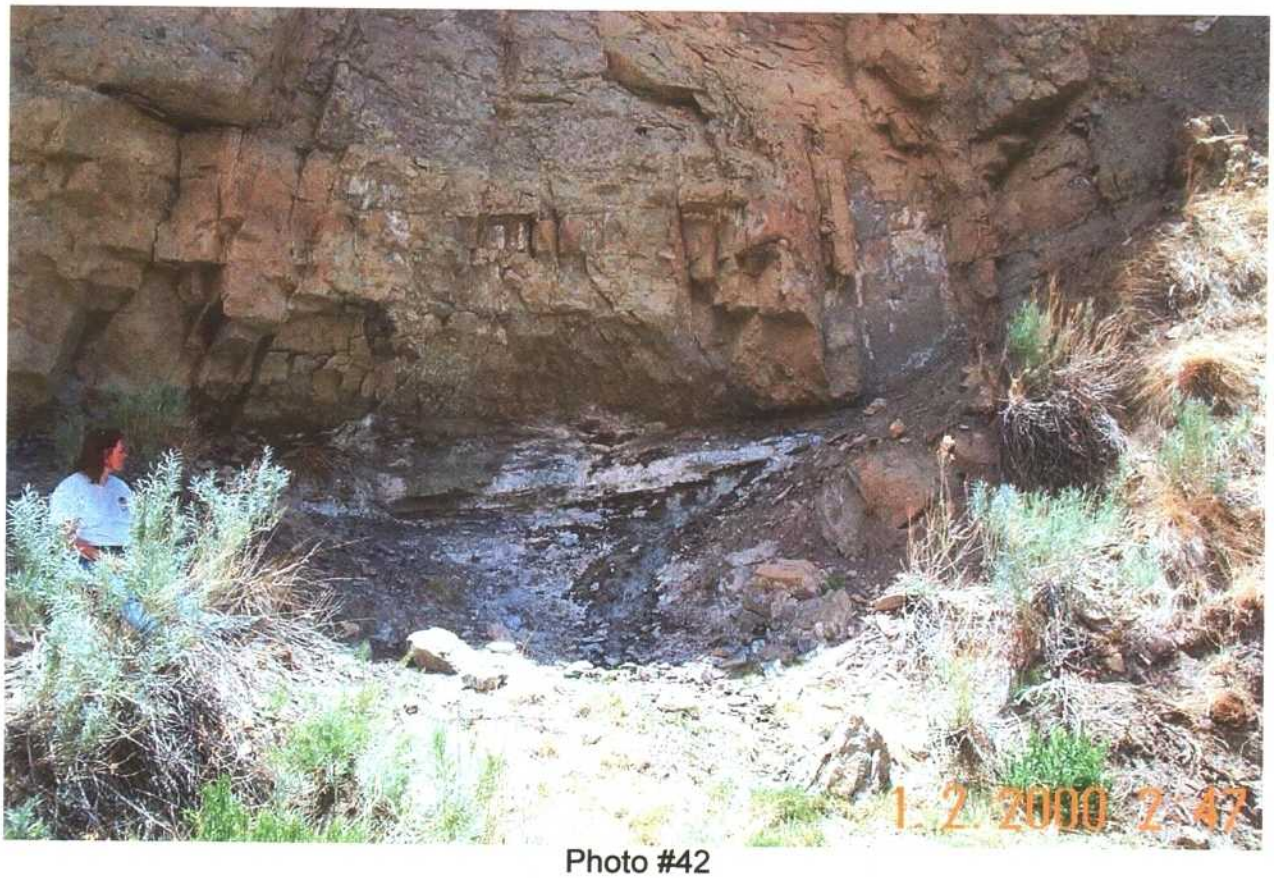
Photo #96

Photo #97

Photo #98

Photo #99

Photo #100



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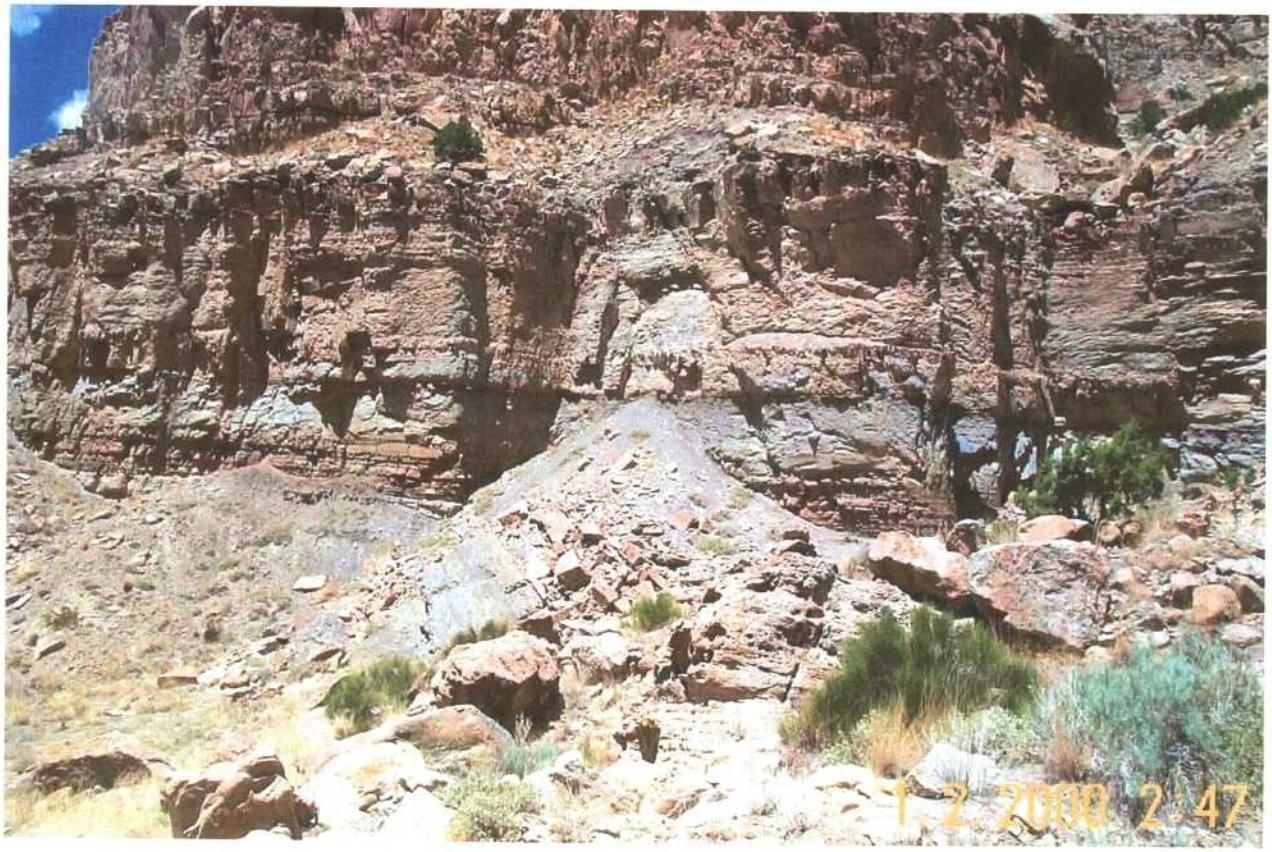

Photo #43

Photo #50

Photo #52

Photo #50A

Photo #72

Photo #75

Photo #76

L-16-G
Little Stink

Location: Located in what has recently been named Stink Spring Canyon by the Operator. The seep is located approximately .25 miles to the West of the permit area and within the Central Graben. The seep is located at the top of the Mancos Shale approximately 600 feet below the coal seam in a highly faulted area at an elevation of 5840 feet. The stream reach is intermittent by definition but is ephemeral acting (See Appendix 7-7 & Plate 7-4). The drainage above and below this monitoring location flows only as a result of spring run-off or storm events.

General: Due to its location, outside the permit area, outside the limit of subsidence, within the Central Graben, and being 600 feet below the coal seam, there is no potential for Lila Canyon Mine to negatively impact this spring or recharge sources. This location is used heavily by Rocky Mountain Bighorn Sheep. The permittee has never observed amphibians at or near this location.

Vegetation description: Habitat immediately below this wet seep monitoring site is a mix of grasses and salt desert shrub habitat.

L-17-G
Big Stink

Location: Located in what has recently been named Stinky Spring Canyon. The seep is located approximately .25 miles to the West of the permit area, .1 mile above L-16-S, and within the Central Graben. The seep is located at the top of the Mancos Shale approximately 500 feet below the coal seam in a highly faulted area at an elevation of 5920 feet. The stream reach is intermittent by definition but is ephemeral acting (See Appendix 7-7 & Plate 7-4). The drainage above and below this monitoring location flows only as a result of spring run-off or storm events.

General: Due to its location, outside the permit area, outside the limit of subsidence, and being 500 feet below the coal seam, there is no potential for Lila Canyon Mine to negatively impact this spring or recharge sources. This location is used heavily by Rocky Mountain Bighorn Sheep. The permittee has never observed amphibians at or near this location.

Vegetation description: Habitat immediately below this wet seep monitoring site is a mix of grasses and salt desert shrub habitat and invasive tamarisk.

Appendix 7-7

Figure 1

All Stream Reaches

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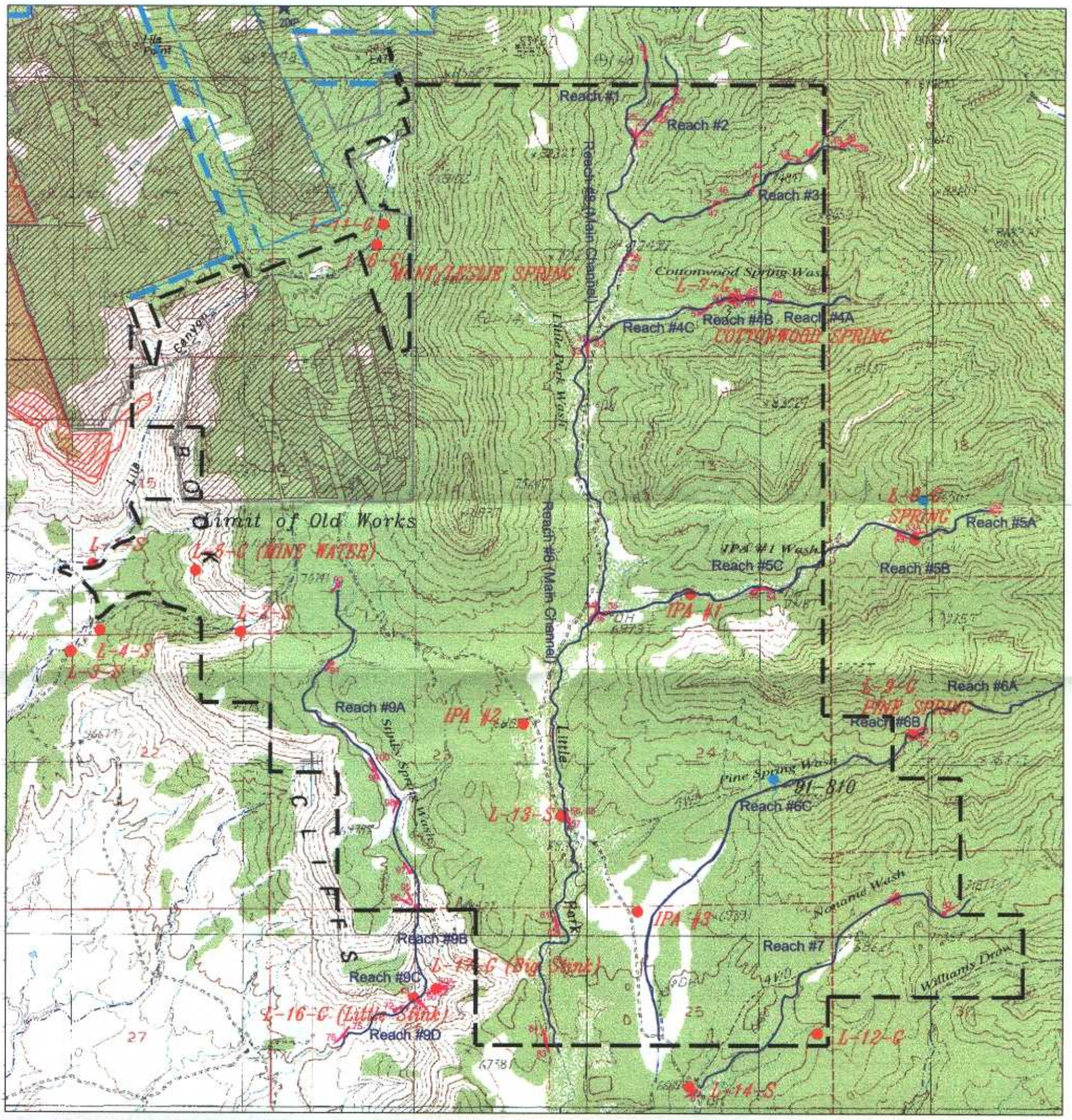

Photo Locations in Magenta

REVISIONS

RJM	01/10/04		

SCALE:
1000' 0' 2000'

Lila Canyon Mine

Appendix 7-7
Figure 1

Lila Canyon Extension

Chapter 8
Bonding & Insurance

TABLE OF CONTENTS

800. BONDING AND INSURANCE. . . . . Page -2-
810. Bonding Definitions and Diversion Responsibilities. . . . . Page -2-
820. Requirement to file a Bond. . . . . Page -2-
830. Determination of Bond Amount. . . . . Page -4-
840. General Terms and Conditions of the Bond. . . . . Page -6-
850. Bonding Requirements . . . . . Page -7-
860. Forms of Bonds. . . . . Page -8-
870. Replacement of Bonds. . . . . Page -8-
880. Requirement to Release Performance Bonds. . . . . Page -8-
890. Terms and Conditions for Liability Insurance. . . . . Page -13-

List Of Appendixes

Appendix 8-1 Reclamation Cost Estimates
Appendix 8-2 Certificate of Liability Insurance
Appendix 8-3 For future use if required

800. BONDING AND INSURANCE.

810. Bonding Definitions and Diversion Responsibilities.

811. Terms used in R645-301-800 may be found defined in R645-100-200.

812. Division Responsibilities - Bonding.

812.100. The Division will prescribe and furnish forms for filing performance bonds.

812.200. The Division will prescribe by regulation terms and conditions for performance bonds and insurance.

812.300. The Division will determine the amount of the bond for each area to be bonded, in accordance with R645-301-830. The Division will also adjust the amount as acreage in the permit area is revised, or when other relevant conditions change according to the requirements of R645-301-830.400.

812.400. The Division may accept a self-bond if the permittee meets the requirements of R645-301-860.300 and any additional requirements in the State or Federal program.

812.500. The Division will release liability under a bond or bonds in accordance with R645-301-880 through R645-301-880.800.

812.600. If the conditions specified in R645-301-880.900 occur, the Division will take appropriate action to cause all or part of a bond to be forfeited in accordance with procedures of that Section.

812.700. The Division will require in the permit that adequate bond coverage be in effect at all times. Except as provided in R645-301-840.520, operating without a bond is a violation of a condition upon which the permit is issued.

820. Requirement to file a Bond.

820.100. Before the permit is issued, The operator will file with the Division, on a form prescribed and furnished by the Division, a bond payable to the Division and

conditioned upon the faithful performance of all the requirements of the State Program, the permit and the reclamation plan.

820.110. Areas to be covered by the Performance Bond are:

820.111. The bond will cover the proposed disturbed area within the permit area.

820.120. The operator will not disturb any surface areas or start any mining or slope work prior to acceptance by the Division of the required performance.

820.130. The applicant will file, with the approval of the Division, a bond or bonds under one of the following schemes to cover the bond amounts for the permit area as determined in accordance with R645-301-830:

820.132. A performance bond will be posted for the full reclamation of the entire proposed disturbed area within the permit area.

820.200. Form of the Performance Bond.

820.210. The Division will prescribe the form of the performance bond.

820.220. The Division may allow for:

820.221. The operator is proposing to post a surety bond for this operation.

820.300. Period of Liability.

820.310. Performance bond liability will be for the duration of the coal mining and reclamation operations and for a period which is coincident with the operator's period of extended responsibility for successful revegetation provided in R645-301-356 or until achievement of the reclamation requirements of the State Program and permit, whichever is later.

820.320. With the approval of the Division, a bond may be

posted and approved to guarantee specific phases of reclamation within the permit area provided the sum of phase bonds posted equals or exceeds the total amount required under R645-301-830 and 830.400. The scope of work to be guaranteed and the liability assumed under each phase bond will be specified in detail.

820.330. Isolated and clearly defined portions of the permit area requiring extended liability may be separated from the original area and bonded separately with the approval of the Division. Such areas will be limited in extent and not constitute a scattered, intermittent, or checkerboard pattern of failure. Access to the separated areas for remedial work may be included in the area under extended liability if deemed necessary by the Division.

820.340. If the Division approves a long-term, intensive agricultural postmining land-use, in accordance with R645-301-413, the applicable five- or ten-year period of liability will commence at the date of initial planting for such long-term agricultural use.

820.350. General.

820.351. The bond liability of the permittee will include only those actions which he or she is obligated to take under the permit, including completion of the reclamation plan, so that the land will be capable of supporting the postmining land use approved under R645-301-413.

820.352. Implementation of an alternative postmining land-use approved under R645-301-413.300 which is beyond the control of the permittee need not be covered by the bond. Bond liability for prime farmland will be as specified in R645-301-880.320.

830. Determination of Bond Amount.

830.100. The amount of the bond required for each bonded area will:

830.110. Be determined by the Division;

830.120. The bonding calculations provided in Appendix 8-1

of this chapter are based on the proposed permit and reclamation plan.

830.130. Bonding Calculations provided are based on probable difficulty of reclamation, with particular emphasis on the steep topography, as well as geologic hydrology and revegetation potential.

830.140. Detailed estimated bonding costs, with supporting calculations are provided in Appendix 8-1 of this permit application.

830.200. The proposed bond cost in Appendix 8-1 is based on current labor and equipment rates (Means, Cat Handbook) and are expected to be sufficient to assure the completion of the reclamation plan if the work has to be performed by the Division in the event of forfeiture.

830.300. The proposed reclamation cost has been inflated over a 5 year period (permit term) using te latest Gross National Index (GNI).

830.400. Adjustment of Amount.

830.410. The amount of the bond or deposit required and the terms of the acceptance of the applicant's bond will be adjusted by the Division from time to time as the area requiring bond coverage is increased or decreased or where the cost of future reclamation changes. The Division may specify periodic times or set a schedule for reevaluating and adjusting the bond amount to fulfill this requirement.

830.420. The Division will:

830.421. Notify the permittee, the surety, and any person with a property interest in collateral who has requested notification under R645-301-860.260 of any proposed adjustment to the bond amount; and

830.422. Provide the permittee an opportunity for an informal conference on the adjustment.

830.430. A permittee may request reduction of the amount of the performance bond upon submission of evidence to the Division providing that the permittee's method of operation or

other circumstances reduces the estimated cost for the Division to reclaim the bonded area. Bond adjustments which involve undisturbed land or revision of the cost estimate of reclamation are not considered bond release subject to procedures of R645-301-880.100 through R645-301-880.800.

830.440. In the event that an approved permit is revised in accordance with the R645 rules, the Division will review the bond for adequacy and, if necessary, will require adjustment of the bond to conform to the permit as revised.

830.500. An operator's financial responsibility under R645-301-525.230 for repairing material damage resulting from subsidence may be satisfied by the liability insurance policy required under R645-301-890.

840. General Terms and Conditions of the Bond.

840.100. The performance bond will be in an amount determined by the Division as provided in R645-301-830.

840.200. The performance bond will be payable to the Division.

840.300. The performance bond will be conditioned upon faithful performance of all the requirements of the State Program and the approved permit, including completion of the reclamation plan.

840.400. The duration of the bond will be for the time period provided in R645-301-820.300.

840.500. General.

840.510. The bond will provide a mechanism for a bank or surety company to give prompt notice to the Division and the permittee of any action filed alleging the insolvency or bankruptcy of the surety company, the bank, or the permittee, or alleging any violations which would result in suspension or revocation of the surety or bank charter or license to do business.

840.520. Upon the incapacity of a bank or surety company by reason of bankruptcy, insolvency, or suspension or revocation of a charter or license, the permittee will be deemed to be without bond coverage and will promptly notify the Division.

The Division, upon notification received through procedures of R645-301-840.510 or from the permittee, will, in writing, notify the operator who is without bond coverage and specify a reasonable period, not to exceed 90 days, to replace bond coverage. If an adequate bond is not posted by the end of the period allowed, the operator will cease coal extraction and will comply with the provisions of R645-301-541.100 through R645-301-541.400 as applicable and will immediately begin to conduct reclamation operations in accordance with the reclamation plan. Mining operations will not resume until the Division has determined that an acceptable bond has been posted.

850. Bonding Requirements for UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES and Associated Long-Term Coal-Related Surface Facilities and Structures.

850.100. Responsibilities. The Division will require bond coverage, in an amount determined under R645-301-830, for long-term surface facilities and structures, and for areas disturbed by surface impacts incident to UNDERGROUND COAL MINING AND RECLAMATION ACTIVITIES, for which a permit is required. Specific reclamation techniques required for underground mines and long-term facilities will be considered in determining the amount of bond to complete the reclamation.

850.200. Long-term period of liability.

850.220. This facility will meet the definition of a long-term surface disturbance, and will be bonded as such.

850.230. The bond will meet the requirements of continuous coverage throughout the required liability period.

850.240. The bond will meet the requirements of continuous coverage throughout the required liability period.

850.300. Bond Forfeiture. The Division will take action to forfeit a bond pursuant to R645-301-850 if 30 days prior to bond expiration the operator has not filed:

350.310. The bond will be renewed at least 30 days prior to the expiration of the permit term to provide continuous coverage.

850.320. The bond will be renewed as required to provide coverage for the period of liability, including the period of extended responsibility for successful revegetation.

860. Forms of Bonds.

860.100. It is proposed to post a surety bond for the Lila Canyon operation.

860.110. The surety bond will be executed by The Operator and a corporate surety licensed to do business in Utah.

860.120. The surety bond will be issued for the expected permit term (5 years) and will be noncancellable during the term.

870. Replacement of Bonds.

870.100. The Division may allow a permittee to replace existing bonds with other bonds that provide equivalent coverage.

870.200. The Division will not release existing performance bonds until the permittee has submitted, and the Division has approved, acceptable replacement performance bonds. Replacement of a performance bond pursuant to this section will not constitute a release of bond under R645-301-880.100 through R645-301-880.800.

880. Requirement to Release Performance Bonds.

880.100. Bond release application.

880.110. The permittee may file an application with the Division for the release of all or part of a performance bond. Applications may be filed only at times or during seasons authorized by the Division in order to properly evaluate the completed reclamation operations. The times or seasons appropriate for the evaluation of certain types of reclamation will be identified in the approved mining and reclamation plan.

880.120. Within 30 days after an application for bond release has been filed with the Division, the operator will submit a copy of an advertisement placed at least once a week for four successive weeks in a newspaper of general circulation in the locality of the coal mining and reclamation operations. The advertisement will be considered part of any bond release

application and will contain the permittee's name, permit number and approval date, notification of the precise location of the land affected, the number of acres, the type and amount of the bond filed and the portion sought to be released, the type and appropriate dates of reclamation work performed, a description of the results achieved as they relate to the operator's approved reclamation plan and the name and address of the Division to which written comments, objections, or requests for public hearings and informal conferences on the specific bond release may be submitted pursuant to R645-301-880.600 and R645-301-880.800. In addition, as part of any bond release application, the applicant will submit copies of letters which he or she has sent to adjoining property owners, local governmental bodies, planning agencies, sewage and water treatment authorities, and water companies in the locality in which the coal mining and reclamation operation took place, notifying them of the intention to seek release from the bond.

880.200. Inspection by the Division.

880.210. Upon receipt of the bond release application, the Division will, within 30 days, or as soon thereafter as weather conditions permit, conduct an inspection and evaluation of the reclamation work involved. The evaluation will consider, among other factors, the degree of difficulty to complete any remaining reclamation, whether pollution of surface and subsurface water is occurring, the probability of future occurrence of such pollution and the estimated cost of abating such pollution. The surface owner, agent or lessee will be given notice of such inspection and may participate with the Division in making the bond release inspection. The Division may arrange with the permittee to allow access to the permit area, upon request of any person with an interest in bond release, for the purpose of gathering information relevant to the proceeding.

880.220. Within 60 days from the filing of the bond release application, if no public hearing is held pursuant to R645-301-880.600, or, within 30 days after a public hearing has been held pursuant to R645-301-880.600, the Division will notify in writing the permittee, the surety or other persons with an

interest in bond collateral who have requested notification under R645-301-860.260 and the persons who either filed objections in writing or objectors who were a party to the hearing proceedings, if any, if its decision to release or not to release all or part of the performance bond.

880.300. The Division may release all or part of the bond for the entire permit area if the Division is satisfied that all the reclamation or a phase of the reclamation covered by the bond or portion thereof has been accomplished in accordance with the following schedules for reclamation of Phases I, II and III:

880.310. At the completion of Phase I, after the operator completes the backfilling and regrading (which may include the replacement of topsoil) and drainage control of a bonded area in accordance with the approved reclamation plan, 60 percent of the bond or collateral for the applicable area;

880.320. At the completion of Phase II, after revegetation has been established on the regraded mined lands in accordance with the approved reclamation plan, an additional amount of bond. When determining the amount of bond to be released after successful revegetation has been established, the Division will retain that amount of bond for the revegetated area which would be sufficient to cover the cost of reestablishing revegetation if completed by a third party and for the period specified for operator responsibility in UCA 40-10-17(t) of the Act for reestablishing revegetation. No part of the bond or deposit will be released under this paragraph so long as the lands to which the release would be applicable are contributing suspended solids to stream flow or runoff outside the permit area in excess of the requirements set by UCA 40-10-17(j) of the Act and by R645-301-751 or until soil productivity for prime farmlands has returned to the equivalent levels of yield as nonmined land of the same soil type in the surrounding area under equivalent management practices as determined from the soil survey performed pursuant to UCA 40-10-11(4) of the Act and R645-301-200. Where a silt dam is to be retained as a permanent impoundment pursuant to R645-301-700, the Phase II portion of the bond may be released under this paragraph so long as provisions for sound future maintenance by the operator or the landowner have been made with the Division; and

880.330. At the completion of Phase III, after the operator has completed successfully all surface coal mining and reclamation operations, the release of the remaining portion of the bond, but not before the expiration of the period specified for operator responsibility in R645-301-357. However, no bond will be fully released under provisions of this section until reclamation requirements of the Act and the permit are fully met.

880.400. If the Division disapproves the application for release of the bond or portion thereof, the Division will notify the permittee, the surety, and any person with an interest in collateral as provided for in R645-301-860.260, in writing, stating the reasons for disapproval and recommending corrective actions necessary to secure the release and allowing an opportunity for a public hearing.

880.500. When an application for total or partial bond release is filed with the Division, the Division will notify the municipality in which the coal mining and reclamation activities are located by certified mail at least 30 days prior to the release of all or a portion of the bond.

880.600. Any person with a valid legal interest which might be adversely affected by release of the bond, or the responsible officer or head of any federal, state, or local governmental agency which has jurisdiction by law or special expertise with respect to any environmental, social or economic impact involved in the operation or which is authorized to develop and enforce environmental standards with respect to such operations, will have the right to file written objections to the proposed release from bond with the Division within 30 days after the last publication of the notice required by R645-301-880.120. If written objections are filed and a hearing is requested, the Division will inform all the interested parties of the time and place of the hearing and will hold a public hearing within 30 days after receipt of the request for the hearing. The date, time and location of the public hearing will be advertised by the Division in a newspaper of general circulation in the locality for two consecutive weeks. The public hearing will be held in the locality of the coal mining and reclamation operations from which bond release is sought, or at the location of the Division office, at the option of the objector.

880.700. For the purpose of the hearing under R645-301-880.600, the Division will have the authority to administer oaths, subpoena witnesses or written or printed material, compel the attendance of

witnesses or the production of materials and take evidence including, but not limited to, inspection of the land affected and other surface coal mining operations carried on by the applicant in the general vicinity. A verbatim record of each public hearing will be made and a transcript will be made available on the motion of any party or by order of the Division.

880.800. Without prejudice to the right of an objector or the applicant, the Division may hold an informal conference as provided in UCA 40-10-13(a) of the Act to resolve such written objections. The Division will make a record of the informal conference unless waived by all parties, which will be accessible to all parties. The Division will also furnish all parties of the informal conference with a written finding of the Division based on the informal conference and the reasons for said finding.

880.900. Forfeiture of Bonds.

880.910. If an operator refuses or is unable to conduct reclamation of an unabated violation, if the terms of the permit are not met, or if the operator defaults on the conditions under which the bond was accepted, the Division will take the following action to forfeit all or part of a bond or bonds for any permit area or an increment of a permit area:

880.911. Send written notification by certified mail, return receipt requested, to the permittee and the surety on the bond, if any, informing them of the determination to forfeit all or part of the bond including the reasons for the forfeiture and the amount to be forfeited. The amount will be based on the estimated total cost of achieving the reclamation plan requirements;

880.912. Advise the permittee and surety, if applicable, of the conditions under which forfeiture may be avoided. Such conditions may include, but are not limited to:

880.912.1. Agreement by the permittee or another party to perform reclamation operations in accordance with a compliance schedule which meets the conditions of the permit, the reclamation plan and the State Program and a demonstration that such party has the ability to satisfy the conditions; or

880.912.2. The Division may allow a surety to complete the reclamation plan, or the portion of the reclamation plan applicable to the bonded phase or increment, if the surety can demonstrate an ability to complete the reclamation in accordance with the approved reclamation plan. Except where the Division may approve partial release authorized under R645-301-880.100 through R645-301-880.800, no surety liability will be released until successful completion of all reclamation under the terms of the permit, including applicable liability periods of R645-301-820.300.

880.920. In the event forfeiture of the bond is required by this section, the Division will:

880.921. Proceed to collect the forfeited amount as provided by applicable laws for the collection of defaulted bonds or other debts if actions to avoid forfeiture have not been taken, or if rights of appeal, if any, have not been exercised within a time established by the Division, or if such appeal, if taken, is unsuccessful; and

880.922. Use funds collected from bond forfeiture to complete the reclamation plan, or portion thereof, on the permit area or increment, to which bond coverage applies.

880.930. Upon default, the Division may cause the forfeiture of any and all bonds deposited to complete reclamation for which the bonds were posted. Bond liability will extend to the entire permit area under conditions of forfeiture.

880.931. In the event the estimated amount forfeited is insufficient to pay for the full cost of reclamation, the operator will be liable for remaining costs. The Division may complete, or authorize completion of, reclamation of the bonded area and may recover from the operator all costs of reclamation in excess of the amount forfeited.

880.932. In the event the amount of performance bond forfeited was more than the amount necessary to complete reclamation, the unused funds will be returned by the Division to the party from whom they were collected.

890. Terms and Conditions for Liability Insurance.

890.100. A certificate of liability insurance for the operation is included in this permit application in Appendix 8-2.

Appendix 8-1

Reclamation Cost Estimates

Bonding Calculations
Horse Canyon MineC/007/013
Lila Canyon Section
Revised Jan. 2003

Bond Summary

Direct Costs

Subtotal Demolition and Removal	$583,118.00	
Subtotal Backfilling and Grading	$363,025.00	
Subtotal Revegetation	$203,111.00	
Direct Costs	$1,149,254.00	
Indirect Costs		
Mob/Demob	$114,925.00	10.0%
Contingency	$57,463.00	5.0%
Engineering Redesign	$28,731.00	2.5%
Main Office Expense	$78,149.00	6.8%
Project Mainagement Fee	$28,731.00	2.5%
Subtotal Indirect Costs	$307,999.00	26.8%
Total Cost in 2003 Dollars	$1,457,253.00	
Escalation factor		0.0282
Number of years		5
Escalation	$217,393.00	
Reclamation Cost 2007	$1,674,646.00	
Bond Amount (rounded to nearest $1,000)	$1,675,000.00	

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Office Bathouse No 01																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						211200					CF		211200	CF	52800
	Structure's Vol. Demolished																0.3	2347	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON													2347	CY	82145
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			134945
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						326					CY		326	CY	3280
	Concrete's Vol. Demolished																1.3	424	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													424	CY	572
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY													424	CY	1370
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													424	CY	3053
	Subtotal																			8275
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			143220

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Shop Warehouse No 02																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						300000					CF		300000	CF	75000
	Structure's Vol. Demolished																0.1	1111	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON													1111	CY	38885
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			113885
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						556					CY		556	CY	5593
	Concrete's Vol. Demolished																1.3	723	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													723	CY	976
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02320 200 0320	3.23	/CY													723	CY	2335
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													723	CY	5206
	Subtotal																			14110
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			127995

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Crusher Screen Plant No 03																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						12000					CF		12000	CF	3000
	Structure's Vol. Demolished																0.1	44	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON													44	CY	1540
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			4540
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						15							15	CY	151
	Concrete's Vol. Demolished																1.3	20	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													20	CY	27
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02320 200 0320	3.23	/CY													20	CY	65
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													20	CY	144
	Subtotal																			387
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			4927

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Security No 04																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						1600					CF		1600	CF	400
	Structure's Vol. Demolished																0.3	18	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON													18	CY	630
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1030
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						4					CY		4	CY	40
	Concrete's Vol. Demolished																1.3	5	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													5	CY	7
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02320 200 0320	3.23	/CY													5	CY	16
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													5	CY	36
	Subtotal																			99
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			1129

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Substation No 05																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost	Mechanical equipment heavy	15055 300 3600	745	/ton							1			4	ton		4	ton	2980
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			2980
	Equipment 's Disposal Cost	Chain link remove 8'-10'	02220 875 0700	2.77	/LF	160										FT		160	FT	443
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			443
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						15					CY		15	CY	151
	Concrete's Vol. Demolished																1.3	20	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													20	CY	27
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02320 200 0320	3.23	/CY													20	CY	65
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													20	CY	144
	Subtotal																			387
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			3810

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Water Treatment No 06																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						1800					CF		1800	CF	450
	Structure's Vol. Demolished																0.3	20	CY	
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel	ECDC	ECDC	35	/TON													20	CY	700
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1150
	Equipment 's Disposal Cost																			
	Dismantling Cost	3000 gal. to 5000 gal. tank	02115 200 0110	545	Ea.										1	EA		1	EA	545
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs	3000 gal. to 5000 gal. tank	02115 200 1023	690	Ea.										1	EA		1	EA	690
	Subtotal																			1235
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						4					CY		4	CY	40
	Concrete's Vol. Demolished																1.3	5	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													5	CY	7
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02320 200 0320	3.23	/CY													5	CY	16
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													5	CY	36
	Subtotal																			99
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2484

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Conveyor 60 inch No 07																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						8400					CF		8400	CF	2100
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			2100
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2100

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Conveyor 48 inch No 08																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						13000					CF		13000		3250
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			3250
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			3250

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Loadout No 09																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						18850					CF		18850	CF	4713
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			4713
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						34							34	CY	342
	Concrete's Vol. Demolished																1.3	44	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													44	CY	59
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. md. trip	02320 200 0320	3.23	/CY													44	CY	142
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													44	CY	317
	Subtotal																			860
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			5573

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Stacking Tube No 10																			
	Structure's Demolition Cost	Steel Bld. Large	02220 100 0012	0.25	/CF						4775					CF		4775	CF	1194
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1194
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost	Concrete demolition	ConcreteDemo1	10.06	/CY						177					CY		177	CY	1781
	Concrete's Vol. Demolished																1.3	230	CY	
	Loading Cost	Front end loader 3 CY	02315 400 1300	1.35	/CY													230	CY	311
	Transportation Cost	12 CY (16 Ton) Dump Truck 1/2 mi. rnd. trip	02320 200 0320	3.23	/CY													230	CY	743
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													230	CY	1656
	Subtotal																			4491
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			5685

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Reclaim Tunnel No 11																			
	Currugated Steel	Steel Bld. Large	02220 100 0012	0.25	/CF						26880					CF		26880	CF	6720
	Escape Tunnel	Steel Bld. Large	02220 100 0012	0.25	/CF						1257					CF		1257	CF	314
	Steel Fan	Steel Bld. Large	02220 100 0012	0.25	/CF						64					CF		64	CF	16
	Fan House	Steel Bld. Large	02220 100 0012	0.25	/CF						512					CF		512	CF	128
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			7178
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			7178

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Culverts No 12																			
	Excavate 18" Culverts	Excavation Bulk Bank 2 CY (322BL)	02315 400 0260	1.73	/CY						50					CY		50	CY	87
	Backfill 18" Culverts	Backfill Trench Minimal Haul 2 1/4 CY	02315 900 3080	1.48	/CY						50					CY		50	CY	74
	Excavate 24" Culverts	Excavation Bulk Bank 2 CY (322BL)	02315 400 0260	1.73	/CY						27					CY		27	CY	47
	Backfill 24" Culverts	Backfill Trench Minimal Haul 2 1/4 CY	02315 900 3080	1.48	/CY						27					CY		27	CY	40
	Excavate 30" Culverts	Excavation Bulk Bank 2 CY (322BL)	02315 400 0260	1.73	/CY						83					CY		83	CY	144
	Backfill 30" Culverts	Backfill Trench Minimal Haul 2 1/4 CY	02315 900 3080	1.48	/CY						83					CY		83	CY	123
	Excavate 60" Culverts	Excavation Bulk Bank 2 CY (322BL)	02315 400 0260	1.73	/CY						654					CY		654	CY	1131
	Backfill 60" Culverts	Backfill Trench Minimal Haul 2 1/4 CY	02315 900 3080	1.48	/CY						654					CY		654	CY	968
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			2614
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2614

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Asphalt No 13																			
	Structure's Demolition Cost																			
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Asphalt Demolition																			
	Demolition Cost	Pavement removal (asphalt) 3 inch	02220 875 1710	3.89	/SY						54557					SY		54557	SY	212227
	Asphalt's Vol. Demolished							3								IN	1.3	5910	CY	
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs	On site disposal	02220 875 5550	7.2	/CY													5910	CY	42552
	Subtotal																			254779
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			254779

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Guard Rail No 14																			
	Structure's Demolition Cost	Guiderail remove	02220 875 0800	10.75	LF	1520										FT		1520	FT	16340
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			16340
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			16340

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Power Line No 15																			
	Structure's Demolition Cost	Wire Removal	Old Means 1	11.3	/CLF	9000										FT		90	CLF	1017
	Structure's Vol. Demolished																			
	Rubble's Weight (exclude steel)																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Non Steel Truck																			
	Transportation Cost Non Steel Drive																			
	Disposal Cost Non Steel																			
	Steel's Weight																			
	Truck's Capacity																			
	Haulage																			
	Transportation Cost Steel Truck																			
	Transportation Cost Steel Truck Drive																			
	Disposal Cost Steel																			
	Subtotal																			1017
	Equipment 's Disposal Cost																			
	Dismantling Cost																			
	Equipment 's Vol. Demolished																			
	Loading Costs																			
	Transport Costs																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Concrete Demolition																			
	Demolition Cost																			
	Concrete's Vol. Demolished																			
	Loading Cost																			
	Transportation Cost																			
	Disposal Costs																			
	Subtotal																			
	Total																			2034

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Office Bathouse No 01																			143220
	Shop Warehouse No 02																			127995
	Crusher Screen Plant No 03																			4927
	Security No 04																			1129
	Substation No 05																			3810
	Water Treatment No 06																			2484
	Conveyor 60 inch No 07																			2100
	Conveyor 48 inch No 08																			3250
	Loadout No 09																			5573
	Stacking Tube No 10																			5685
	Reclaim Tunnel No 11																			7178
	Culverts No 12																			2614
	Asphalt No 13																			254779
	Guard Rail No 14																			16340
	Power Line No 15																			2034
	Total																			583118

	Equipment Cost	Hourly Operating Costs	Equipment Overhead	Operator's Hourly Wage Rate	Hourly Cost	Number of Men or Eq.	Total Eq. & Lab. Costs	Units	Quantity	Units	Production Rate	Units	Equip. + Labor Time/Dis.	Units	Cost
Horse Canyon Mine Llla Canyon Project															
Grading															
Load and Haul Material															
631E SERIES II EROPS 2001 (9-40) (3Q02)	18615	82.4	0.1	49.35	256.33	3	768.99	$/HR	44201	CY	393	CY/HR	112.5	HR	86511
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	49.35	227.26	1	227.26	$/HR					112.5	HR	25567
Subtotal															112078
Spread and Compact Material															
Assume 4 passes 8 mph 10 in. lift															
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	49.35	227.26	1	227.26	$/HR					112.5	HR	25567
825G((8-5) (4Q02))	12825	43.5	0.1	49.35	177.36	1	177.36	$/HR					112.5	HR	19953
Subtotal															45520
Load and Haul Topsoil															
631E SERIES II EROPS 2001 (9-40) (3Q02)	18615	82.4	0.1	49.35	256.33	3	768.99	$/HR	66000		393	CY/HR	167.9	HR	129113
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	49.35	227.26	1	227.26	$/HR					167.9	HR	38157
Subtotal															167270
Spread Material															
D9R Semi-U EROPS (9-43) (3Q02)	17060	64.8	0.1	49.35	227.26	1	227.26	$/HR					167.9	HR	38157
Subtotal															38157
Total															363025

Ref.	Description	Materials	Means Reference Number	Unit Cost	Unit	Length	Width	Height	Diameter	Area	Volume	Weight	Density	Time	Number	Unit	Swell Factor	Quantity	Unit	Cost
	Vegetation																			
	Ground Preparation																			
	See Chapter 5 page 95-96 Sec. 553.230																			
	Soil to be ripped	75 HP Dozerw/scarifiers	02920 340 3100	3.83	MSF					28.11						AC		1224	MSF	4688
	Gouging/Pocking																			
	Assume vol = area(28.11) x 1 ft.	Excavation Bulk Bank 2 CY (322BL)	02315 400 0260	1.73	/CY						339					CY/AC		9529	CY	16485
	Subtotal																			21173
	Seeding																			
	Fertilize Material	Fetilizer Hydro Spread	M029353000180	3.66	/MSF					28.11						AC		1224	MSF	4480
	Grtasses	Grasses for Lila Canyon	Lila07131	140.5	/AC					28.11						AC		28.11	AC	3949
	Forbes	Forbs for Lila Canyon	Lila07132	93.33	/AC					28.11						AC		28.11	AC	2624
	Shurbs	Shrubs for Lila Canyon	Lila07133	134.75	/AC					28.11						AC		28.11	AC	3788
	Seeding Application	Hydro Spreader (equip. & labor) B-81	Reveg005	19.01	/MSF					28.11						AC		1224	MSF	23268
	Mulch Materials	Hay 1" material only 0291205000250	Reveg001	48.95	/MSF					28.11						AC		1224	MSF	59915
	Mulch Application	Hydro Spreader (equip. & labor) B-81	Reveg005	19.01	/MSF					28.11						AC		1224	MSF	23268
	Subtotal																			121292
	Reseeding																			60646
	Assume 50% reseeding rate																			
	Subtotal																			60646
	Total																			203111

Appendix 8-2

Certificate of Liability Insurance

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 07/16/2003

PRODUCER (724)349-1300 FAX (724)349-1446 Reschini Agency Inc 922 Philadelphia Street .O. Box 449 ndiana, PA 15701	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED	INSURERS AFFORDING COVERAGE	NAIC #
UtahAmerican Energy, Inc. 375 Carbon Avenue Price, UT 84501	INSURER A: Federal Insurance Company	20281
	INSURER B: National Union Fire Ins. Co.	
	INSURER C:	
	INSURER D:	
	INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	ADD'L INSRD	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A		GENERAL LIABILITY [X] COMMERCIAL GENERAL LIABILITY [ ] CLAIMS MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [X] POLICY [ ] PRO-JECT [ ] LOC	37104410	06/01/2003	06/01/2004	EACH OCCURRENCE	$ 1,000,000
						DAMAGE TO RENTED PREMISES (Ea occurence)	$ 100,000
						MED EXP (Any one person)	$ 10,000
						PERSONAL & ADV INJURY	$ 1,000,000
						GENERAL AGGREGATE	$ 3,000,000
						PRODUCTS - COMP/OP AGG	$ 1,000,000
A		AUTOMOBILE LIABILITY [X] ANY AUTO [ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS [ ] HIRED AUTOS [ ] NON-OWNED AUTOS	(03)73171037	06/01/2003	06/01/2004	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
						BODILY INJURY (Per person)	$
						BODILY INJURY (Per accident)	$
						PROPERTY DAMAGE (Per accident)	$
		GARAGE LIABILITY [ ] ANY AUTO				AUTO ONLY - EA ACCIDENT	$
						OTHER THAN AUTO ONLY: EA ACC	$
						AGG	$
B		EXCESS/UMBRELLA LIABILITY [X] OCCUR [ ] CLAIMS MADE [ ] DEDUCTIBLE [X] RETENTION $ 10,000	BE2988169	06/01/2003	06/01/2004	EACH OCCURRENCE	$ 25,000,000
						AGGREGATE	$ 25,000,000
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below				WC STATU-TORY LIMITS / OTH-ER	
						E.L. EACH ACCIDENT	$
						E.L. DISEASE - EA EMPLOYEE	$
						E.L. DISEASE - POLICY LIMIT	$
		OTHER					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

General Liability Coverage is inclusive of XCU Coverage.
Reference: Horse Canyon Mine MSHA ID# 42-00100 and Lila Canyon Mine MSHA ID#42-02241

Subsidence Coverage is included with $250,000 property damage deductible under the General Liability Policy.

CERTIFICATE HOLDER	CANCELLATION
State of Utah Division of Oil, Gas, and Mining Attn: Pam Grubaugh-Littig 1594 West North Temple Suite 1210 Salt Lake City, UT 84114-5801	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL XXXXXXXX MAIL 45 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX AUTHORIZED REPRESENTATIVE Karen Williams/KAREN Karen Williams

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APPENDIX 7-9

Right Fork of Lila Canyon Flow and Geomorphic Evaluation

Hydrologic Design

Thomas J. Suchoski

INTRODUCTION:

On January 31, 2004 a stream evaluation was conducted of the Right Fork of Lila Canyon downstream of the proposed mine facilities toward the Price River. The purpose of the study was to determine the impact of a continuous discharge of 500 gpm from the mine would have on the downstream channel. A series of cross-section measurements were taken to characterize the channel configuration and the channel bed and bank materials. Photographs were taken of each cros-section location looking upstream and downstream to help visualize the conditions at the cross-section. Also, a photograph of the bed and bank materials was taken to aid in classifying the material type. The photographs are presented in Attachment #1 to this Appendix.

Figure 1 shows the location of the cross-section sites. The original plan was to collect cross-sections at one-half mile spacings along the channel alignment between the mine site and the Price River. However, at the third cross-section location, a recent diversion structure was found which diverted the normal flow of the Right Fork of Lila Canyon. Previously the flow from the Right Fork joined with the flows from Grassy Wash. However, with the diversion, the entire flow of the Right Fork is diverted to a diversion channel. The location of the diversion dam and alignment of the diversion channel is presented in Figure 1. Ultimately, the diversion channel will convey the flow to a stock pond located in the SW/4, SW/4 of Section 28, T. 16 S., R. 14 E.

This stock pond is a BLM pond. The agency had implemented a range improvement program in the area of the pond. As part of this program, the embankment had been improved and raised, the outlet riprapped, and the diversion structure moved upstream and improved to collect additional flows.

The result of this range improvement project is that the flows from the Right Fork of Lila Canyon will be diverted to the stock pond. If the pond fills, any excess water will be released back to Grassy Wash. Based on the size of the pond, it appears that the pond will hold about 5 to 7 acre-feet.

Results:

Channel sections

The Right Fork of Lila Canyon is an ephemeral channel which is incised into the pediment surface below the Book Cliffs. At cross-section location 1, the channel is incised about 25 to 30 feet and has a top width of approximately 75 to 100 feet. The channel has a low-flow component that consists of a general

trapezoidal shape with 1V:1.5 to 2H slopes, a bottom width of about 5 feet, and a low flow channel depth of almost 1.5 feet. Channel material consists of fine to coarse gravels and fine sands and few silts.

At cross section location 2, the channel is transitioning from the incised section to a broader section at the confluence of the Right Fork with Grassy Wash. In this reach, the channel is incised about 10 to 15 feet and has a top width of approximately 250 to 300 feet. The channel has a low-flow component that consists of a swale shape with gentle sideslopes, a bottom width of about 7.5 to 10 feet, and a low flow channel depth of almost 1.0 foot. Channel material consists of fine to coarse gravels and fine sands and silts.

Upstream of the confluence, Grassy Wash consists of a braided channel with several flow channels. The predominant channel has a top width of 10 to 12 feet with a bottom width of 8 or 9 feet and steep side slopes. The depth of this channel is approximately 2.5 feet deep. The overall channel is approximately 50 to 75 feet wide. Channel material consists of fine to coarse gravels and fine sands and silts.

Downstream of the confluence with the Right Fork, Grassy Wash is again an incised channel. The channel is approximately 10 to 15 feet wide with a depth of 5 to 6 feet. The channel bends to the west and flow is directed against the outer bank. This results in a steep slope on the outer bank and a gentler slope on the inner bank. Channel material consists of fine to coarse gravels and fine sands and silts.

Stream Transmission Loss Modeling

Based on the DOGM estimate for mine discharge, an estimate was prepared to determine if flow would reach the Price River. This estimate is based on the concepts presented in the U.S. Soil Conservation Service National Engineering Handbook Chapter 19 - Transmission Losses (1985). The actual method is based on regression equations derived from Arizona and New Mexico conditions. While the current site is similar, the conditions are different. Therefore, the current site was modeled using similar concepts.

The estimated mine discharge was assumed to be introduced to the channel. The soil designations of the channel area were determined from preliminary soils maps developed by the NRCS Price Office for the Emery County Soil Survey (personnel communication, Leland Sasser, 2004). The length of channel crossing each different soil type was determined. Permeability estimates of the soils were determined from the SCS soil survey engineering properties table. Estimates of channel width and depth, valley fill width and depth, along with the length of soil

sections and permeability data were input into the spreadsheet presented in Table 1. No evaporation was assumed to provide a conservative estimate. Based on the discharge to the channel and the estimates of infiltration and permeability loss over the flow length, an estimate of the distance that the flow would be conveyed was determined.

Given the soils in the area the 500 gpm flow from the mine would be expected to flow a distance of approximately 18,300 feet or 3.4 miles. The distance to the Price River from the mine is about 9.5 miles. Therefore, the flow from the mine will not reach the Price River.

With the presence of the diversion and the anticipated collection of the flows from the Right Fork of Lila Canyon in the stock pond, it is likely that the flow will not reach the 3.4 mile distance estimated.

Flow Characteristics

Based on regresssion equations for ephemeral streams in Utah developed by Thomas and Lindskov (1983), two watersheds on the Right Fork of Lila Canyon were evaluated to determine the peakflow and flow depth of the various return period storms. The first was the drainage from the mine site upstream. The second was the entire drainage upstream from the confluence with Grassy Wash. Calculations are presented in Attachment #2.

The results of the calculations show that the 500 gpm mine discharge (1.1 cfs) is significantly less than the 37 cfs for the 2 year flood flow expected just below the mine site. Given that the regression equations are limited in accuracy, even if the estimated peak is off by a factor of 2, the mine discharge would still be less than 6 percent of the expected peakflow of 18.5 cfs.

The 2 year flow was selected for comparison as this is generally considered to be the bankfull stage or capacity of the low flow channel. Many reseachers consider the bankfull flow to be the major channel forming flow, due to its probability of occurrence and its channel forming energy. Given the fact that the mine water flow is significantly below this flow, its is not likely that the flow will have any significant negative impact on the channel conditions.

It is likely that the constant low flow condition will result in the establishment of a vegetative community adjacent to the channel for the short distance that flow will exist above ground. Additionally, the development of such a community, would increase the evapotranspiration along the flow corridor and ultimately result in a shorter flow distance below the mine.

Table 1

Utah American Energy, Inc. - Lila Extension
Mine Discharge Flow Modeling

Day	Discharge (gpm)	a Discharge (ac-ft/day)	Reach ID	Channel Length (ft)	Channel Width (ft)	Valley Fill Depth (ft)	Valley Fill Width (ft)	Fill Porosity	b Fill Storage Volume (ac-ft)	Infiltration Rate (in/hr)	c Potential Infiltration to Storage (ac-ft)	d Estimated Infiltration to Storage (ac-ft)	e Excess Flow (ac-ft)	f Percolation Rate from Storage (in/hr)	g Potential Percolation from Storage (ac-ft)	h Estimated Percolation from Storage (ac-ft)	i Total Outflow from Reach (ac-ft)	j
1	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	2.15	0.06	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
				6251														
2	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.38	1.12	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.12	3	206	10	5	30	0.2	0.14	2	0.19	0.14	0.97	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		0.97	4	3760	10	5	30	0.2	2.59	2	3.45	0.97	0.00	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
				10944														
3	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.11	1.38	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.38	3	206	10	5	30	0.2	0.14	2	0.19	0.04	1.35	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		1.35	4	3760	10	5	30	0.2	2.59	2	3.45	0.69	0.66	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
		0.66	5	7127	10	5	30	0.2	4.91	2	6.54	0.66	0.00	8.33E-03	1.31	0.66	2.21	Total Outflow Loss > Discharge, Stop
				18071														
4	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.11	1.38	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.38	3	206	10	5	30	0.2	0.14	2	0.19	0.04	1.35	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		1.35	4	3760	10	5	30	0.2	2.59	2	3.45	0.69	0.66	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
		0.66	5	7127	10	5	30	0.2	4.91	2	6.54	1.31	0.00	8.33E-03	1.31	1.31	2.86	Total Outflow Loss > Discharge, Stop
				18071														
5	500	2.21	1	6251	5	5	15	0.2	2.15	2	2.87	0.72	1.49	8.33E-03	0.72	0.72	0.72	Excess flow, Continue Simulation
		1.49	2	727	7.5	5	22.5	0.2	0.38	2	0.50	0.11	1.38	8.33E-03	0.11	0.11	0.83	Excess flow, Continue Simulation
		1.38	3	206	10	5	30	0.2	0.14	2	0.19	0.04	1.35	8.33E-03	0.04	0.04	0.86	Excess flow, Continue Simulation
		1.35	4	3760	10	5	30	0.2	2.59	2	3.45	0.69	0.66	8.33E-03	0.69	0.69	1.55	Excess flow, Continue Simulation
		0.66	5	7127	10	5	30	0.2	4.91	2	6.54	1.31	0.00	8.33E-03	1.31	1.31	2.86	Total Outflow Loss > Discharge, Stop
				18071														

Calculation Method:

Column	
a	Input discharge in ac-ft or transfer excess flow from previous reach.
b	Multiply valley fill width and depth and reach length by porosity of soil.
c	Convert infiltration rate to volume in ac-ft. Assume that infiltration will occur across channel width and along reach length.
d	Compare infiltration potential to available fill volume. If infiltration potential is less than available fill volume, then use infiltration potential. If infiltration potential is greter than available fill volume, then use available fill volume. However, if prior storage already filled, then available fill volume is limited to the flux out of storage by percolation.
e	Excess flow is the discharge (a) - infiltration (d).
f	Percolation rate includes movement of stored water into adjacent soils, bedrock, and consumption by plants and is estimated to be 5% of the infiltration rate.
g	Convert percolation rate to volume in ac-ft. Assume that 2 times depth plus width of valley fill estimate is the percolation flux surface.
h	Compare estimated infiltration to potential percolation. If estimated infiltration is greater than potential percolation, use potential percolation. If not then use infiltration.
i	Add up the outflow from each reach by summing the percolation outflows.
j	Compare the total outflow versus the discharge to the channel. When the total outflow from the channel is equal to or greater than the discharge, then the flow will not continue downstream.

ATTACHMENT #1

PHOTOGRAPHS

X-section 1 Looking Upstream

X-Section 1 Looking Downstream

X-Section 1 Bed Materials

X-Section 2 - Looking Upstream

X-section 2 Bed Materials

X-section 3 Looking Upstream

X-section 4 Looking Upstream
Diversion Dam center and
Diversion Channel to Right

X-section 4 looking upstream
Diversion channel in center

Diversion Channel above stock pond

ATTACHMENT #2

CALCULATIONS

- EVALUATION OF PEAKFLOWS FOR RIGHT FORK OF LILA CANYON VS MINE DISCHARGE.

- RIGHT FORK OF LILA CANYON IS AN UNGAGED, UN-DEVELOPED WATERSHED. NO FLOW RECORDS EXIST.

- ESTIMATE FLOWS USING REGRESSION EQUATIONS OF THOMAS & LINDSKOV (1983).
  - BASED ON FIGURE 1 (ATTACHED), SITE IS LOCATED IN REGION E - LOW PLATEAUS.
  - INPUTS FOR PEAK DISCHARGE ARE:
    - WATERSHED AREA (SQ MI)
    - MEAN WS ELEVATION (1000'S OF FEET)

- TWO WATERSHED'S ARE TO BE EVALUATED:

A - JUST BELOW SEDIMENT POND

B - @ CONFLUENCE OF GRASSY WASH & RIGHT FORK OF LILA CANYON.

- AREAS

WS A - 12751280 FT^2 = 0.457 Sq MI

WS B - 24207230 FT^2 = 0.868 Sq. MI.

- MEAN WS ELEV. - DETERMINED FROM 20 GRIDDED POINTS OVER WS

WS A - 6910 FT → 6.9

WS B - 6324 FT → 6.3

- REGRESSION EQUATIONS ARE PRESENTED IN TABLE 6 (ATTACHED)

- TABLE 1 PRESENTS THE CALCULATION RESULTS

- BASED ON RESULTS THE 500 GPM ~ 1.1 CFS, IT IS LESS THAN THE 2YR EVENT FOR THE DRAINAGE CHANNEL WITH A FLOW DEPTH LESS THAN 0.9 FT.

- BASED ON STANDARD CHANNEL MORPHOLOGY, THE 2-YR EVENT IS GENERALLY CONSIDERED TO BE BANK FULL FOR A CHANNEL. THE BANK FULL FLOW IS THE FLOW THAT WILL AFFECT CHANNEL MORPHOLOGY THE MOST FREQUENTLY. THEREFORE, IT WILL HAVE THE MOST SIGNIFICANT AFFECT ON CHANNEL SHAPE & CONDITION.

- FOR THE MINE DISCHARGE, THE 500 GPM FLOW WILL EASILY BE CARRIED WITHIN THE LOW FLOW CHANNEL & WILL NOT AFFECT CHANNEL MORPHOLOGY.

EXPLANATION

FLOOD REGIONS

A. Northern Mountains High Elevation
B. Northern Mountains Low Elevation
C. Uinta Basin
D. High Plateaus
E. Low Plateaus
Great Basin—
F. High Elevation Subregion
G. Low Elevation Subregion

BOUNDARY OF FLOOD REGIONS—dashed where based on mean basin elevation.

DRAINAGE DIVIDE BETWEEN GREAT BASIN AND COLORADO RIVER BASIN.

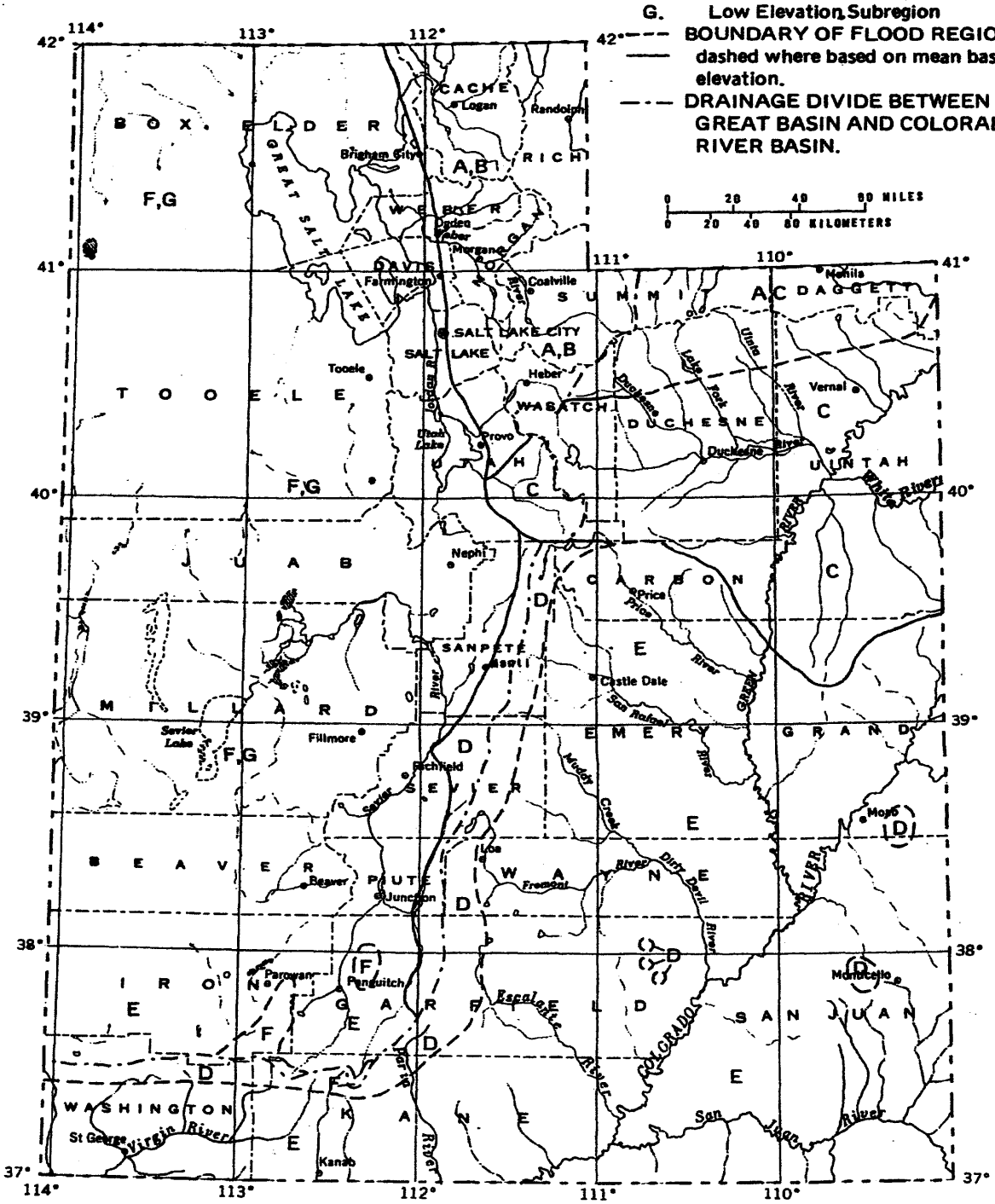


Figure 1.—Flood regions in Utah.

4/6

Table 6.--Regression equations for peak discharges and flood depths of selected recurrence-interval floods for Low Plateaus Region

Equation: Q, peak discharge, in cubic feet per second; D, flood depth, in feet; A, drainage area, in square miles; and E, mean basin elevation, in thousands of feet.

Recurrence interval, in years	Equation	Number of stations used in analysis	Average standard error of estimate, in percent
	Peak Discharge		
2	$Q = 3{,}980\ A^{0.535}\ E^{-2.21}$	81	87
5	$Q = 13{,}300\ A^{0.467}\ E^{-2.23}$	81	72
10	$Q = 23{,}700\ A^{0.433}\ E^{-2.23}$	81	67
25	$Q = 42{,}500\ A^{0.398}\ E^{-2.21}$	81	65
50	$Q = 61{,}000\ A^{0.375}\ E^{-2.19}$	81	65
100	$Q = 83{,}100\ A^{0.356}\ E^{-2.17}$	81	66
	Flood Depth[1]		
2	$D = 11.3\ A^{0.230}\ E^{-1.23}$	46	35
5	$D = 22.7\ A^{0.180}\ E^{-1.25}$	46	35
10	$D = 29.3\ A^{0.157}\ E^{-1.21}$	46	37
25	$D = 32.0\ A^{0.141}\ E^{-1.10}$	46	38
50	$D = 35.8\ A^{0.128}\ E^{-1.06}$	45	37
100	$D = 17.9\ A^{0.143}\ E^{-0.680}$	43	33

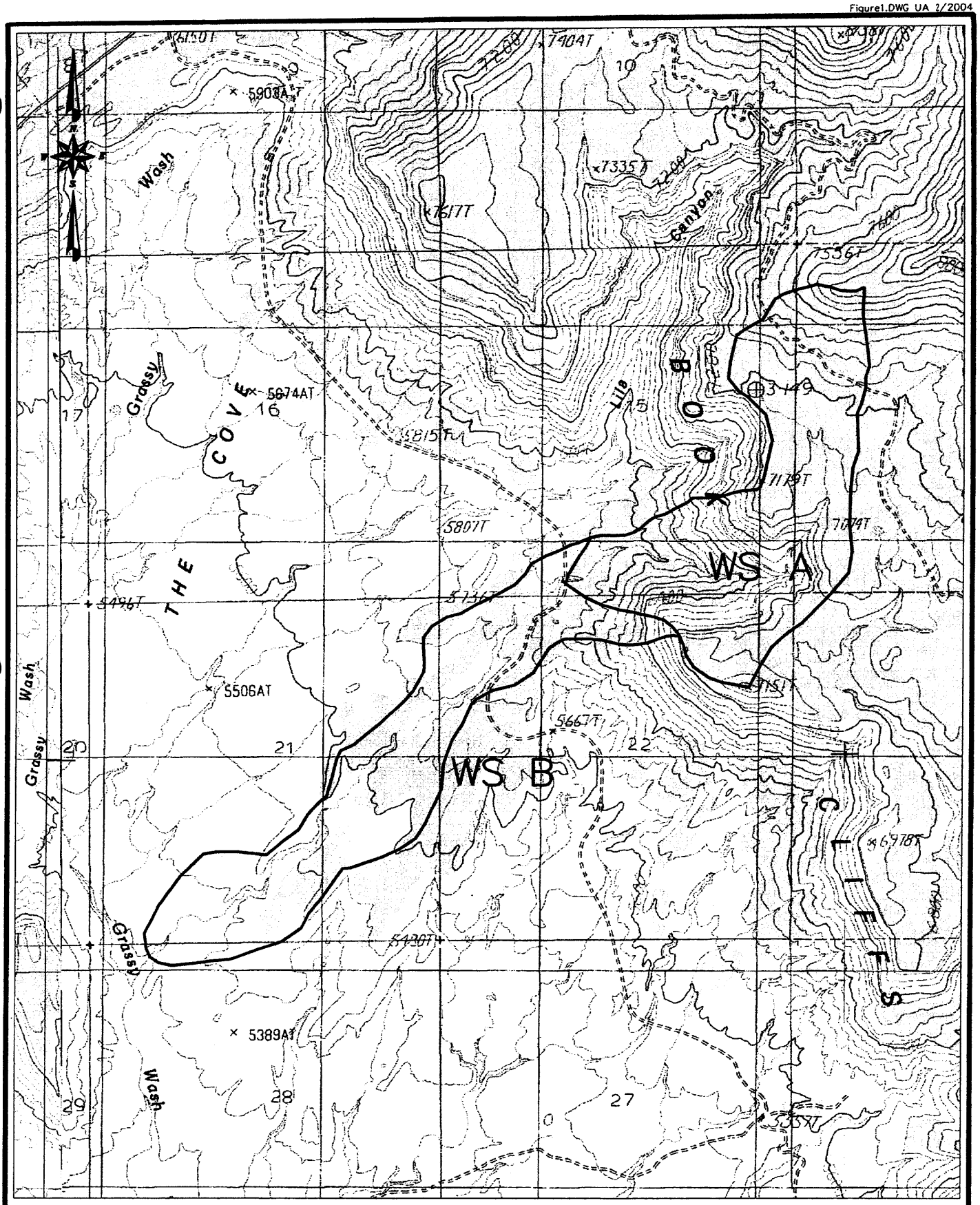
[1] The number of stations used in the flood-depth analysis varies because station rating curves were extended only as far as available information would permit.

Table 1

Regression Calculations for Peak Flow and Flow Depth
For Low Plateau Region - Thomas and Lindskov (1983)

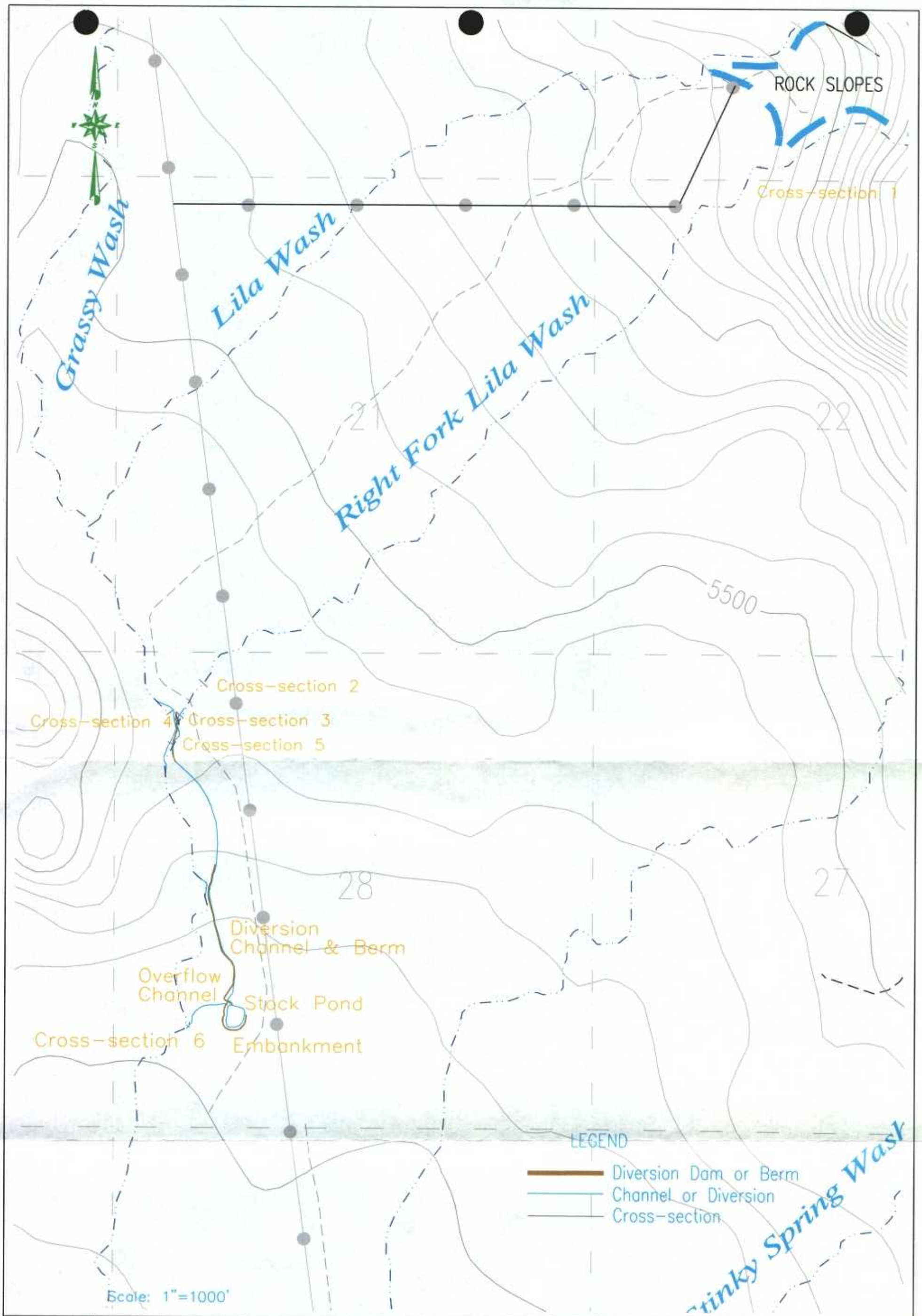
Inputs:	WS A	WS B
Area:	0.457 Sq. mi.	0.868 Sq. mi.
Mean Elevation:	6.9 1000's of feet	6.3 1000's of feet
Peak Discharge Results:		
2yr	37 cfs	63 cfs
5yr	124 cfs	205 cfs
10yr	227 cfs	368 cfs
25yr	436 cfs	688 cfs
50yr	662 cfs	1027 cfs
100yr	951 cfs	1456 cfs
Flood Depth Results:		
2yr	0.9 ft	1.1 ft
5yr	1.8 ft	2.2 ft
10yr	2.5 ft	3.1 ft
25yr	3.4 ft	4.1 ft
50yr	4.2 ft	5.0 ft
100yr	4.3 ft	5.0 ft

Figure1.DWG UA 2/2004



0' 2000'

ATTACHMENT 2—FIG 1. WATERSHED LOCATION MAP



GH	FIGURE 1. Cross-section Locations Diversion Dam & Channel Alignment	UtahAmerican Price, Utah	LILA CANYON MINE Price, Utah

FIGURE1.DWG UA 2/2004

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