

CANYON FUEL COMPANY, LLC

**DUGOUT CANYON MINE
METHANE DEGASSIFICATION AMENDMENT
WELLS G-1 THRU G-10
C/007/039**

JULY 2005

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July 2005 ~~March 2005~~

CHAPTER 1

LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

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110 MINIMUM REQUIREMENTS FOR LEGAL, FINANCIAL, COMPLIANCE AND RELATED INFORMATION

111 Introduction

The degassification wells will be located on property owned by the Milton and Ardith Thayne Trust. The well locations are found in Table 1-1 and are shown in Figure 1-1.

**TABLE 1-1
 Degas Well Locations
 Pine Canyon, Utah Quadrangle, Salt Lake Meridian**

Hole Number	Section	Township and Range
G-1	Portion of N1/2SE1/4NW1/4 Section 24	Township 13 South, Range 12 East
G-2	Portion of N1/2SW1/4NE1/4 Section 24	Township 13 South, Range 12 East
G-3	Portion of N1/2SW1/4NW1/4 Section 19	Township 13 South, Range 13 East
G-4	Portion of N1/2NE1/4NW1/4 Section 24	Township 13 South, Range 12 East
G-5	Portion of N1/2NW1/4NE1/4 Section 24	Township 13 South, Range 12 East
G-6	Portion of S1/2SW1/4NW1/4 Section 18	Township 13 South, Range 13 East
G-7	Portion of SW1/4NE1/4SE1/4 Section 24	Township 13 South, Range 12 East
G-8	Portion of NE1/4NE1/4NE1/4 Section 26	Township 13 South, Range 12 East

G-9	Portion of NW1/4NW1/4SW1/4 Section 21	Township 13 South, Range 13 East
G-10	Portion of NE1/4NE1/4SE1/4 Section 20	Township 13 South, Range 13 East

112 Identification of Interests

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.100 Business Entity

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.200 Applicant and Operator

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.300 Officers of the Applicant

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.400 Coal Mining and Reclamation Operation Owned or Controlled

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

112.500 Legal or Equitable Owner of the Surface and Mineral Properties

The legal and equitable owner of the surface and mineral properties to be affected by this operation during the duration of the permit period are list below.

Milton & Ardith Thayn Trust
7730 East US Highway 6
Sunnyside Star Route
Price, Utah 84501

United States of America
State of Utah, Department of Interior
Bureau of Land Management
Price Field Office
125 South 600 West
Price, Utah 84501

State of Utah
School and Institutional
Trust Lands Administration
675 East 500 South
Salt Lake City, Utah 84102-2818

112.600 Owners of Record of Property Contiguous to Proposed Permit Area

Owners of record for surface and mineral properties contiguous to the proposed permit area are list below.

United States of America
Department of Interior
Bureau of Land Management
Price Field Office
125 South 600 West
Price, Utah 84501

State of Utah
School and Industrial
Trust Lands Administration
675 East 500 South
Salt Lake City, Utah 84102-2818

George and Alice Conover, Et Al
2701 Georgia Way

Sandy, Utah 84092

112.700 MSHA Numbers

Refer to the same section of the approved M&RP.

112.800 Interest In Contiguous Lands

Canyon Fuel Company, LLC has no interest in contiguous lands other than those currently owned as shown on Plate 1-1 of the approved M&RP.

112.900 Certification of Submittal Information

No information has changed in the approved M&RP because of this submittal. Refer to the same section of the approved M&RP.

113 Violation Information

Refer to the same section of the General Chapter 1 for Canyon Fuel Company, LLC prepared for the Dugout Canyon Mine, Soldier Canyon Mine and Banning Loadout operations.

114 Right-of-Entry Information

Refer to the same section of the approved M&RP.

See Table 1-2 for disturbed acreage for each well site. The disturbed acres will be added to the total disturbed acreage for the Dugout Mine as each site is constructed.

TABLE 1-2
Disturbed Acres by Well Site

Well Site	Disturbed Acres
G-1	0.6
G-2	1.21
G-3	0.97
G-4	0.85
G-5	0.75
G-6	0.32
G-7	1.25
G-8	0.9
G-9	2.2
G-10	1.7

115 Status of Unsuitability Claims

Refer to the same section of the approved M&RP.

116 Permit Term

Refer to the same section of the approved M&RP.

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

The certificate of insurance(s) for each well will be obtained if required when the well is drilled. The certificate of insurance(s) will be included in Appendix 1-2 of the approved M&RP and General Chapter 1.

118 Filling Fees

Refer to the same section of the approved M&RP.

120 PERMIT APPLICATION FORMAT AND CONTENTS

This amendment submittal will comply with R645-301-120.

130 REPORTING OF TECHNICAL DATA

All technical data submitted in the amendment will be accompanied by the name or organization responsible for the collection and analysis of data, dates of collection and descriptions of methodology used. Technical analyses will be planned by or under the direction of a qualified professional in the subject to be analyzed.

140 MAPS AND PLANS

The maps and plans in the Mining and Reclamation Plan will correspond with the requirements in R645-301-140.

150 COMPLETENESS

CFC believes the information in this permit application to be complete and correct.

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
~~March~~ July 2005

CHAPTER 2

SOILS

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210 INTRODUCTION

This chapter and associated attachments address the pertinent data required for the addition of the degassification well sites for the Dugout Canyon Mine. Only those sections of the Division regulations that apply to the well sites have been addressed. The remainder of the regulations have already been addressed in the existing M&RP. The M&RP and this document contain pertinent information relating to the identification, management, and reclamation activities associated with the soil resources.

220 ENVIRONMENTAL DESCRIPTION

The well sites range in elevation from approximately 7400 to 9000 feet. The well sites are located in the Pace Canyon area of the Book Cliffs. General vegetation includes sagebrush, serviceberry, aspen, Douglas-fir, and snowberry.

221 Prime Farmland Investigation

Due to limiting terrain, lack of water for irrigation and no evidence of past cultivation of the sites, it is concluded that no prime farmland exists within the area of the well site disturbance.

222 Soil Survey

222.100 Soils Map

The soils have been mapped as part of the Soil Survey of the Carbon Area, Utah by the Soil Conservation Service (1988), at an Order III intensity level.

A description of the soils is included in Appendix 2-2 of the approved M&RP and in Attachment 2-1, which includes a report by Dan Larsen, Soil Scientist, entitled "Soil Inventory and Assessment Six Methane Degassification Borehole Sites". An additional report for well site G-6 was prepared in

2004 and is incorporated into Attachment 2-1. Soil information for Well G-7 is incorporated into Attachment 2-1. A photograph of the G-7 site is included in Attachment 3-1. Well site G-3 and the access road can be seen on the photograph.

The soils report prepared by Dan Larsen, Soil Scientist for wells G-8 thru G-13 is provided in Attachment 2-1. Wells are being permitted in groups of three: G-8 thru G-10, G-11 thru G-13 and DUG0105 and DUG0205.

222.200 Soil Identification

<u>Well No.</u>	<u>Soil Map Unit</u>	<u>Soil Components</u>
G-1	62/88	Midfork-Comodore complex, Rabbitex-Datino Variet
G-2	7	Brycan, Beje-Trag complex, 3-30% slopes
G-3	7	Beje-Trag complex, 3-30% slopes
G-4	62/103	Midfork-Comodore complex, Senchert-Toze complex
G-5	103	Senchert-Croydon
G-6	62	Midfork-Comodore complex
G-7	7	Beje-Trag complex, 3-30% slopes
G-8	21	Croydon Loam, 8 to 30% slopes
G-9	97/62	Midfork-Comodore complex, Rottulee family-Trag complex
G-10	97	Rottulee family-Trag complex

222.300 Soil Description

Refer to Attachment 2-1 of the submittal for soil descriptions.

222.400 Soil Productivity

The depth of topsoil at each site was measured to determine the amount of growth medium available for reclamation. The following table lists each well site and the approximate amount of growth medium available.

TABLE 2-1
Topsoil Volumes

Well No.	Cubic Yards of Material
G-1	415
G-2	3,104
G-3	1,182
G-4	1,100
G-5	1,909
G-6	792
G-7	1251
G-8	543
G-9	1,574
G-10	2,344

Figure 5-1 through Figure 5-25 show the layout and approximate size of well pads for G-1 thru G-6. Figures 5-27 thru 5-29 show the layout and size for well G-7. **The figures for wells G-8, G-9 and G-10 are located in Attachment 5-1.** Topsoil volume calculations can be found in Attachment 2-2.

Estimated topsoil salvage from the G-1 well site will average about 7". This site on a ridge top has previously been disturbed for exploration drilling. The site has pockets of fractured sandstone bedrock at the surface and stony subsoils, which are the limiting factors in the quantity of salvageable topsoil. The average topsoil depth at well site G-2 is 30". The average topsoil thickness for well site G-3 is 10". However, enough soil will be stripped to allow 12" of soil to be placed during reclamation. Thus some subsoils will be stripped with the topsoil to generate the

required volume. The estimated topsoil salvage from well site G-4 area will be 28" except on the area of the exiting road(s). The average salvageable topsoil at well site G-5 is 22". Well site G-6 will be established on a pre-existing drill pad, with a portion of the new pad extending onto undisturbed area. Topsoil on the pre-existing drill pad ranges from 0 to 30 inches, on the north edge in from 20 to 28 inches and on the cut slope on the south edge from 6 to 30 inches. The slope will be restored to original contour with the application of topsoil, the entire site will receive at least 12 inches of topsoil. Twelve inches was used to calculate the volume of topsoil to be salvaged and to determine the size of the topsoil pile for drill site G-6. Degas well G-7 will be developed on a site with soils consistent with G-3. There is a pre-existing road to well G-3 that continues on to the G-7 proposed site. There are signs of previous vehicle disturbance at the site, however the majority of the site is undisturbed. Topsoil available for salvage has been estimated to be 10 to 12 inches. Available topsoil will be salvaged and if necessary some subsoils will be stripped with the topsoil to generate the required volume to place a minimum of 12 inches during site reclamation. Available topsoil at each site will be salvaged, stockpiled and redistributed.

Twelve inches of soil will be salvaged at well sites G-8 and G-9. The available topsoil at site G-8 is about six inches, therefore subsoil will be stripped with the topsoil to generate the additional growth medium. Well site G-9 has no topsoil over approximately half of the site, thus requiring the salvage of subsoil to generate the foot of soil proposed for reclamation. Suitable soil for salvage at site G-10 is approximately 15 inches with some areas having 24 inches of soil. Where available soil will be salvaged to a minimum of 15 inches and approximately 18 inches will be available to cover the G-10 disturbed area at the time of reclamation.

223 Soil Characterization

The topsoil evaluation described in this chapter was performed by Daniel M. Larsen, Professional Soil Scientist and Dean Stacy, NRCS Range Management Specialist in accordance with the standards of the National Cooperative Soil Survey.

224 Substitute Topsoil

Dugout Canyon does not plan to use substitute topsoil as growth media except as described in Section 222.400.

230 OPERATION PLAN

231 General Requirements

231.100 Removing and Storing Topsoil Methods

The topsoil will be removed, stockpiled and protected with a berm and/or silt fence. A qualified person will be on site during soil salvage to monitor and supervise the operation for the purpose of maximizing salvage volumes. Prior to topsoil salvage shrubs/vegetation will be removed and placed/wind rowed along the inside perimeter of the disturbed area.

After the topsoil is removed, the mud pit will be excavated and the soils from the mud pit excavation will be stored immediately adjacent to the mud pit. Mud pit excavation of subsoil will be approximately 110 CY at each well site. A portable container for drilling fluids will be used if necessary, should there not be sufficient subsoil depth to excavate a mud pit.

Topsoil beneath the topsoil stockpiles will not be removed. Ribbon or a marking fabric will be placed on top of the topsoil prior to placement of the topsoil from the well pad area.

The approximate volume of subsoil to be salvaged and used to create berms around the perimeter of the well site including the topsoil stockpile perimeter is: G-1 - 161 CY; G-2 - 254 CY, G-3 - 208 CY, G-4-165 CY, G-5 - 191 CY, G-6 - 156 CY, G-7 - 107 CY, **G-8 - 143 CY, G-9 - 182 CY, and G-10 - 137 CY.**

231.200 Suitability of Topsoil Substitutes/Supplements

See Section 224.

231.300 Testing of Topsoil Handling and Reclamation Procedures Regarding Revegetation

Dugout will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability on graded slopes. Erosion control measures will include silt fences, berms, seeding, straw bales, soil roughening, and mulching of the soils.

Topsoil will be redistributed and the original soil surface beneath the topsoil stockpile will be roughened as presented in Section 242.100 and seeded with the seed mix described in Chapter 3, Section 352.

Methods used to evaluate success of revegetation and stabilization are discussed in Chapter 3, Section 356.

231.400 Construction, Modification, Use, and Maintenance of Topsoil Storage Pile

Topsoil removed from the drill pad sites will be stockpiled on the site. The estimated volumes of topsoil stockpile for each site are shown in Table 2-1. The stockpiles will be sized as shown in Table 2-2.

The slopes of the stockpile will be 1H:1V or approximately 45° during the construction phase. Soils in these areas generally have an angle of repose greater than 50 degrees, making a stockpile with 1:1 slopes feasible. The steeper slope also help minimize the area to be disturbed. When space is available topsoil will be stockpiled with slopes of 2H:1V.

TABLE 2-2
Topsoil Stockpile Dimensions*

Well No.	Length (ft)	Width (ft)	Height (ft)
G-1	55	35	16
G-2	156	50	20
G-3	70	60	17
G-4	110	35	17
G-5	90	65	21
G-6	105	30	13
G-7	80	70	6 to 12
G-8	168	60	6
G-9	160	90	30
G-10	170	705	65

* These are approximate dimensions of the topsoil stockpile and construction dimensions may vary.

See Section 234.200 for detailed information on the topsoil stockpile(s).

232 Topsoil and Subsoil Removal

232.100 Topsoil Removal and Segregation

All topsoil will be removed as a single layer with no segregation. Topsoil will be removed using a dozer and/or loader. Refer to Section 231.100 for additional details.

232.200 Poor Topsoil

No poor soils exist at the well sites see Attachment 2-1.

232.300 Thin Topsoil

Not applicable see Attachment 2-1.

232.400 Minor Disturbances Not Requiring Topsoil Removal

Topsoil will not be removed along the fence line at the wells sites.

232.500 Subsoil Segregation

The B and C soil horizons will not be removed. Any small quantity of subsoil removed with the topsoil will not be segregated.

232.600 Timing

Topsoil removal will take place after all vegetation that could interfere with salvaging the topsoil has been grubbed.

232.700 Topsoil and Subsoil Removal Under Adverse Conditions

The topsoil will be removed first and stockpiled and the remaining soil horizons will be left in place, except where natural conditions render removal operations hazardous or detrimental to soils outside the disturbed area then topsoil will not be removed.

Conventional Machines - In locations where steep grades, adverse terrains, severe rockiness, limited depth of soils, or other adverse conditions exist that render soil removal activities using conventional machines hazardous, soils will not be salvaged and stockpiled. Such conditions are not likely to occur in these areas.

Substitute Topsoil - Importing of substitute topsoil is not anticipated (Section 224).

233 Topsoil Substitutes and Supplements

233.100 Overburden Materials Supplementing and/or Replacing Topsoil

No overburden material will be used.

233.200 Suitability of Topsoil Substitutes and Supplements

No substitute topsoil is planned.

233.300 Physical and Chemical Analysis

See Section 243.

233.400 Testing of Substitute Topsoil

No substitute topsoil is planned.

234 Topsoil Storage

234.100 Topsoil Stockpiling

Topsoil will be stockpiled for later use in reclamation operations. ~~During the construction of the Pace Canyon Fan it may become necessary to store topsoil at Degas Well Site G-3.~~ The topsoil will be stored and treated as outlined in Section 234 of this amendment. Refer to Sections 231 through 234 of the M&RP for additional information pertaining to the topsoil at the Pace Canyon Fan site.

234.200 Topsoil Stockpile

Stable Stockpile Site - Stockpiled material will be placed on a stable site.

Protection from Contaminants and Compaction - To protect the topsoil from contaminants and unnecessary compaction that could interfere with vegetation, the stockpile will be isolated from the main surface area by a berm and/or silt fence. A sign designating "topsoil" will be installed on the stockpile.

The topsoil stockpile will be constructed in such a manner as to allow access for repair of the pile surfaces and diversion structures.

Wind and Water Erosion Protection - The topsoil stockpile will be protected from water erosion by berms, which trap sediment runoff from the stockpile. The berms have been designed to completely contain the 10-year 24-hour storm event (see Attachment 7-1). The stockpile will be

surface pitted, gouged and/or roughened and revegetated using the grass seeds listed in Table 3-2 to prevent wind erosion.

Topsoil Redistribution - Stockpile soil will not be moved until redistribution during contemporaneous or final reclamation operations unless approved by the Division.

234.300 Topsoil Stockpile Relocation

Stockpiled soil in jeopardy of being detrimentally affected in terms of its quantity and quality by drilling operations may be temporarily redistributed or relocated on approval by the Division and modification of this M&RP.

240 RECLAMATION PLAN

241 General Information

Reclamation of the degassification sites (topsoil redistribution, amendments, and stabilization) is discussed in Sections 242, 243, and 244 respectively.

242 Soil Redistribution

242.100 Soil Redistribution Practices

The topsoil will be placed after recontouring of the site has occurred. Topsoil will be handled when they are loose or in a friable condition. The moisture content will be visually monitored and water will be added as needed to enhance the soil's condition for handling. The approximate amount of topsoil available for each site is shown in Table 2-1. The reclamation time line can be found on Figure 5-15 for sites G-2 and G-3 and on Figure 5-26 for sites G-4, G-5, G-6, G-7, **G-8, G-9 and G-10.**

The topsoil will be distributed in two phases at well site G-1, G-2 and G-3, the first phase will be the contemporaneous reclamation of a portion of the pad area used during well construction (see Figures 5-4, 5-8 and 5-12). During contemporaneous reclamation topsoil from the stockpile will be distributed on each site in the depths shown in Table 2-3.

Final reclamation will occur at all well sites after venting of the methane gas is complete, venting equipment has been removed and the well has been plugged. The topsoil stockpile storage area and access road (G-2 and G-5) will be reclaimed during this final phase. The access roads to G-1, G-3, G-4, G-6, G-7, G-8, G-9 and G-10 are pre-existing and will not be reclaimed.

Refer to Section 341 for additional information.

Soil Thickness - The topsoil will be distributed during contemporaneous and final reclamation in the thickness shown in Table 2-3.

TABLE 2-3
Approximate Topsoil Distribution Thickness

Well Site No.	Topsoil Thickness (Inches)
G-1	7
G-2	30
G-3	12
G-4	28
G-5	22
G-6	12
G-7	12
G-8	12
G-9	12
G-10	18

Compaction - Prior to the application of topsoil, compacted subsoils will be roughened or loosened for a depth of 18 to 24 inches. To prevent compaction of topsoil, soil moving equipment will refrain from unnecessary operation over spread topsoil. The topsoil will be in a loosened condition prior to seeding.

Following the drying of the mud pit materials, the dirt excavated to create the mud pit will be mixed with the drill cutting and returned to the pit to prevent a boundary of hard material from forming in the mud pit area that would hamper root penetration and then compacted to minimize settling.

Erosion - Care will be exercised to ensure the stability of topsoil on graded slopes to guard against erosion during and after topsoil application. Post reclamation (contemporaneous and final) erosion control measures will be surface roughing, mulching and seeding.

242.200 Regrading

The areas will be graded to their approximate original topographic configuration.

242.300 Topsoil Redistribution on Impoundments and Roads

The mud pits will be dismantled and filled following completion of drilling. See Section 242.100, Compaction for additional information. Mud pits will be covered with the same amount of topsoil as the rest of the site. The roads existing prior to starting the drilling program will not be reclaimed. Access roads built to allow entrance to the drilling pads will be reclaimed and will receive topsoil in the same depth as their corresponding pad areas when methane venting is complete.

243 Soil Nutrients and Amendments

The soils will be analyzed directly following salvage to determine if amendments are needed. Testing of the topsoil will be done according to Table 6 of the Division's Topsoil and Overburden Guidelines. The topsoil will be tested at a minimum for the following parameters: pH, electrical

conductivity, total carbon, SAR, water holding capacity, plant available nitrogen, and phosphorus. Results of these analyses will be incorporated into Attachment 2-2.

244 Soil Stabilization

244.100 Protection and Stabilization of Surface Area

All reclaimed areas will be stabilized to control erosion by application of mulch, tackifier, and roughening of the surface. The areas will be graded to the approximately original topographic configuration. Seeding will be accomplished with the application of seeds and mulch with a long fiber tackifier or broadcast. Methods of protection and stabilization are further discussed in Chapter 3, Section 341.

244.200 Mulch Application

Mulch/tackifier will be applied to stabilize the soil on all areas that have been regraded and covered with growth media. For further discussion of revegetation practices to be utilized, see Chapter 3, Section 341.

244.300 Rills and Gullies

Postmining Land Use and Revegetation - Rills and gullies that are approximately nine (9) inches in depth and disrupt the postmining land use or reestablishment of vegetative cover will be regraded and seeded.

Water Quality - There are no streams immediately adjacent to the well sites.

250 PERFORMANCE STANDARDS

251 Topsoil, Subsoil, and Topsoil Supplements Management

All topsoil, subsoil, and topsoil supplements will be managed as outlined in Sections 230 and 240.

252 Stockpiled Topsoil and Subsoil

All stockpiled topsoil and subsoil will be managed according to plans outlined in Sections 230 and 240.

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
~~March~~ July 2005

**ATTACHMENT 2-1
SOIL INVENTORY AND ASSESSMENT**

add to the back of existing information

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July ~~March~~ 2005

**ATTACHMENT 2-1
SOIL INVENTORY AND ASSESSMENT**

add to the back of existing information

Soil Inventory

Proposed 2005 Degas Borehole Locations
Dugout Canyon Mine
Carbon County, Utah

Prepared For:

Canyon Fuel Company, LLC
Dugout Canyon Mine
P.O. Box 1029
Wellington, Utah 84542

By:

Daniel M. Larsen
Soil Scientist
EIS Environmental & Engineering Consulting
31 North Main Street
Helper, Utah 84526

June 2005

**Soil Inventory for Proposed
2005 Degas Borehole Locations**

Dugout Canyon Mine

Introduction

On-site soil inventories were conducted on June 9 – 14, 2005 at six degas borehole locations and two exploration drill sites for the Dugout Canyon Mine by Dan Larsen, Soil Scientist, EIS Environmental & Engineering Consulting, Helper, Utah.

These sites are noted as G-8, G-9, G-10, G-11, G-12, G-13 and DUG0105/DUG0205. They are located in the Pace Canyon area east of the Dugout Mine portal and facilities site. The sites are proposed locations for the 2005 degas borehole drilling program. Proposed drill pads had been flagged or staked at each corner prior to the soil inventory and a pre-work field review of each site was conducted by Vicky Miller, Environmental Engineer, Canyon Fuel Company.

The emphasis for this soil inventory was to identify soil resource suitability for site development (drill pad) and reclamation. Each site was evaluated for the quality, distribution, and amount of soil suitable for salvage. Soil potentials and limitations were noted in conjunction with associated environmental factors such as vegetation, slope, geology and climate.

Soils were inspected by the use of hand tools (spade and auger) and by observing materials in cut slopes. Pits were dug to depths that were sufficient to identify suitable soils for reclamation and the features of underlying materials. Depths were generally confined to very stony soils, solid rock or shale. Backhoe pits were not excavated for this inventory but may be used later if more specific information is needed.

Sketches were prepared for each drill site showing the general pad layout, soil pit locations, available "topsoil" depths and other notes. Conditions for each site were also documented by taking photographs of landscape and soil features.

Setting and General Soil Resources

The project area is characterized by steep, rocky mountain slopes having high relief with narrow canyons and ridges dissected in sedimentary rocks composed mostly of sandstone and shale in a semi-arid environment. It is in the Pace Canyon area of the Book Cliffs, northeast of Wellington and northwest of East Carbon, Utah in Carbon County.

The area has been mapped at the order 3 intensity level as part of the Soil Survey of the Carbon Area, Utah by the Soil Conservations Service (now the Natural Resources Conservation Service) issued in June 1988. Representative soil map units are:

Map Unit 97 – Rottulee family – Trag complex

Map Unit 62 – Midfork family – Comodore complex

Map Units 21 and 22 – Croydon loam

Map Unit 84 – Podo-Rock outcrop complex

Map Unit 88 – Rabbitex-Datino Variant complex

Map Units 100 and 101 – Senchert loam

These soils range from shallow over sandstone and shale to very deep. Dark colored surface layers (topsoil) range from near zero to about 30 inches. Soil textures range from sandy loam to silty clay loam and commonly have more clay or rock fragments in the subsoils. Reaction is commonly near neutral to moderately alkaline with carbonates commonly being more concentrated in the subsoil. Surface stones and boulders are common on many of the steep slopes, along ridgelines, and steeply sloping drainage dissections.

Vegetation includes pinyon-juniper, Douglas fir, Ponderosa pine, aspen, sagebrush and snowberry plus many other associated species. Elevation of the sites ranges from about 7,400 to 8,800 feet.

Soil Inventory and Assessment For Each Location (Site)

G-8

This site is on a narrow ridge at about 8,200 feet in elevation. Soils are shallow along the main ridge which supports Ponderosa pine and deeper on the northwest side under Douglas fir.

Most of the site has 4 to 6 inches of topsoil over a poor to unsuited clayey subsoil. Along the west side there are some deeper soils at an erosional slope break. This is a small area, but up to 18 inches of suitable soil was noted. Eroded spots at the southeast corner, along the south edge, and in the northeast corner have very little to no topsoil available.

Soil pit G-8-P1 is representative of this site. The surface soil to six inches is dark, grayish brown (moist) silt loam. At about six inches, the soil shows shale structure and has brownish yellow and pale yellow colors with high carbonates.

G-9

This site is a fairly complex, mostly disturbed area in a side canyon to Pace Canyon. It is on the northwest side of a drainage. The surface consists of an old roadway, slope cuts, benched surface, slash piles, and an undisturbed surface along the upper portion of the site that has been significantly eroded.

Shallow soils over shale and weathered shale exposed by slope cutting dominate the site. There is basically no topsoil on about half of the site. A large slash pile lies along the south edge between the access road and the drainage (dry). At the east edge there are some good soils as shown in soil profile G-9-P1 with about 18 inches of topsoil available. There is also a small area at the northwest corner where a topsoil thickness of 16 to 20 inches was noted.

The slope above the site is very eroded with gullies being common. Soils are variable in depth, being eroded to shale at the base of the gullies and having up to about 14 inches of soil between

the gullies. Northwest of the site, above the access road, the surface is very bouldery for about 150 feet. Then there is a slight ridge with shallow soils over shale with a non-stony surface. Soils are deeper along the east side near the large boulder (house rock) and where maple becomes a component of the vegetation.

G-10

This site is located in the same canyon as G-9. It is on a bench above an access road northwest of the drainage. The elevation is about 8,000 feet and the slope is fairly uniform at about 25 percent. Vegetation includes Douglas fir, sagebrush, snowberry, penstemon and a variety of other forbs and grasses.

The soils have formed from sandstone and shale and have textures of very fine sandy loam to silty clay loam. Soil erosion is evident by several gullies about 1 to 1 ½ feet deep. These appear to have formed years ago and are relatively inactive at the present time, although they would continue to erode under high precipitation events. Typically, the soils have a silt loam to loam surface layer that is dark brown to dark yellowish brown with about 10 percent rock fragments. At about 7 inches it becomes lighter in color (brown) and increases in clay content with a heavy silt loam to silty clay loam texture. The subsoil at about 24 inches has a high carbonate content evident by light colored (nearly white) patches, and the soil has an overall yellowish brown color. The topsoil is thinner and subsoil is closer to the surface on eroded spots.

A few stones and boulders are present on the site; however, they increase substantially along the northwest side just out of the pad site as it has been laid out.

Suitable soil for salvage is about 15 inches over the site with portions up to 24 inches and eroded spots with very little.

G-11

This site is located along the road in Pace Canyon and a side road leading into a side canyon to the north. It is at an elevation of about 7,500 feet and has slopes above the road that are about 35 to 50 percent gradient supporting a general pinyon-juniper vegetation type with scattered Douglas fir.

Much of the area has been disturbed by road construction and the major part of the undisturbed portion has shallow eroded soils. An area of deeper soils with more topsoil (10 to 16 inches) is present along the west side of the site. Two soil pits were dug and described that represent the contrast in the soils.

The road cut slope is mostly unsuited material consisting of light colored clayey shale material associated with siltstone and sandstone. There appears to be both residual rock and mixed colluvial materials.

Soil textures are commonly clay loam to silty clay loam. The soils along the west side are higher in organic matter, darker colored and deeper than most of the site. Rock fragment content is about 10 to 30 percent ranging from gravel to stone size and should not pose a problem for soil salvage. The area to the west and north of the staked site is higher in rock fragment content with more stones and boulders at the surface.

G-12

This site is located along the road in Pace Canyon at an elevation of about 7,400 feet. The site is about 50 percent disturbed and the undisturbed portion has a slope of about 30 to 40 percent and supports pinyon-juniper, Ponderosa pine, Douglas fir, sagebrush, snowberry and other associated vegetation. The soils have formed in colluvial materials derived from sandstone and shale. The slope above the site has a gradient of 50 to 65 percent and is very stony and bouldery. A drainage dissection to the north is very bouldery.

The site has a good potential for salvage of suitable soil for reclamation. About 12 to 30 inches could be salvaged from the undisturbed slope and two feet or more is available in the fill slope along the east side.

Two soil pits were dug and described (G12-P1 and G12-P2). One was near the center of the site and the other on the upslope edge. The upper 11 to 14 inches of soil is dark brown to very dark grayish brown clay loam to silty clay loam. It represents typical topsoil and is very well suited for plant growth. Below this layer (A horizon) the soil becomes slightly lighter in color and has a structure change from granular to subangular blocky. This layer extends to about 18 to 20 inches in depth and is more or less transitional from the true topsoil to the subsoil. It supports good root distribution and is suitable for salvage. The subsoil is lighter colored, high in carbonates and has a higher rock fragment content (30 – 45%).

Large boulders are present on the east and west sides of the identified pad site. Excavating for pad development may encounter more large stones and boulders.

G-13

This site is located along a road on an east-facing slope supporting dominantly a pinyon-juniper vegetation type at an elevation of about 7,600 feet about ¼ mile north of Pace Creek. Slopes are about 10 to 20 percent on the site but break steeply off the east edge. The road borders the west side.

Parent materials for soil formation are primarily colluvial deposits derived from sandstone and shale. Bedrock appears to control the slope break to the east. The surface ranges from relatively smooth and non-stony to very stony. Suitable soil for salvage ranges from about 8 to 28 inches over most of the site. Limitations are primarily due to high rock fragment content and low organic matter (yellowish brown, clayey subsoil). Portions along the southeast edge are too stony for soil salvage. Three soils pits were dug and described to identify the dominant soil features.

DUG0105

This site is along a ridge north of Pace Canyon at an elevation of about 8,900 feet in elevation. The site is fairly complex and supports Pinyon pine, sagebrush, snowberry, Douglas fir and aspen. The slope is mostly to the northeast at about 10 percent. Soils are shallow and stony along the south and west edges and become deeper and less stony to the northeast. Underlying material is dominantly sandstone.

Topsoils are cobbly sandy loam to loam about 6 to 8 inches thick over about 2/3 of the site. They are very cobbly or stony in the subsoil with bedrock commonly being within 20 inches. Subsoils are yellowish brown.

Near the center and the northeast portion of the site aspen and snowberry are main components of the vegetation and are indicators of deeper, more suitable soils for plant growth. About 14 to 20 inches of topsoil is present over a brown, very cobbly loam subsoil. The soils are similar to the Midfork and Comodore soils.

Slopes break steeply off to the south from the site, are shallow and stony to the west and have 14 to 20 inches of topsoil on 25 percent slopes to the north and northeast.

DUG0205

This site is on a north slope of 8 to 20 percent at an elevation of about 8,800 feet about one mile north of Pace Creek near the rim of Pace Creek Canyon. This site is separated by a short section of access road from site DUG0105. The vegetation is dominantly Douglas fir with some aspen. The area has been logged.

The site is relatively uniform with soils of and similar to the Midfork family. They have a very dark brown sandy loam to loam surface over very cobbly to very stony brown subsoils. Topsoil thickness is typically 15 to 18 inches over the site; however, along the northeast edge suitable

topsoils are up to 24 inches and in the northwest corner about 12 inches was noted over the high rock fragment subsoil.

Road Location – DUG0105 to DUG0205

The section of road proposed between sites DUG0105 and DUG0205 have soils similar to those described for site DUG0205. The slope is about 25% with a relatively uniform smooth surface. Suitable topsoil is very dark brown to dark brown sandy loam about 14 to 18 inches thick over a very cobbly subsoil.

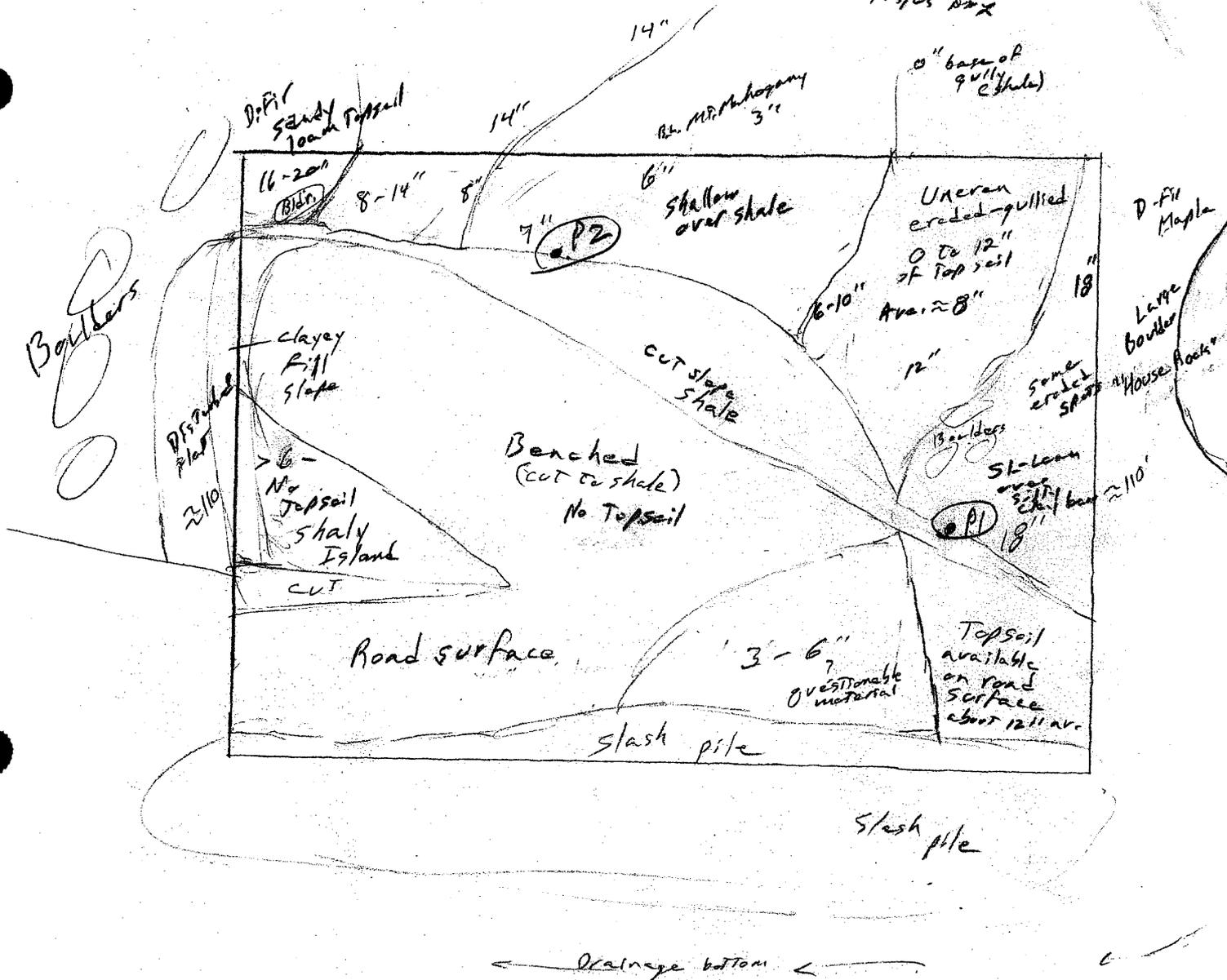
Soil Classification of Pedon Descriptions for 2005 Degas Borehole Sites
Dugout Canyon Mine 6/9-13/05 DML

<u>Pedon No.</u>	<u>Taxonomic Classification</u>
G8-P1	Loamy, mixed, superactive, calcareous, frigid, shallow Typic Ustortent
G9-P1	Fine-loamy, mixed, superactive, Pachic Argicryoll
G9-P2	Loamy, mixed, superactive, calcareous, frigid, shallow Typic Ustorthent
G10-P1	Fine-loamy, mixed, superactive, Typic Argiustoll
G11-P1	Fine-loamy, mixed, superactive, frigid Typic Haplustept
G11-P2	Loamy, mixed, superactive, calcareous, shallow, frigid Typic Ustorthent
G12-P1	Fine-loamy, mixed, superactive, Aridic Calciustoll
G12-P2	Loamy-skeletal, mixed, superactive, frigid Typic Calciustoll
G13-P1	Loamy-skeletal, mixed, superactive, frigid Typic Argiustoll
G13-P2	Loamy-skeletal, mixed, superactive, frigid Typic Argiustoll
G13-P3	Loamy-skeletal, mixed, superactive, frigid Typic Argiustoll
DUG0105-P1	Loamy-skeletal, mixed, superactive, frigid Lithic Haplustoll
DUG0105-P2	Loamy-skeletal, mixed, superactive, Typic Haplocryoll
DUG0105-P3	Loamy-skeletal, mixed, superactive, Typic Haplocryoll
DUG0205-P1	Loamy-skeletal, mixed, superactive, Typic Haplocryoll

Dugout Canyon Degas Benchole
2005

G 9

6/13/05 Dxx

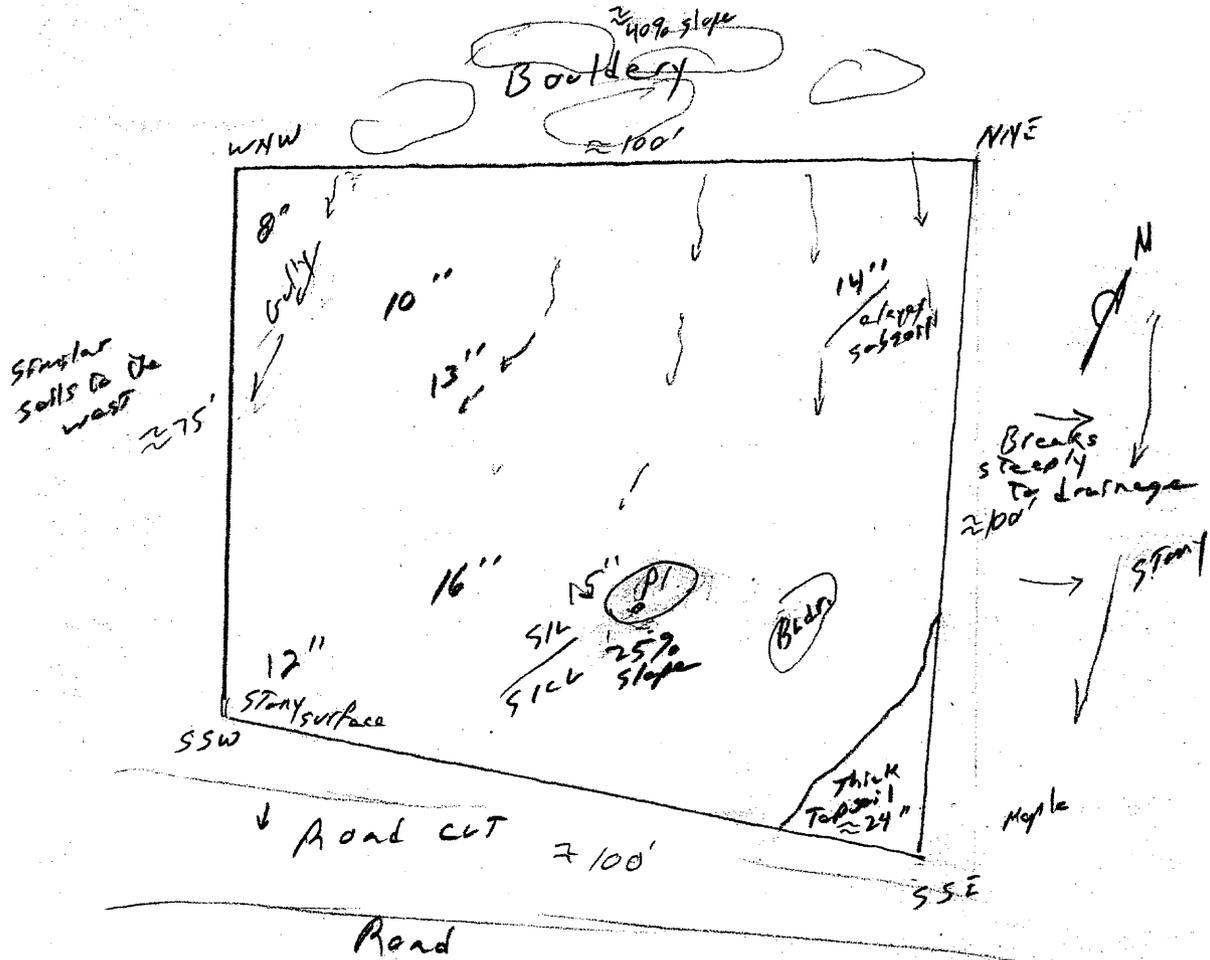


Some of the "shale" is very fine sandy clay loam
and some is very fine sand and silt (siltstone)

2005 Degas Bore Hole Site
Soil Notes

G-10

6-13-05 PMZ



This site is fairly uniform at 10 to 16 inches of suitable "topsoil" over the area except in washed (gullied) spots where there is less and in the SSE corner where it is thicker.
 ↙ ↘ = gullies (old washed out sections)

Fairly open Douglas-fir, sagebrush (sparse), snowberry shrubs

Some of the subsoil is fair and thickness could be increased about 6 inches on vegetated spots that are not eroded.

6/13/05
DMZ

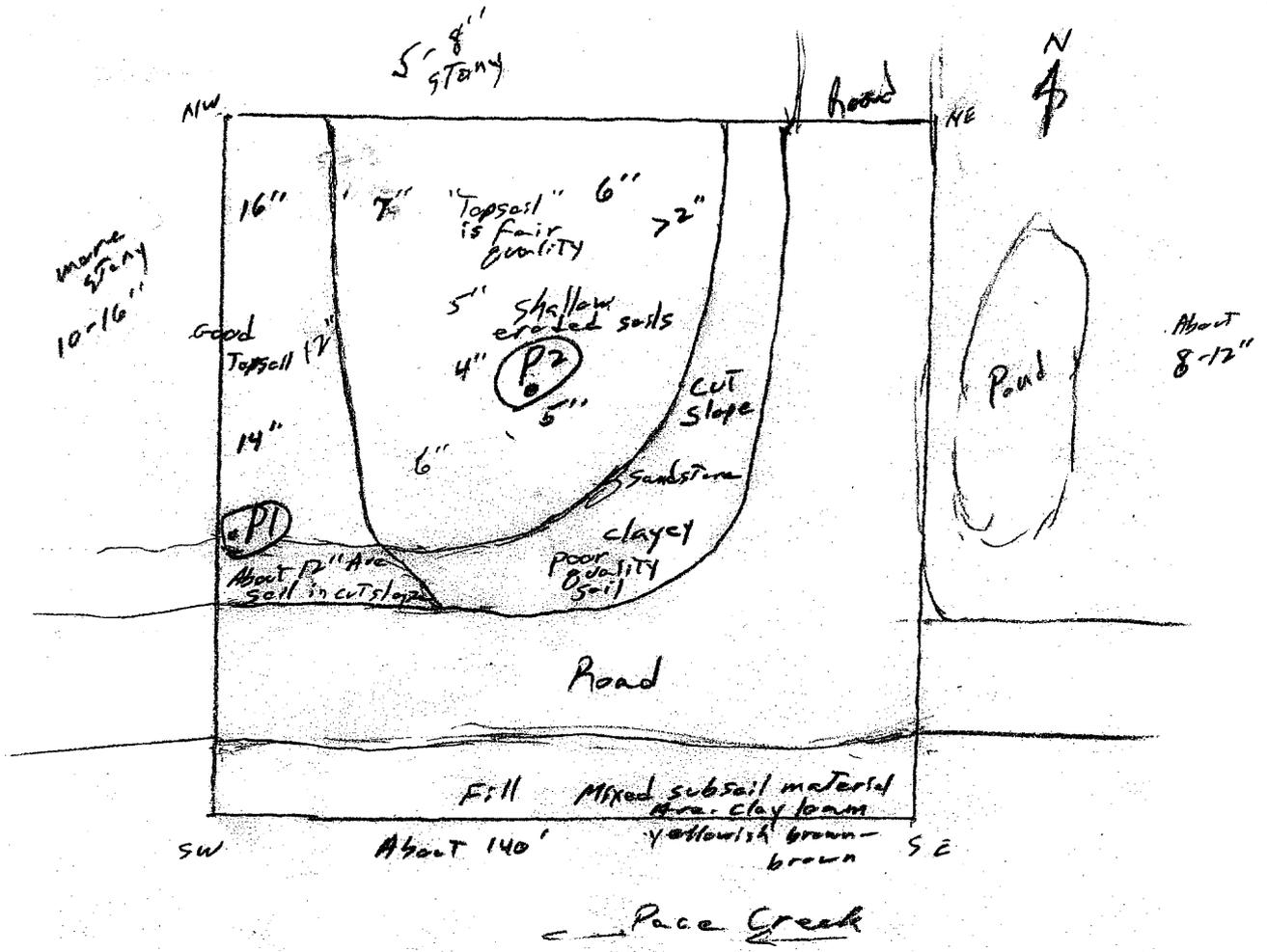
G-11

2005 Dugout Canyon Mine Degas Site

Soil Notes

6/13/05

"Topsoil"

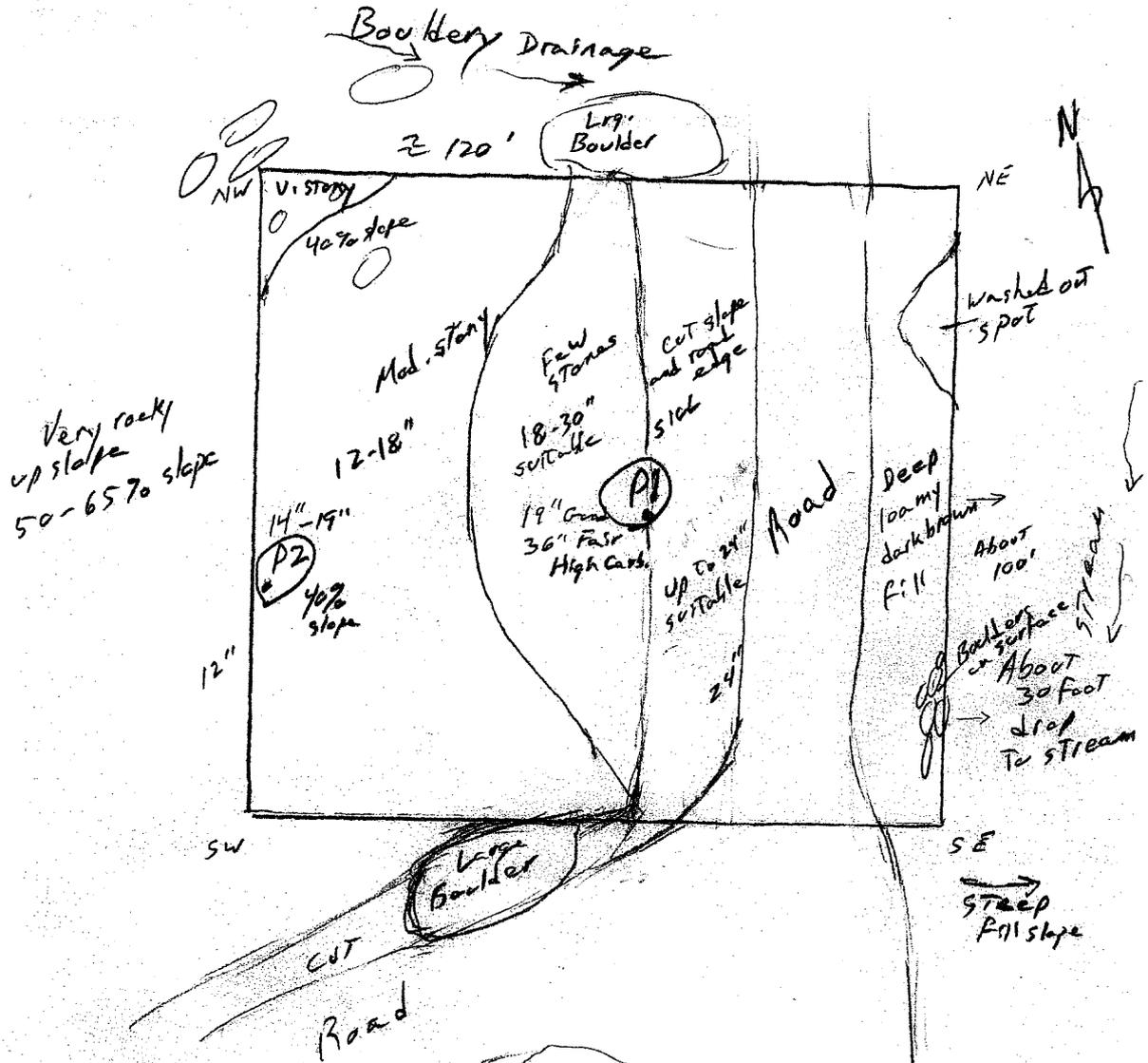


Some good topsoil is available along the west side. Material in most of the cut slope is unsorted to poor. Much of the area is eroded and has shallow soil with thin fair quality to soils. The site is about 140 feet on each side.

Dugout Canyon Degas
Borehole Locations

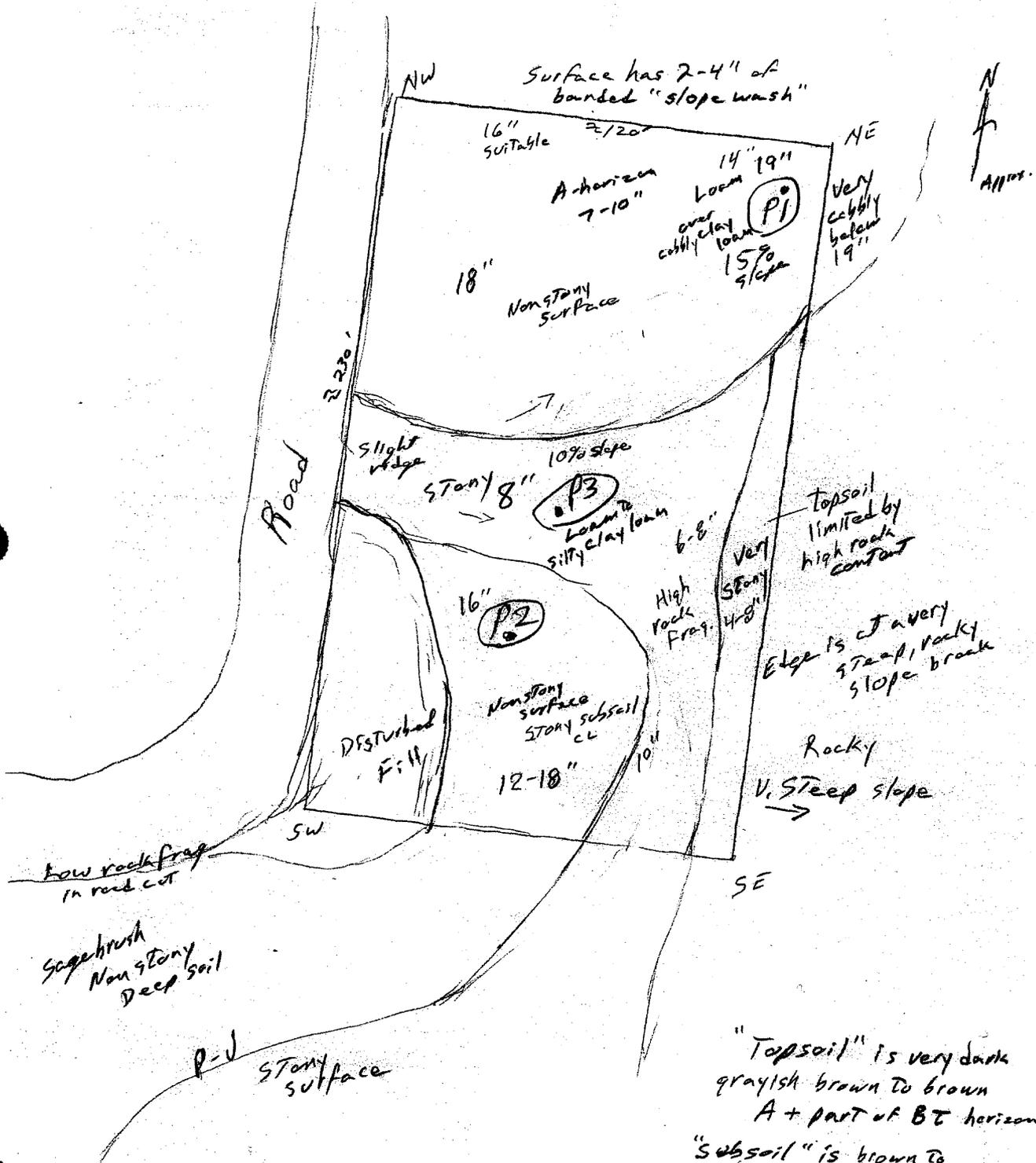
G-12

Soil Notes 6/12/05 DML
"Topsoil" thickness



Dugout Canyon Mine 2005 Degas Bore Hole Location

Topsoil Thickness Soils Notes: DML 6/10/03



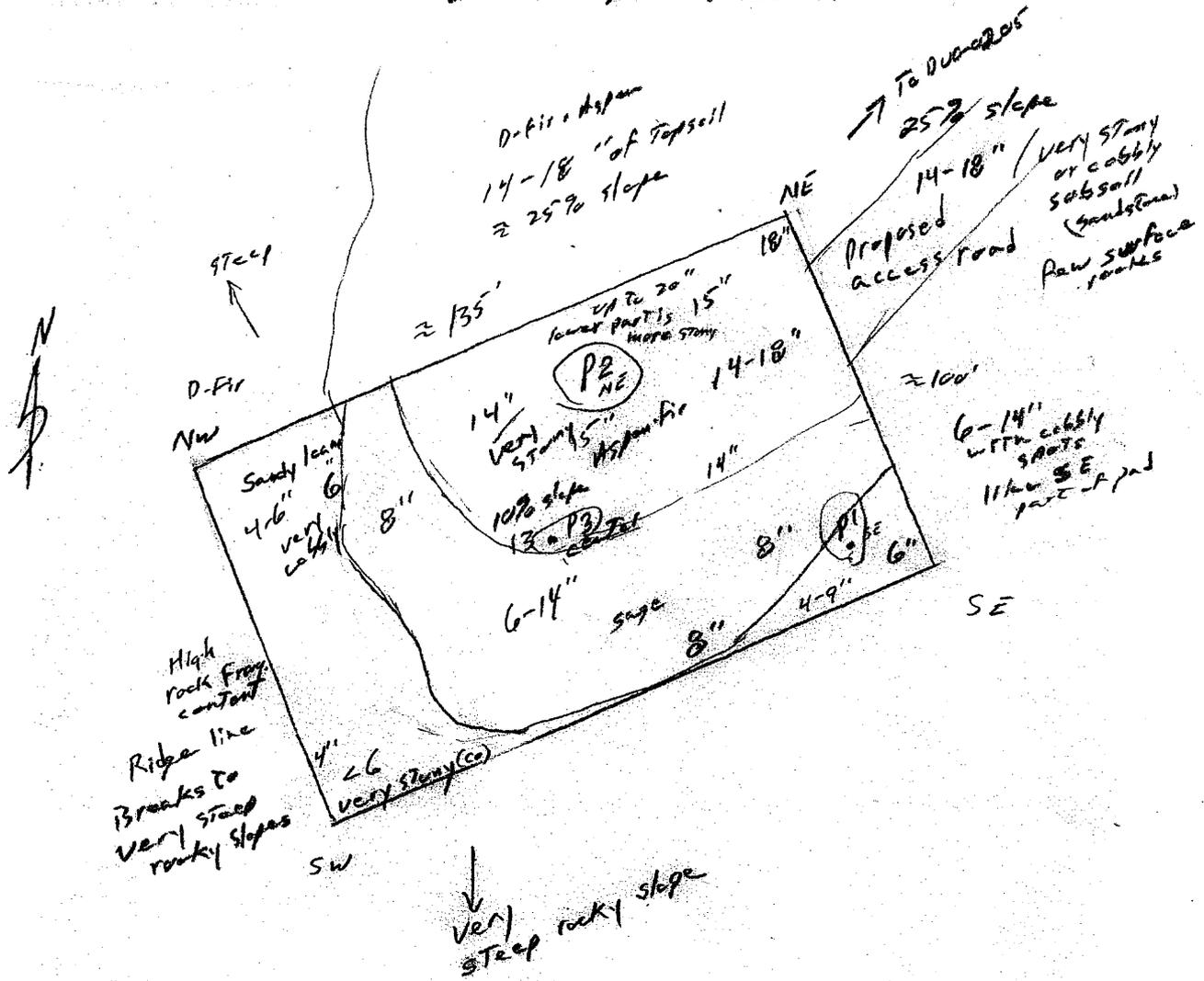
"Topsoil" is very dark grayish brown to brown
 A + part of Bt horizon
 "Subsoil" is brown to yellowish brown with high rock fragment content

Dugout Canyon Mine
2005 Exploration Drill Site

DUG0105

Soil Notes 6/10/05 DAL

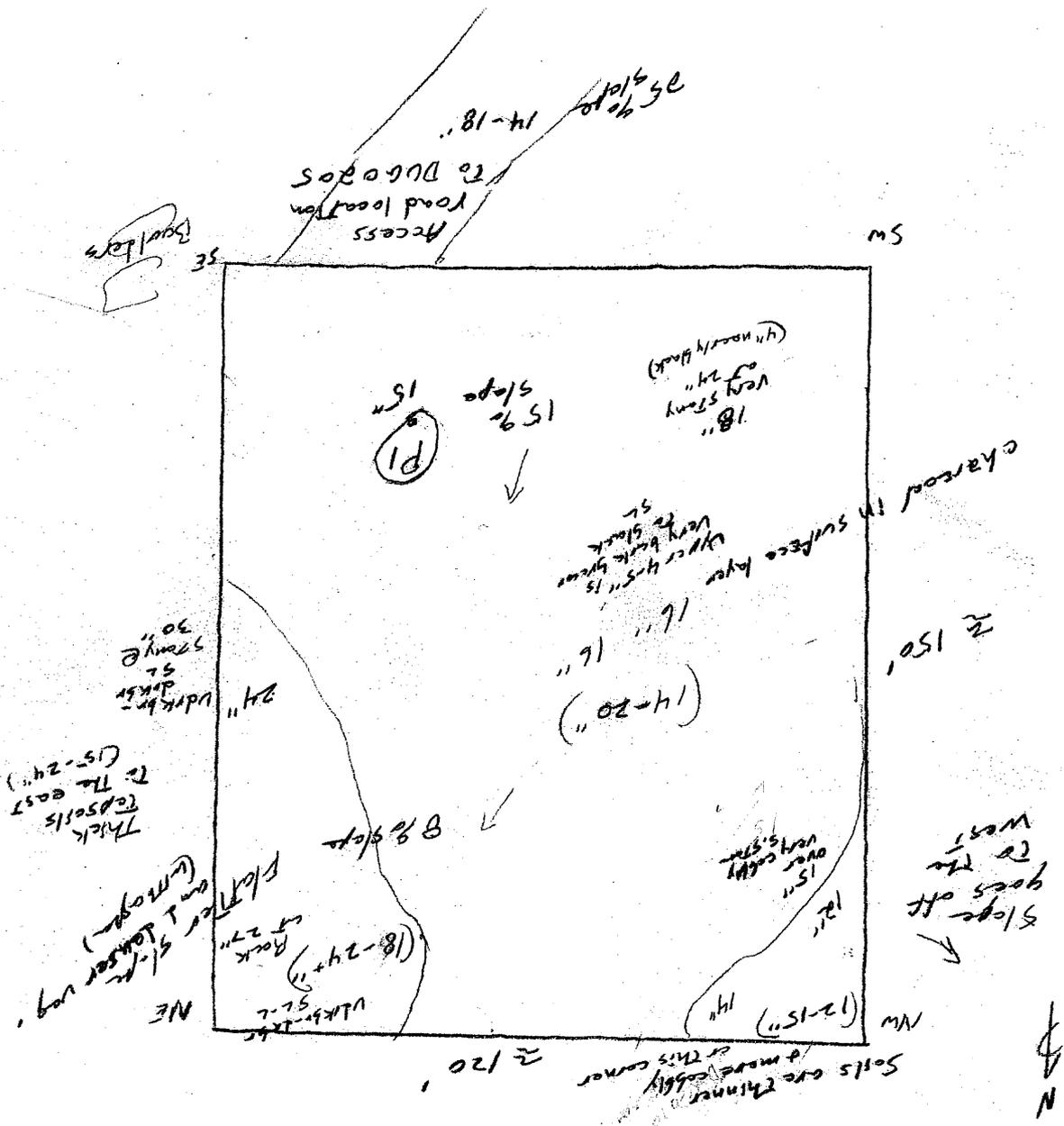
Salvageable "Topsoil" Thickness



Soil textures are mostly sandy loam
Areas along the south and east edge are
very cobbly. Shallow soils over sandstone
The northeast has good topsoil potential.
Some of the rock is layered - flint stone

Dugout Canyon Mine
 2005 Exploration Drill Site
 DUG0205

Soil notes 6/10/05 DMC
 Topsoil Thickness evaluation



2005 Degas

2005

Soil type Croydon

File No. 69 P1

Area	<u>Degout Canyon Mine, Sida Canyon to Pace Canyon</u>		Date	<u>6/1/55</u>	By:	<u>D. LARSEN</u>	Plot No.		
Classification	<u>Fine-loamy, mixed, superactive, Pachic Argieryoll</u>								
Location	<u>East edge of G-9 near large boulder NW 1/4, SW 1/4, S21, T13S, R13E</u>								
N. (or crop)	<u>Douglas Fir, Aspen, snowberry</u>					Climate	<u>Cryic / Frigid border</u>		
Parent material	<u>Sandstone - shale</u>								
Physiography	<u>Five steps near a drainage in dissected mountains</u>								
Relief	<u>Mod. Steep</u>	Drainage	<u>Well drained</u>					Salt or alkali	
Elevation	<u>~ 8000 feet</u>	Gr. water						Stoniness	
Slope	<u>35%</u>	Moisture							
Aspect	<u>South</u>	Root distrib.	<u>Well distributed but not in upper 18"</u>					% Clay *	
Erosion	<u>Mod.</u>	% Coarse fragments *						% Coarser than V.F.S. *	
Permeability	<u>Mod. - Moderate</u>								
Additional notes									

Upper B" very good
6-18" F-C
19-24 F

24" could be salvaged
will be useful for good/unsettled spots

* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reac-tion	Bound-ary	% Rock Frag-ments	Root Dist-ribution
		Dry	Moist			Dry	Moist	Wet				
A1	0-5		10YA 3/2	SIL	2FCA	SH	FA	S/P	em	ew	59	Common to 18"
A2	5-8		10YA 3/2	Heavy SIL SIL	2FCA 2FSA	SH	PA-FI	S/P	em 7.0	9w	89 50	
BT1	8-12		10YA 3/4 3-4 1/2	"	2FSA	SH H	FI	S/P	em	9w	159 50	
BT2	12-24		10YA 4/2	SIL		FI	FI	S/P	es	9w	159 50	few below 18"
BC	24-36	stony,	10YA 4/3	SIL	WFSM OM				es		309 100 155	Few carbunites patches below 18"

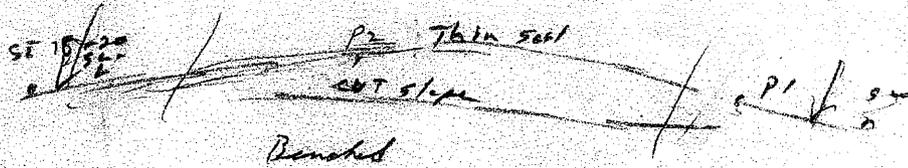
* Borderline mollic

Soil type *Cabba ? (Cool moist end of range)*

File No. *G9-P2*

Area <i>Duport Canyon Mine</i>		Date <i>6/13/05</i>	By <i>D. Larsen</i>	Stop No.
Classification <i>loamy, mixed, superactive, calcareous, frigid, shallow Typic Ustorthent</i>				
Location <i>Above cut slope, SE corner G9 NW 1/4 SW 1/4 S21 T13S, R13E</i>				
N. veg. (or crop) <i>Service berry, D-Fir, Birchleaf MA Mahogany</i>			Climate <i>Frigid / Cryic Transi</i>	
Parent material <i>Shale</i>				
Physiography <i>40% slope near top above a drainage</i>				
Relief <i>steep</i>	Drainage <i>Well drained</i>		Salt or alkali	
Elevation <i>about 8000'</i>	Gr. water		Stoniness	
Slope <i>40%</i>	Moisture			
Aspect <i>S</i>	Root distrib. <i>Upper 11"</i>		% Clay*	
Erosion <i>severely eroded surface</i>	% Coarse fragments*		% Coarser than V.F.S.*	
Permeability <i>slow</i>				
Additional notes				

There are soils with thick topsoil on each side of this shaly slope.



esp. P2 in film - slope above staked pad 517

* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reac-tion	Bound-ary	% Rock Frag-ments	Root Dist-ribu-tion
		Dry	Moist			Dry	Moist	Wet				
	<i>0-7</i>		<i>2.5 Y 4/2 4/3</i>	<i>sic</i>	<i>2 fgr</i>	<i>50/50</i>	<i>FA</i>	<i>S/P</i>	<i>es</i>	<i>gd</i>	<i>15%</i>	<i>CFM</i>
	<i>7-11</i>		<i>2.5 Y 4/3</i>	<i>sic</i>		<i>H</i>	<i>F1</i>		<i>es</i>	<i>gd</i>	<i>60% shale</i>	<i>R- CFM</i>
	<i>11-14</i>		<i>2.5 Y 5/2</i>		<i>FA</i>		<i>VFI</i>		<i>es</i>		<i>80% shale</i>	<i>FP</i>
	<i>14</i>											<i>highly fractured soft shale, harder and heavier than roots</i>

2005 Vegas

SOIL DESCRIPTION

Soil type Smectic De Trogon - ? May be a Calcicustoll or Calcicryoll File No. G10-P1

Area Dugout Canyon Mine, Puro Canyon area Date 4/13/65 By D. Larsen Stop No. _____

Classification Fine-loamy mixed superactive, Typic Argiustoll

Location Vegas Site G10, NE 1/4, S 24, S 20, T 13S, R 13E

N. veg. (or crop) Douglas fir, snowberry, sagebrush Climate Cryc near F1/1d

Parent material shale + sandstone 95%

Physiography iron slope, lower slope of side canyon to Puro Canyon

Relief Med. steep slope Drainage Well Drained Salt or alkali _____

Elevation About 8000 feet Gr. water _____ Stoniness _____

Slope 25% Moisture Med

Aspect SE Root distrib. Mostly upper 10" no sign of restriction % Clay * _____

Erosion Med. % Coarse fragments _____ % Coarser than V.F.S.* _____

Permeability Med.-slow

Additional notes _____

*upper 2" is more friable and more sandy 10YA 1/4 dry surface (slope wash)

Changed to Mollic



* Control section average Mon/red

Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Bound-ary	% Rock Frag-ments	Root Dist-ribution	
		Dry	Moist			Dry	Moist	Wet					
A1	6-9 0-7		Under gr. brown to dark grayish brown 10YA 3/2 - 4/2	heavy sil	2F ar	SO-5H	FR-FI	S/P	es	qw	10%	20-40% gravel on surface C-M FM	
BT1	7-13		Brown 10YA 4/3 - 5/3	sil scl	2F sbk	SH	FI	S/P	7.5 11	1.5 qw	3%	CP	
B2K	15-24		10YA 4-5/4	SIL	2F-m sbk	H	VFI	S/P	"	cw	5%	scl	
BK	24-28		Yellowish brown 10YA 5/4	SIL	om-2m sbk ↑ om when moist structure shows upon drying	H	VF		ex 7.6	1.6	shaly	Highly carbonated light particles	

SOIL DESCRIPTION

2005 Dugout Dezas

File No. 6-11-PI

Soil type Dooney Family?

Area	Dugout Canyon Mine, Pace Canyon		Date	6/13/83	By	D. Larsen	Stop No.			
Classification	Fine-loamy, mixed, superactive, frigid Typic Haplustept									
Location	Dezas site 6-11 in Pace Canyon, West edge above road SW 1/4 S 20 T 135 R 13E									
N. veg. (or crop)	P-J, sagebrush, serviceberry, D-Fir(P)					Climate			Frigid, USTic	
Parent material	Colluvium from shale and sandstone									
Physiography	Canyon toe slope									
Relief	sloped, single		Drainage	Well Drained				Salt or alkali		
Elevation	~ 4500 Feet		Gr. water						Stoniness	
Slope	50%		Moisture	Moist					% Clay *	
Aspect	South		Root distrib.						% Coarser than V.F.S. *	
Erosion	severe, active surface		% Coarse fragments *							
Permeability	slow									
Additional notes										

Up to 22" could be salvaged from this spot - About 14" is pretty good



* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Bound-ary	% Rock Frag-ments	Root Dist-ribution
		Dry	Moist			Dry	Moist	Ret				
A1	0-6		Brown 10YR 4/3	1"-L cl	1F7v	S SH	FA F1	S/P	2.5- 2.7	9W	15% 50 55	CF M
BT1	6-14		10YR 4/3-5/4	S1Lk	1F5bk	SH	F1	S/P	7	9W	"	CF M
BT2	14-22		2.5Y 4/3 - 10YR 4/3	S1L	1F5bk	M	F1	S/P	"	cW	20% 50	RF M
Bk/c	22-30		Olive brown 2.5Y 4/4	"	om ?	M	VF1	S/P	"		"	

2005 Dugout - Degas SOIL DESCRIPTION

G11-P2
File No.

Soil type Cabba - Similar (Paratitic)

Area Dugout Canyon Mine, Pace Canyon Date 6/17/68 By James Stop No.

Classification Lomny, mixed, superactive, calcareous, frigid, shallow type Ustorthent

Location Dugout Canyon Degas Sta G11 SW1/4, S20, T13S, R13E

N. veg. (or crop) Prayer - juniper Climate Frigid, USTe

Parent material Sandstone - a cellular surface from sandstone + shale

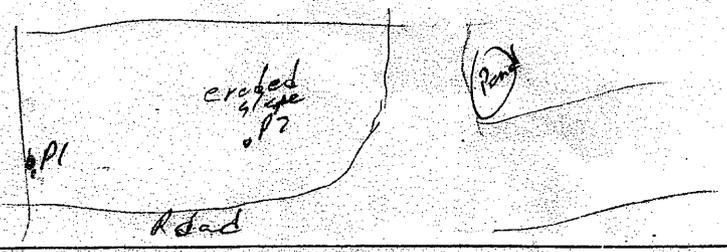
Physiography Tee slope

Relief <u>steep</u>	Drainage <u>well drained</u>	Salt or alkali
Elevation <u>7500 feet</u>	Gr. water	Stoniness
Slope <u>40%</u>	Moisture	
Aspect <u>South</u>	Root distrib. <u>To 8 inches</u>	% Clay *
Erosion <u>severe</u>	% Coarse fragments *	% Coarser than V.F.S. *

Permeability slow to mod. slow

Additional notes

"Topsoil" 5"
Rock at the base of the soil pit is soft weathered silt stone or very fine to fine sand

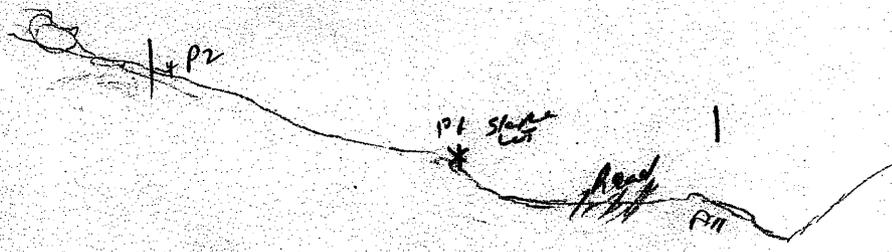


* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Boundary	% Rock Fragments	Root Distribution
		Dry	Moist			Dry	Moist	Wet				
A1	0-2		10YR 5/4 - 4/4	CL	VFA	S	VFA	S/P	es	CW	40g 5c	roots to about 8"
A2	2-5		"	CL	1FA 1FA BK	SH	FA SP	S/P	es	CW	15g	
C	5-10		10YR 6/3 + 7.5YR 6/8	SCL	OM	SH	F1	SS/ SP	em		5g 9c	
CR	10-14 +		7.5YR 5/3 weathered sandstone	LFS	OM	H	VFI		em			weathering rock

Soil type *Rabbitex (upper end of A moisture)* File No. *G-12-P1*

Area <i>Dugout Canyon Mine, Pace Canyon</i>	Date <i>6/1/55</i>	By <i>D. Larsen</i>	Plot No.
Classification <i>Fine-loamy, mixed superactive Aridic Calcicustall ? or Typic Calciboroll</i>			
Location <i>Dugout Drill site G12, Pace Canyon, by switchback road SW 1/4 S20 T135 R13E</i>			
N. veg. (or crop) <i>Pinon-juniper Douglas fir ponderosa pine, sugar pine, Gambel's quail</i>	Climate <i>Frigid, U.S.T.C.</i>		
Parent material <i>Sandstone & shale derived alluvium & colluvium</i>			
Physiography <i>Top slope near stream</i>			
Relief <i>mod. steep, single</i>	Drainage <i>well drained</i>	Salt or alkali	
Elevation <i>about 7400 feet</i>	Gr. water	Stoniness	
Slope <i>30-35%</i>	Moisture <i>Moist</i>		
Aspect <i>East</i>	Root distrib. <i>No restrictions to 36"</i>	% Clay*	
Erosion	% Coarse fragments*	% Coarser than V.F.S.*	
Permeability <i>Med-slow</i>			
Additional notes			



* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Bound-ary	% Rock Frag-ments	Root Dist-ribution	
		Dry	Moist			Dry	Moist	Wet					
<i>A1</i>	<i>0-11</i>	<i>Crayish brown 2.5Y 5/2</i>	<i>Very dark gr-br 2.5Y 3/2 - 4/2</i>	<i>heavy silty scl</i>	<i>Med. Mod. gr. (SMGT)</i>	<i>Co SH</i>	<i>FA</i>	<i>S/P</i>	<i>em cs</i>	<i>gw</i>	<i>5%</i>	<i>mf</i>	
<i>AB</i>	<i>11-19</i>		<i>Dark brown brown with MnR 4/3</i>	<i>scl</i>	<i>1 f sbk</i>	<i>SH</i>	<i>F1</i>	<i>S/P</i>	<i>cs</i>	<i>gw</i>	<i>5%</i>	<i>cf</i>	
<i>Bk</i>	<i>19-36</i>		<i>10YR 5/3 spots 6/3 + patches 10YR 4/2 matrix</i>	<i>scl</i>	<i>1 f m sbk</i>	<i>SH</i>	<i>F1</i>	<i>S/P</i>	<i>cs v</i>	<i>cw</i>	<i>5%</i>	<i>PF</i>	<i>Carbonate patches</i>
<i>C</i>	<i>36-50</i>		<i>2.5Y 4/3 - 4/3 with carbonate patches gravelly and some clay loam patches</i>		<i>om</i>		<i>F1</i>	<i>S/P</i>	<i>"</i>		<i>35% SC</i>	<i>PF</i>	<i>"</i>

Soil type

Guben (Dat no if not calc)

File No. G-12-P2

Area Dugout Canyon Mine Pace Canyon Carbon Co, UT Date 6/13/65 By: D. Larsen Stop No. _____

Classification Loamy-skeletal, mixed, superactive, frigid, Typic Calcustoll

Location Degas Drill Site G-12, upper slope near center SW 1/4 S20, T13S, R13E Climate _____

N. veg. (or crop) Pinyon-juniper, Sagebrush, D-Fir

Parent material Sandstone and shale (colluvium)

Physiography Mountain slope, lower 1/3 near canyon bottom

Relief Steps Drainage Well drained Salt or alkali _____

Elevation about 7400' Gr. water _____ Stoniness _____

Slope 40% Moisture Moist

Aspect SE Root distrib. Decreases @ 19" % Clay* _____

Erosion _____ % Coarse fragments* _____ % Coarser than V.F.S.* _____

Permeability Med. - Med. slow

Additional notes _____

Good D-pest 18-19"

50-60% rock fragments on surface (Erosion surface)

* Control section average

Horizon	Depth inches	Color		Texture	Structure	Consistence			Reaction	Boundary	% Rock Fragments	Root Distribution	Carbonates	
		Dry	Moist			Dry	Moist	Ret						
A1	0-3		2.5Y 4/3	CL	2Fst WITH SOME SANDY	SO	FR	S/P	es	CU	20% 70%	Good Dist.		
A2	3-14		10YR 3/3	CL	2Fst	SH	FA-FI	S/P	es	GN	10% 5%			
AB	14-19		10YR 3/2 - 4/3	CL	1Fstbk	SH	FI	S/P	es		"	↓		
BK	19-24		2.5Y 4/3	CL	1F-m sbk	SH	FI	S/P			30% 10% 5%?	few	Common pedis areas	
	24-28	hit large stone - very stony?										30% 15% 10%		

SOIL DESCRIPTION

2005 Degas Borahde Sites

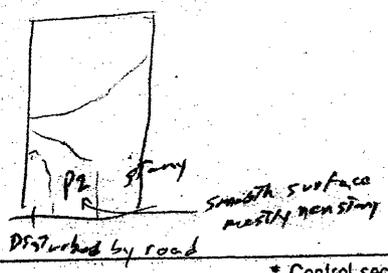
Soil type Curecant

File No. G-13-P2

Area	<u>Dugout Canyon Mine Race Canyon</u>		Carbon Co., UT	Date	<u>6/10/68</u>	By	<u>D. Larsen</u>	Stop No.		
Classification	<u>Loamy-skeletal, mixed, superactive, frigid Typic Argustoll (near Pachic)</u>									
Location	<u>Degas Site G13, south center NE 1/4, SE 1/4, S 1/4, T 13S, R 13E</u>									
N. veg. (or crop)	<u>Pinyon-Juniper Few Douglas-Fir</u>						Climate	<u>Frigid/USFC</u>		
Parent material	<u>Colluvium from sandstone and shale</u>									
Physiography	<u>Mountain slope, bench</u>									
Relief	<u>Mod. sloping</u>	Drainage	<u>Well Drained</u>						Salt or alkali	
Elevation	<u>~7600'</u>	Gr. water							Stoniness	
Slope	<u>~10%</u>	Moisture	<u>Moist</u>						% Clay *	
Aspect	<u>NE</u>	Root distrib.							% Coarser than V.F.S. *	
Erosion	<u>Some surface accumulation</u>		% Coarse fragments *				% Coarser than V.F.S. *			
Permeability	<u>Mod. slow</u>									
Additional notes										

Between disturbed road fill and rocky slope

Close to "Pachic"



* Control section average

Horizon	Depth inches	Color		Texture	Structure	Consistence			Reaction	Boundary	% Rock Fragments	Root Distribution	Carbonates	
		Dry	Moist			Dry	Moist	Wet						
A1	0-2	<u>slope wash - Banded</u>		<u>VPsl</u>		<u>SO</u>	<u>VFA</u>	<u>50/100</u>		<u>CS</u>	<u>5%</u>			
A2	2-9		<u>10YR 7/3</u>	<u>L</u>	<u>2MFA</u>	<u>SH</u>	<u>FR</u>	<u>S/P</u>		<u>CW</u>	<u>5% 50%</u>	<u>cl. c.</u>		
BT1	9-16		<u>10YR 5/3 - 3/4</u>	<u>CL</u>	<u>3ABK</u>	<u>H</u>	<u>F1</u>	<u>S/P</u>		<u>cl</u>	<u>"</u>	<u>"</u>		
BT2	16-18		<u>10YR 4/4</u>	<u>CL</u>	<u>2ABK</u>	<u>H</u>	<u>F1</u>	<u>V5/P</u>			<u>10%</u> <u>10%</u>			
		<u>Large rock</u>												

2005 Degas Borehole

SOIL DESCRIPTION

Soil type *Curecanti like*

File No. *G-13-P3*

Area *Dugout Canyon Mine, Pace Canyon Carbon Co., VT* Date *6/10/65* By: *D. Larsen* Stop No.

Classification *loamy-skeletal, mixed superactive, Frigid Typic Argiustoll*

Location *Degas borehole G13, near center NE 1/4, SE 1/4, S 1/2, T 135, R 13E*

N. veg. (or crop) *Polygon - juniper* Climate *Frigid / UPTC*

Parent material *Colluvium from sandstone and shale*

Physiography *Bench on mountain slope (dissected canyon)*

Relief *Mod. sloping* Drainage *Well Drained* Salt or alkali

Elevation *~ 7600'* Gr. water Stoniness

Slope *10%* Moisture

Aspect *NE* Root distrib. % Clay *

Erosion % Coarse fragments * % Coarser than V.F.S. *

Permeability

Additional notes

About 30% surface rock fragments - mostly 3 to 10 inch diameter

Total rock fragment content and size is a rough estimate from a small pit - Includes a mix of gravel to boulders - Cobble size is most common



* Control section average

Horizon	Depth inches	Color		Texture	Structure	Consistence			Reaction	Bound-ary	% Rock Frag-ments	Root Dist-ribution	Carbon-ates
		Dry	Moist			Dry	Moist	wet					
<i>slight wash</i>	<i>0-1/2</i>			<i>FSL</i>		<i>S</i>	<i>VFA</i>	<i>90/100</i>		<i>CS</i>	<i>30% 15% mostly cobbly</i>		
<i>A1</i>	<i>1/2-8</i>		<i>10YR 3/2-3</i>	<i>L-CL</i>	<i>2fgr</i>	<i>SH</i>	<i>FA</i>	<i>5/10</i>		<i>CW</i>	<i>10% 5% 5%</i>	<i>cf- M</i>	
<i>BT</i>	<i>8-12</i>		<i>dark to 10YR 4/4 yellowish br.</i>	<i>CL</i>	<i>2MSBK</i>	<i>H</i>	<i>FI</i>	<i>9/10</i>		<i>aw</i>	<i>10% +</i>		
<p><i>10 large rock at 8 to 12 inches in depth</i></p> <p><i>Not a true soil horizon break - just a large rock fragment</i></p>												<p><i>Est. 40-50% 100% in soil in pit overall</i></p> <p><i>Mix of sizes 95-600</i></p>	

SOIL DESCRIPTION

SOIL CONSERVATION SERVICE

Soil type *Mid Perk*

N₉T_c

File No. *DUG 0105 P 2 NE*

Area	<i>Dugout Canyon Mine, N. of Pace Canon</i>		Date	<i>6/10/62</i>	By	<i>Ransom</i>	Stop No.	
Classification	<i>loamy skeletal, mixed, superactive, Typic Haplucryoll</i>							
Location	<i>NE end of DUGOUT SW 1/4, S 2 1/4, S 17, T 13 S, R 13 E</i>							
N. veg. (or crop)	<i>Aspen, P. Fir, snodgrass, Ran sage</i>					Climate	<i>Cryc</i>	
Parent material	<i>Sandstone</i>							
Physiography	<i>Upper N slope of P from a canyon ridge</i>							
Relief	<i>Md steep</i>		Drainage	<i>well</i>		Salt or alkali		
Elevation	<i>6800</i>		Gr. water					Stoniness
Slope	<i>10%</i>		Moisture	<i>Moist</i>				
Aspect	<i>N</i>		Root distrib.					% Clay*
Erosion			% Coarse fragments*					% Coarser than V.F.S.*
Permeability	<i>Moderate</i>							
Additional notes								

see photo 6612-7

* Control section average

Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Boundary	% Rock Fragments	Root Distribution
		Dry	Moist			Dry	Moist	Wet				
<i>A1</i>	<i>0-6</i>		<i>10YR 7/2</i>	<i>SL</i>	<i>1Pgr</i>		<i>FA</i>				<i>15%</i>	<i>Well distributed</i>
<i>A2</i>	<i>6-12</i>		<i>7.5YR 3/3 10YR 7/2</i>	<i>SL</i>	<i>1Pgr 1Psbk</i>		<i>FA</i>				<i>10% 10%</i>	<i>roots</i>
<i>BW</i>	<i>12-20</i>		<i>7.5YR 4/4</i>	<i>SL</i>			<i>FR F1</i>				<i>15% 20% 5%</i>	
	<i>20'</i>	<i>very cobbly</i>										

SOIL DESCRIPTION

SOIL CONSERVATION SERVICE

Soil type Midfork ? maybe moderately deep Notes
 File No. DUG-0105
P3

Area Dugout Canyon Mine Date 6/10/68 By D. Larsen Stop No. control

Classification Lanney-4kafat, Typic Cryoboroll (Hapleryoll)

Location SW 1/4, SE 1/4, S17, T135, R13E

N. veg. (or crop) Sagebrush, sparse aspen, Douglas-fir, snowberry Climate

Parent material Sandstone

Physiography Alpine top

Relief Mod. sloping Drainage Well Drained Salt or alkali

Elevation 8900 Gr. water Stoniness

Slope 10% Moisture

Aspect NE Root distrib. % Clay*

Erosion % Coarse fragments* % Coarser than V.F.S.*

Permeability

Additional notes

2005 Exploration drill site

13 to 18 inches of top soil include part of the cobbly subsoil

Projected as moderately deep.

* Control section average

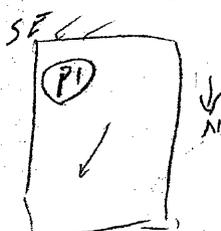
Horizon	Depth	Color		Texture	Structure	Consistence			Reaction	Bound-ary	% Rock Frag-ments	Root Dist-ribution
		Dry	Moist			Dry	Moist	Wet				
A1	0-6		10YR 3/2	SL	2fgr	VFA	SS	SP			10	9
A2	6-14		7.5YR 3/3	SL	"	FA	SS	SP			10	Good distribution
Bw	14-20		7.5YR 4/3 ^{some 3/3}	SL	slight SBR 2m	FA					25	900
Bc	20+ 12"	very cobbly	7.5YR 4/4	SL		FA					45%	
		Probably near bedrock										
		Broken sandstone rocks 7.5YR 4/6-5/6										

Soil type *Midfolk*

File No. *DUG0205*
P1

Area <i>Dugout Canyon Mine - North of Pace Canyon</i>		Date <i>6/10/68</i>	By: <i>D. Larson</i>	Stop No.
Classification <i>Loamy skeletal, mixed, superactive, Dystric, Haploxylo</i>				
Location <i>SW 1/4, SE 1/4, S17, T13S, R13E North rim of Pace Canyon</i>				
N. veg. (or crop) <i>Douglas-Fir + some aspen</i>			Climate <i>ENYC</i>	
Parent material <i>Sandstone</i>				
Physiography <i>Upper slope near a ridge top - slight bench</i>				
Relief <i>Mod. steep</i>	Drainage <i>Well drained</i>		Salt or alkali	
Elevation <i>~ 8800 feet</i>	Gr. water		Stoniness	
Slope <i>15%</i>	Moisture <i>Moist</i>			
Aspect <i>North</i>	Root distrib. <i>Good distribution to 20"</i>		% Clay*	
Erosion <i>-</i>	% Coarse fragments*		% Coarser than V.F.S.*	
Permeability <i>Moderate</i>				
Additional notes				

*Site is quite uniform
No significant surface
rocks - Surface has
a good litter layer over
much of the site.
Area has been logged*



Near "Pachic" colors & thickness

* Control section average

Chlorophan Red

Horizon	Depth Inches	Color		Texture	Structure	Consistence			Reac- tion	Bound- ary	% Rock Frag- ments	Root Dist- ribution	Carbon- ates
		Dry	Moist			Dry	Moist	Wet					
<i>O</i>	<i>1-0</i>	<i>Organic Layer - Needles, Twigs, cones etc</i>											
	<i>m</i>		<i>Very dark brown</i>	<i>HL, HOM</i>					<i>e0</i>			<i>CPm</i>	
<i>A1</i>	<i>0-3</i>	<i>7.5YR 2.5/2</i>	<i>10YR 4/2</i>	<i>SL</i>	<i>1FGA</i>	<i>S0</i>	<i>UFR</i>	<i>50/100</i>	<i>6.0</i>	<i>CV</i>			
<i>A2</i>	<i>3-15</i>	<i>7.5YR 3/3 - 4/4</i>		<i>SL</i>	<i>1FGA- 1MSBK</i>	<i>S0</i>	<i>FR</i>	<i>55/50</i>	<i>6.4</i>	<i>9W</i>	<i>58 50</i>	<i>CPm +co</i>	
<i>AB</i>	<i>15-20</i>	<i>7.5YR 3/4 - 4/3</i>		<i>SL</i>	<i>1MSBK OM</i>	<i>S1</i>	<i>FR</i>	<i>"</i>	<i>6.4</i>		<i>58 50</i>	<i>FF m</i>	
<i>BW</i>	<i>20-24</i>	<i>Very stony 10YR 4/4</i>									<i>50%</i>		

PHOTOGRAPHS
DEGAS BOREHOLE LOCATIONS

G-8 thru 13 and DUG0105/DUG0205

Dugout Canyon Mine Soil Inventory
Photographs for the 2005 Degas Borehole Sites, June 9-13, 2005
D. Larsen

CD Photo No.

Site G-8

- 6563-5 A view from the south edge of site G-8 looking approximately to the north along the narrow ridge.
- 6563-6 From the north edge looking southerly at site G-8.
- 6563-7 View from the northeast corner of G-8 showing the steep slope break to the east of the site.
- 6563-8 Soil profile G8-P1 showing the shallow soils typically found along the ridge at site G-8.
- 6563-9 Soil profile G8-P1 showing the shallow soils typically found along the ridge at site G-8.
(With location card in photo)
- 6563-10 Site conditions at the location of soil pit G8-P1. This is the north central part of the proposed drill pad.
- 6563-11 Surface and soil at the northeast corner of site G-8. There is essentially no topsoil present at this spot, and the soils have a very pale brown color when moist.
- 6563-12 A view looking southerly along the west edge of site G-8. There is about 18 inches of suitable topsoil near the spade and very little in the eroded spot to the right. The slope breaks to about a 50% gradient just off the west edge of the proposed drill pad.
- 6563-13 Eroded slope along the west edge of G-8. Deeper soil is present above the erosional slope break near the spade. This view is from near the southwest corner looking to the north.
- 6513-14 Surface conditions at the south edge and southeast corner of site G-8 showing a rocky spot and very shallow, eroded soils. Looking approximately northeast.
- 6563-15 A view from the road on the south edge of G-8 looking toward the southwest corner. Soils are shallow in the foreground and are deeper where there is more vegetation behind the spade.
- 6563-16 Site conditions at the flag in the southwest corner of G-8. About 10 inches of topsoil are available at his location.

Site G-9

- 6794-11 Site G-9 from the approximate southeast corner showing the slash pile along the edge and the old road surface. Up to about 12 inches of topsoil could be salvage from the road on this end of the site.
- 6794-12 Up slope from the previous photo showing some of the central part of site G-9. The deepest, most suitable soils are along the left side (west).
- 6794-13 The west portion of site G-9 above the old road (landing) and looking to the northwest corner. About 14 to 18 inches of topsoil are available.
- 6794-14 The west (approx.) side of drill site G-9. The large boulder, referred to as "house rock", is outside of the proposed pad site. There is a dry drainage channel to the right of the boulder. The slash pile ends near the lower right portion of the photo.
- 6794-15 The central portion of site G-9 looking down slope toward the slash pile and drainage. There is no "topsoil" in the foreground.
- 6794-16 The southwest corner of site G-9. The corner flag is at the edge of the slash pile. From near the center looking to the southwest.
- 6794-17 A benched (leveled) area near the west side of site G-9. Surface soil has been removed and soil is mostly unsuitable shaly material.
- 6794-18 A view of site G-9 from across the canyon. "House rock" is at the right side of the photo. The light colored area near the center and to the left has no "topsoil".
- 6794-19 Soil profile G9-P1 near the west central part of site G-9. This location is a good source of topsoil, although most of the site has very little.
- 6794-20 Location of soil pit G9-P1 looking up slope toward the northeast corner of site G-9. This area has about 14 to 20 inches of topsoil available for salvage. The eroded slope at the upper part of the photo is at the edge of the drill pad site and has less topsoil and more stones.
- 6794-21 Soil profile G9-P2 on the cut slope at the south central part of site G-9. This soil is shallow over weathered shale. Salvageable soil is about seven inches thick. The underlying material is soft sedimentary rock that ranges from clayey to very fine sand and silt in particle size.

- 36794-22 Location of soil pit G9-P2 at the upper part of the cut slope at drill site G-9. This is on a slightly rounded slope underlain by shale (includes siltstone) and has an eroded surface. The shallow soil area supports mountain brush and lacks trees that are on the sites with deeper soils.
- 6794-23 An eroded soil above proposed drill pad site G-9. Above the pad site the soils are fairly stony and have gullies that have cut about 10 to 18 inches deep. The bottom of the gullies are typically cut down to weathered shale material. On the micro-ridges between the gullies up to 14 inches of suitable topsoil was noted.
- 6794-24 A view from the cut slope looking down across the central portion of site G-9. An area with no topsoil.

Site G-10

- 6793-1 A view from the lower (SSW) corner of site G-10 looking to east. About 12 inches of topsoil is present at this location.
- 6793-2 A view of the central part of site G-10 and the location of soil pit G10-P1. Overall, this site has a good potential for salvageable topsoil, ranging from about 8 to 20 inches.
- 6793-3 Soil profile G10-P1. This soil is representative of the site. It has silt loam and silty clay loam texture, very dark grayish brown and brown colors that are suitable; and is underlain by yellowish brown subsoils.
- 6793-5 This photo shows some of the boulders that are common on the slopes above drill site G-10. Slopes above the site are bouldery, eroded, brushy, and steeper than the proposed pad site.
- 6793-6 The upper (NNE) corner of site G-10. This location has surface erosion which causes irregularity in topsoil thickness. The base of some of the gullies consists of subsoil materials. Up to 12 inches of topsoil is available, with an average of about eight inches.

Site G-11

- 6793-7 Site G-11 from the southwest corner looking easterly up the road in Pace Canyon. Fill slope is to the right, road in center, and cut slope on the left. A side road goes to the left behind the cut slope.
- 6793-8 The road and cut slope at site G-11 from the southwest corner looking northeast. The cut slope consists of sandstone, shale, and some colluvium.

- 6793-9 Soil profile G11-P1 along the west side of drill site G-11. About 14 inches of suitable topsoil is present at this site.
- 6793-10 Location of soil pit G1-P1 looking up slope along the west edge of site G-11 from the road. The soil pit is in the shadow just left of center. This is the most suitable soil area at the proposed drill site.
- 6793-11 Soil profile G11-P2 on an eroded spot above the road cut at site G-11. This is a very shallow soil over weathered sandstone.
- 6793-12 Site conditions at the location of soil pit G11-P2. The surface is eroded with sparse vegetation.
- 6793-13 View from above the cut slope looking down at the road and the fill slope at site G-11.
- 6793-14 View from the west edge of site G-11 showing the road and the cut slope. In the foreground the soil materials are colluvial and deeper than where the surface rock is present.
- 6793-15 Site conditions at the northwest corner of site G-11. About 12 to 14 inches of suitable soil is available for salvage.

Site G-12

- 6612-23 Site overview of G-12 showing the roadway and fill slope. The large boulder is near a side drainage to Pace Creek which is to the right of the photo.
- 6612-24 Site G-12 showing the cut slope and the undisturbed land above it.
- 6794-1 Soil profile G12-P1 above the cut slope near the center of site G-12. Good topsoil to 19 inches and fair up to about 30 inches. Soils below 19 inches are high in carbonates and have lower organic mater than the soil above.
- 6794-2 Soil profile G12-P1.
- 6794-3 Location of soil pit G12-P1.
- 6794-4 From the north edge of G-12 looking southwest. Large boulders are present along the drainage to the north of the site.
- 6794-5 The edge of the fill slope at site G-12. Much of the fill would be suitable topsoil.
- 6794-6 Cut slope with a large boulder on the side road southwest of site G-12.

- 6794-7 Bouldery surface at the northwest corner of site G-12.
- 6794-8 A view looking up slope near the west edge of site G-12. Above the proposed pad site location the slopes become steeper and more stony.
- 6794-9 Soil profile G12-P2 near the center of the upper edge of site G-12. High carbonates and high rock fragment content at about 18 to 20 inches.
- 6794-10 Site location of soil pit G12-P2 along the west edge of site G-12.

Site G-13

- 6563-17 At the upper end of site G-13 looking into the potential topsoil storage area.
- 6563-18 The south central portion of site G-13. This location has a non-stony surface.
- 6563-19 The upper (SW) corner of site G-13 showing the edge of the road and a widened fill slope.
- 6563-20 Soil profile G13-P1. Slope was (deposited erosional material) at the surface and very stony subsoil. About 17 to 19 inches of suitable soil could be salvaged.
- 6563-22 Soil profile G13-P1. With identification card. See above.
- 6563-23 Location of soil pit G13-P1 near the northeast corner of site G-13.
- 6612-15 Stony surface along the east edge of site G-13.
- 6612-16 Stony surface at the southeast corner of site G-13. The slope breaks steeply to the east.
- 6612-18 Soil profile G13-P2. Depth is to a large stone or boulder. Lighter colored subsoil begins at about 16 inches.
- 6612-19 Surface conditions at the location of soil pit G13-P2. This is a non-stony surface at the south central portion of the proposed drill site.
- 6612-20 Soil profile G13-P3. Depth is to very stony subsoil. The surface 10 to 12 inches is fairly high in rock fragments (20 to 30%) but would be suitable to salvage.
- 6612-21 Surface conditions at the location of soil pit G13-P3 near the center of site G-13. The surface has about 30% rock fragment, mostly of cobble size.

6612-22 A view of the road and the west edge of site G-13 looking down slope (NNE).

Site DUG0105 (G-14A)

6612-4 View of site DUG0105 from the southeast corner looking diagonal to the northwest corner. Soils are deepest to the north, which is on the right side of the photo.

6612-5 Shallow soil over bedrock near the southwest corner of site DUG0105. Soil profile DUG0105-P1.

6612-6 Shallow soil over fractured sandstone at the northwest corner of site DUG0105.

6612-7 Surface conditions at the northwest corner of site DUG0105 and location previous photo.

6612-8 View looking into the northeast corner of site DUG0105 and the access road location between DUG0105 and DUG0205. About 14 to 18 inches of soil could be salvaged in this area.

6612-9 Soil profile DUG0105-P2 along the north edge of site DUG0105. Subsoils are very high in rock fragments and limit suitable soil depths to about 14 to 18 inches.

6612-10 Site conditions at the location of soil pit DUG0105-P2.

6612-11 Soil profile DUG0105-P3 near the center of site DUG0105 at the edge of the sagebrush and the aspen. Rock fragment content increases significantly at 14 to 20 inches.

6612-12 Site conditions at the location of soil pit DUG0105-P3.

6612-13 Cobbly surface and very shallow soils at the southwest corner of site DUG0105.

6612-14 Near the southwest corner of site DUG0105 showing the rocky surface and steep slope break to the south of the site.

Site DUG0205 (G-14B)

6563-24 Surface conditions at site DUG0205 viewed from the southeast corner looking to the northwest. Location of soil pit DUG0205-P1.

6563-25 Soil profile DUG0205-P1. This soil is representative of the site and the road to DUG0105. Depth is to very cobbly subsoils. Topsoils are 15 to 18 inches thick over most of the site.

6612-2

View from the center of site DUG0205 looking to the north.

6612-3

The northeast corner of site DUG0205. Thick topsoils are available at this location (20-24 inches).



6563-5



6563-6



6563-7



6563-8



6563-9



6563-10



6563-11



6563-12



6563-13



6513-14



6563-15



6563-16



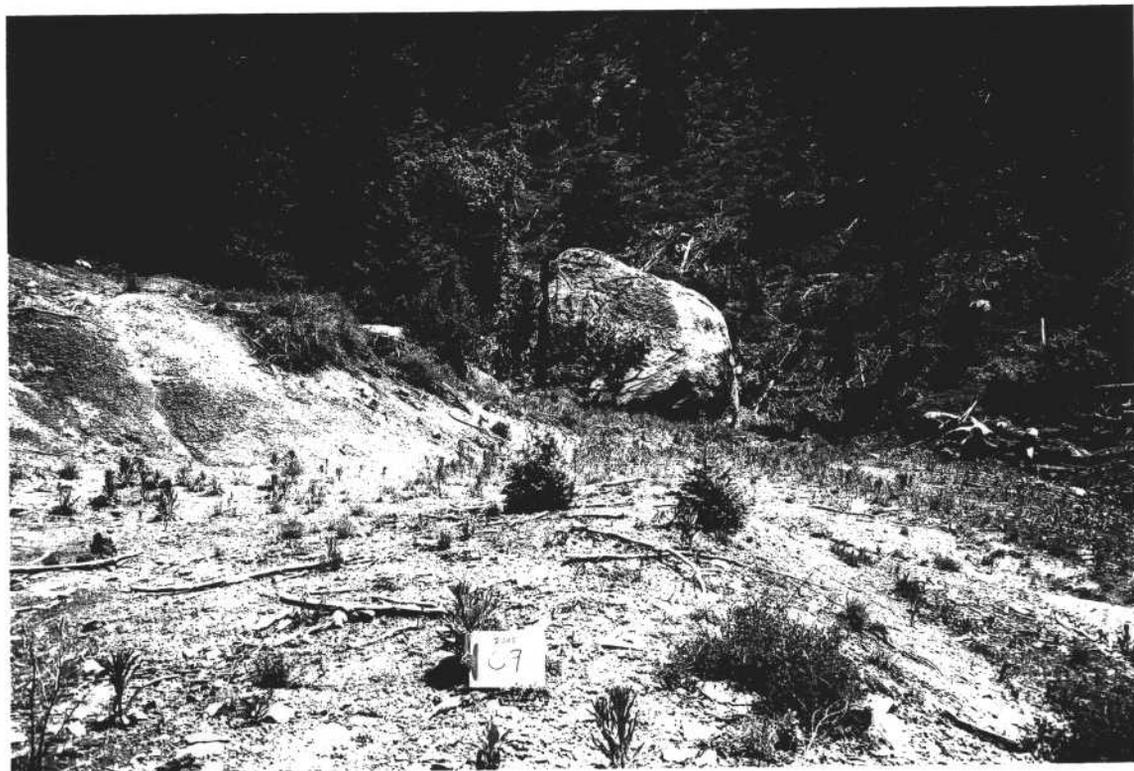
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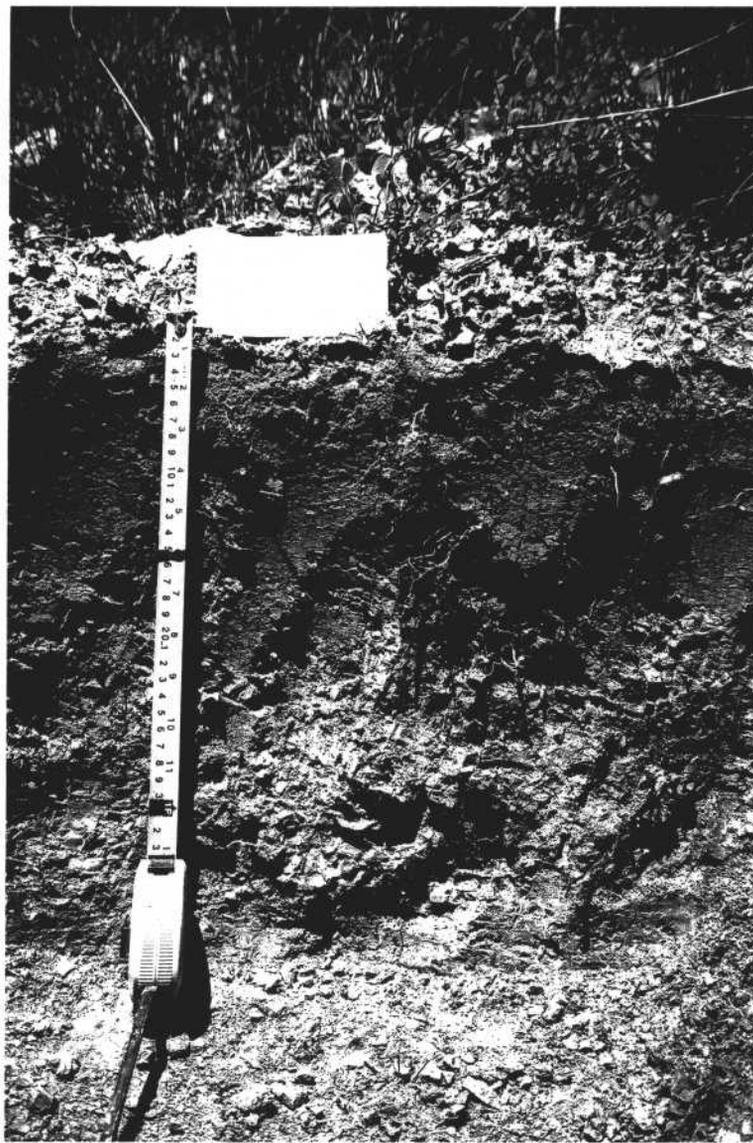
Site G-9



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6794-23



6794-24



6793-1



6793-2

6793-3

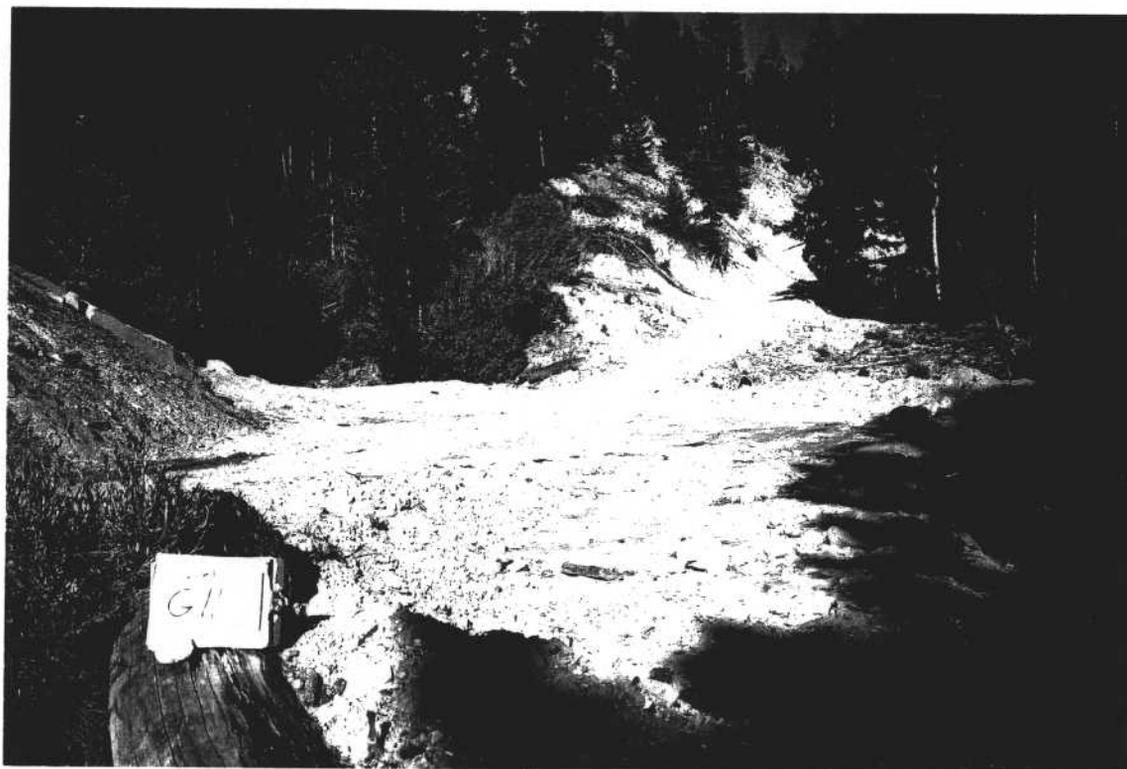




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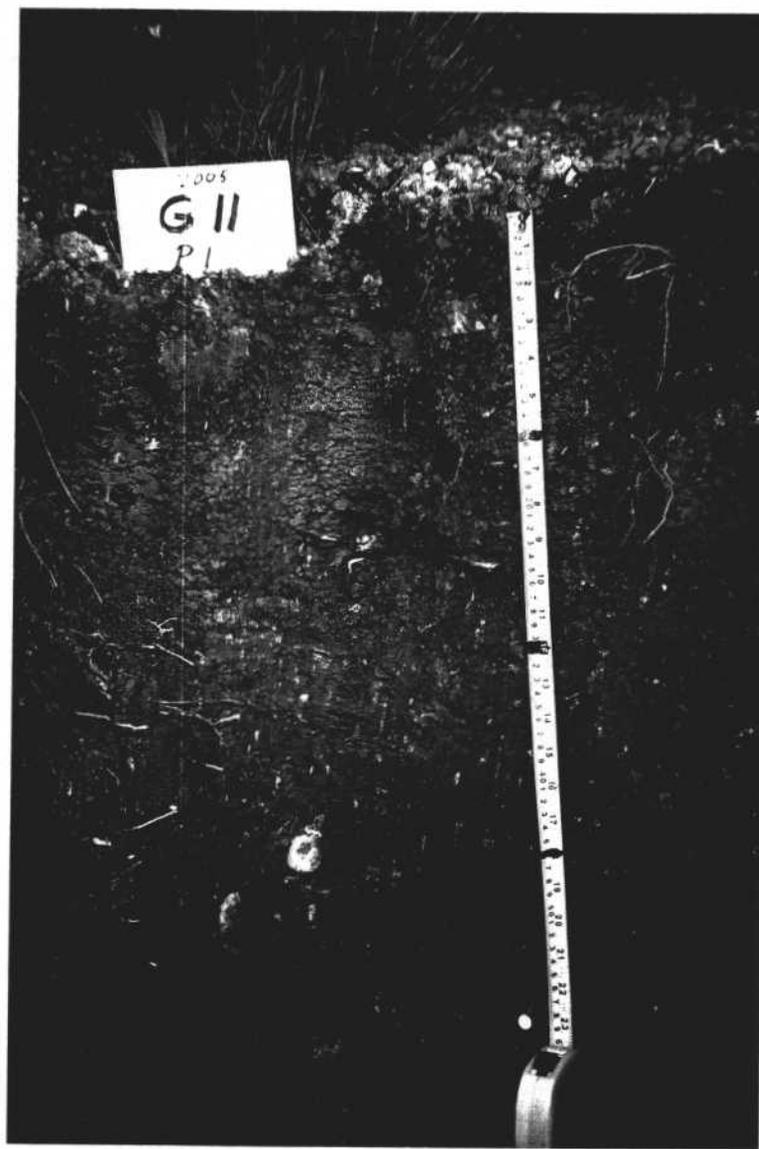
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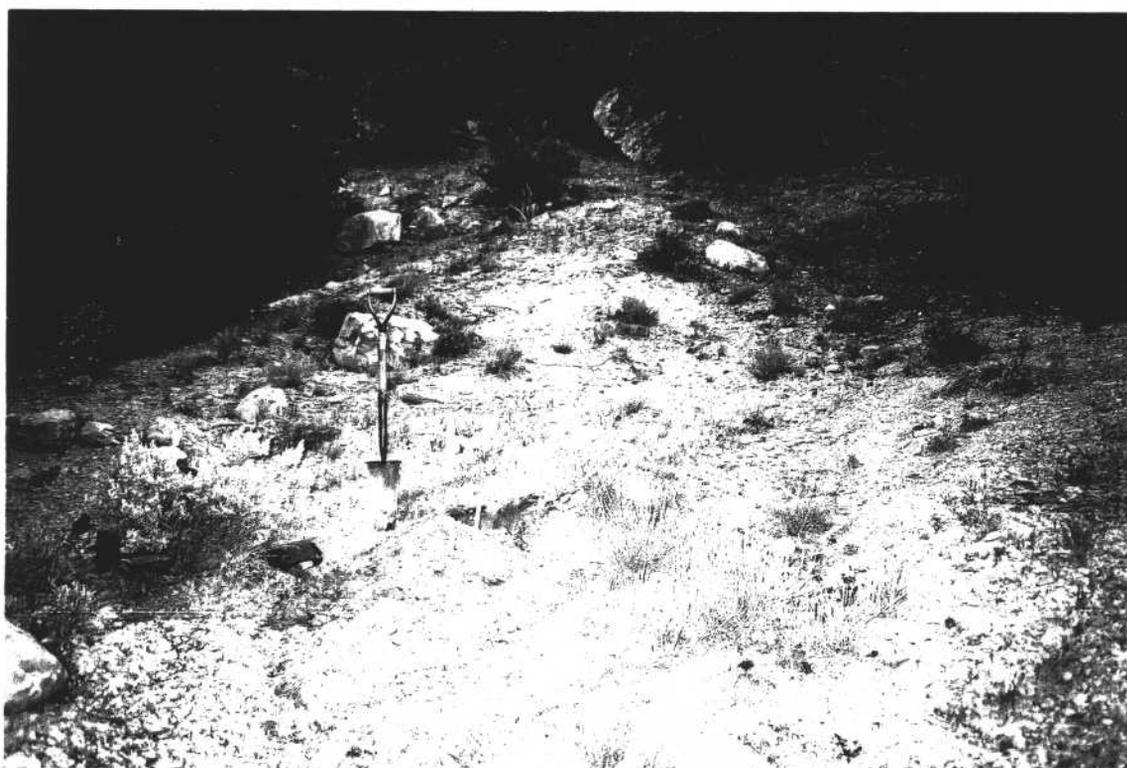
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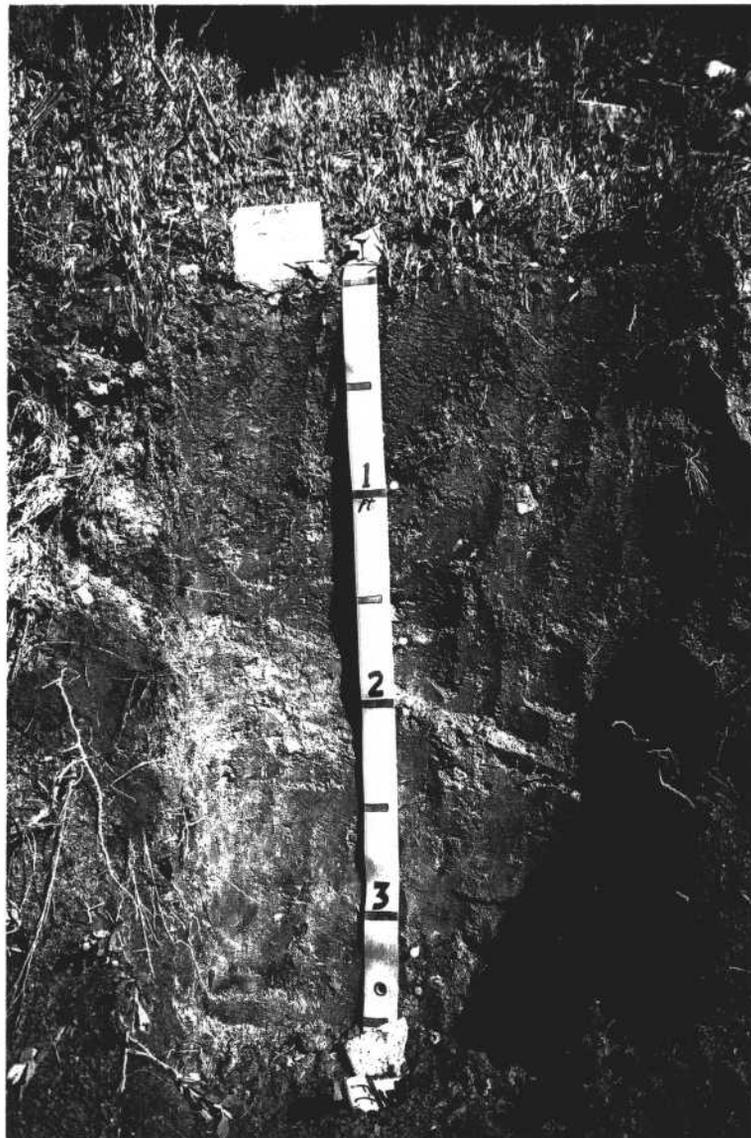
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6612-23



6612-24



6794-1



6794-3



6794-2



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6794-10



6563-17

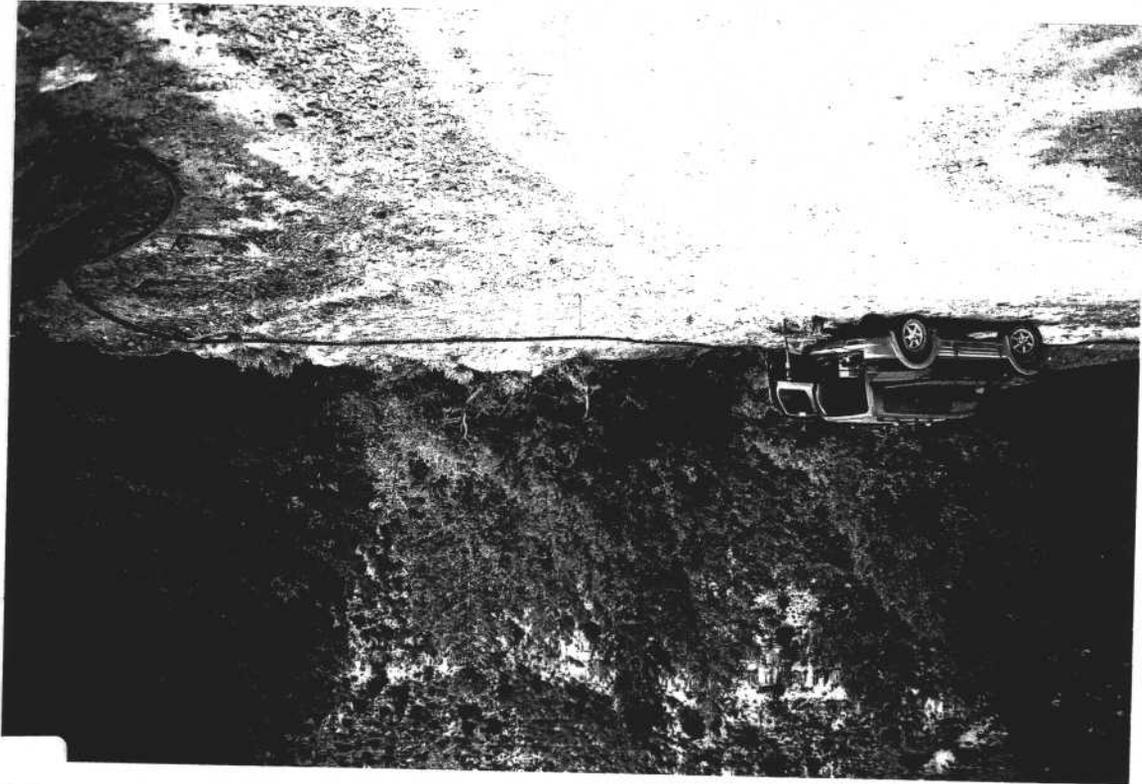


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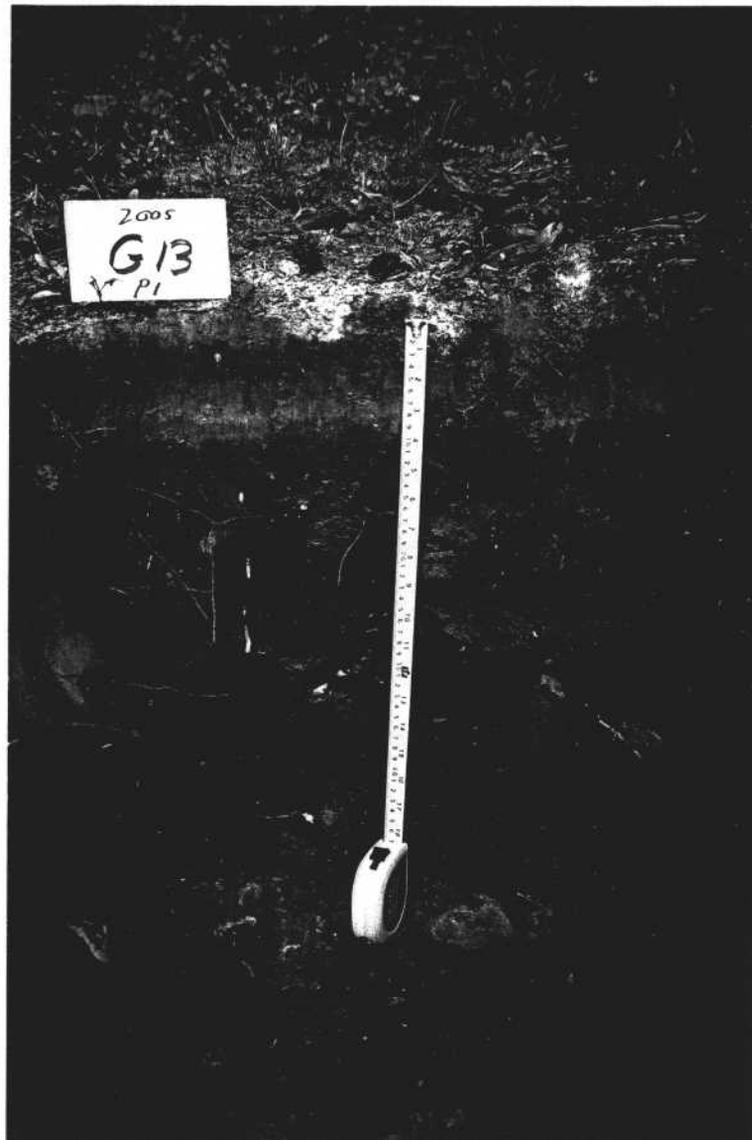
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6563-19



Site G-13



6563-22



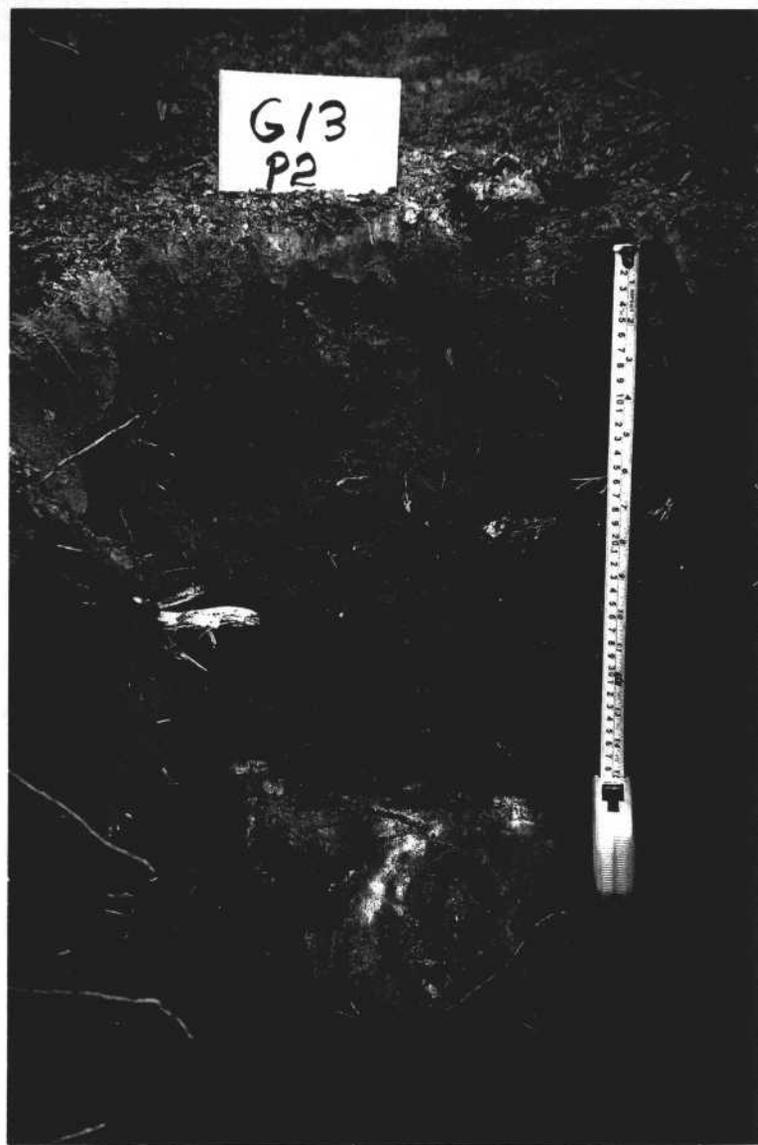
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6612-15



6612-16



6612-18



6612-19



6612-20



6612-21



6612-22



6612-4



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6612-9



6612-10



6612-11



6612-12



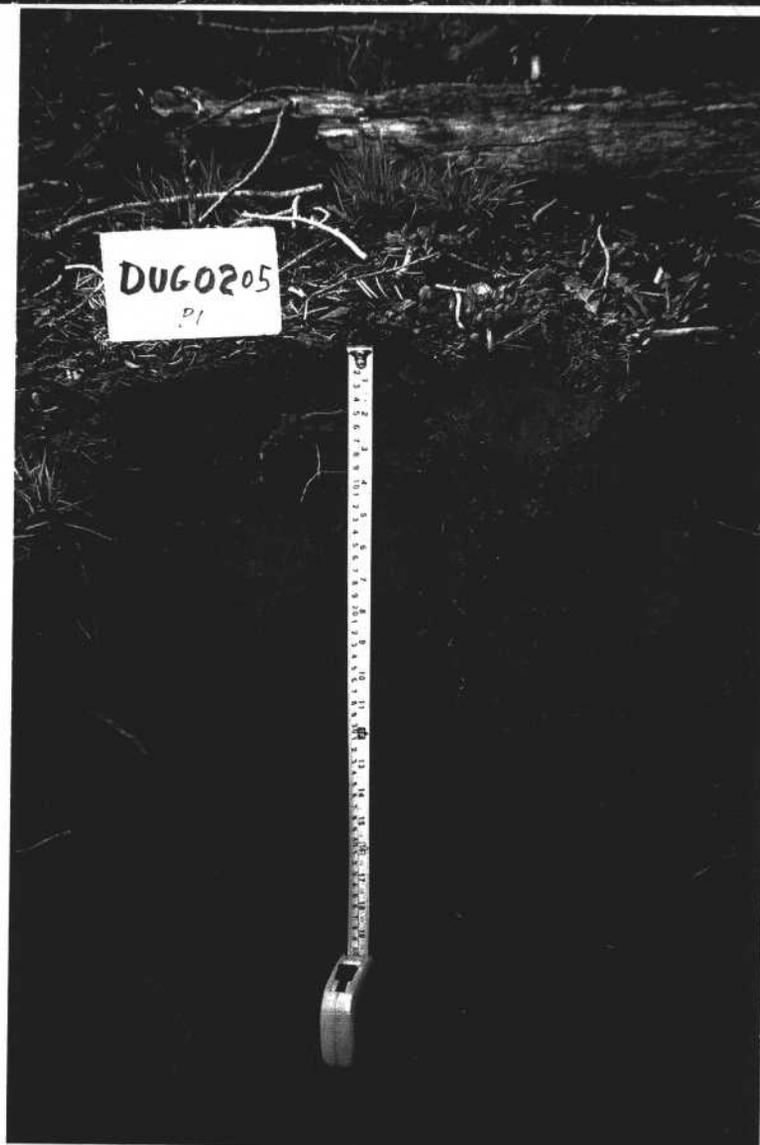
6612-13



6612-14



6563-24



6563-25



6612-2



6612-3

100—Senchert loam, 3 to 15 percent slopes. This moderately deep, well drained soil is on plateaus and ridges. It is near Steer, Gooseneck, Buckskin, and Van Duesen Ridges and at the top of Whitmore Park. It formed in alluvium and residuum derived dominantly from sandstone and shale. Slopes are 100 to 200 feet long and are concave to convex. The present vegetation is mainly aspen and snowberry. Elevation is 8,700 to 9,500 feet. The average annual precipitation is about 20 to 30 inches, the average annual air temperature is 36 to 38 degrees F, and the average freeze-free period is 40 to 60 days.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The upper part of the subsoil is brown loam about 12 inches thick, and the lower part to a depth of 35 inches is brown clay loam over calcareous sandstone. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 10 percent Senchert family soils, 3 to 15 percent slopes; 5 percent Senchert loam, 30 to 50 percent slopes; 5 percent Senchert fine sandy loam; and small areas soils that are similar to this Senchert soil but is deep or very deep.

Permeability of the Senchert soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 11 to 17 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 5 to 10 percent. Runoff is slow, and the hazard of water erosion is moderate.

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

The potential vegetation on the Senchert soil includes an overstory of aspen with a canopy of 40 percent. The understory vegetation is 65 percent grasses, 15 percent forbs, and 20 percent shrubs. Among the important plants are slender wheatgrass, Columbia needlegrass, and Thurber fescue.

This unit is well suited to the production of aspen. The site index for aspen ranges from 60 to 80. The unit can produce about 40 cubic feet of aspen per acre per year. Limitations for the harvesting of wood products are slight.

The suitability of this unit for grazing is good. Management practices that maintain or improve the rangeland vegetation include proper grazing use, a planned grazing system, and proper location of water developments. If the desirable forage plants are mostly depleted, burning can be used to improve the rangeland vegetation.

The suitability of this unit for rangeland seeding is poor. The main limitation is competition from aspen.

This map unit is in capability subclass VIe, nonirrigated, and in the High Mountain Loam (Aspen) woodland site.

101—Senchert loam, 30 to 50 percent slopes. This moderately deep, well drained soil is on mountain slopes. It is near Steer, Gooseneck, Buckskin, and Van Duesen Ridges and near Bruin Point. It formed in alluvium derived dominantly from sandstone and shale. Slopes are 100 to 200 feet long and are concave to convex. The present vegetation is mainly aspen, snowberry, and perennial grasses. Elevation is 8,600 to 9,400 feet. The average annual precipitation is about 20 to 30 inches, the average annual air temperature is 36 to 38 degrees F, and the average freeze-free period is 40 to 60 days.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The upper part of the subsoil is brown loam about 12 inches thick, and the lower part to a depth of 35 inches is brown clay loam over calcareous sandstone. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are about 10 percent Senchert loam, 15 to 40 percent slopes; 5 percent Sheepcan

stony loam; 5 percent soils that are similar to this Senchert soil but are 40 to 60 inches thick; and 5 percent Senchert loam, 3 to 15 percent slopes.

Permeability of this Senchert soil is moderate. Available water capacity is about 5 to 6 inches. Water supplying capacity is 12 to 17 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 5 to 10 percent. Runoff is medium, and the hazard of water erosion is moderate.

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

The potential plant community on the Senchert soil includes an overstory of aspen with a canopy of 40 percent. The understory vegetation is 65 percent grasses, 15 percent forbs, and 20 percent shrubs. Among the important plants are slender wheatgrass, Columbia needlegrass, Thurber fescue, and quaking aspen.

This unit is well suited to the production of aspen. The site index for aspen ranges from 60 to 80. The unit can produce about 40 cubic feet of wood products per acre per year. This unit is moderately limited for the harvesting of wood products because of the steepness of slope and the hazard of erosion.

The suitability of this unit for grazing is good. Management practices that maintain or improve the rangeland vegetation include proper grazing use, a planned grazing system, and proper location of water developments. If the desirable forage plants are mostly depleted, burning can be used to improve the rangeland vegetation.

The suitability of this unit for rangeland seeding is poor. The main limitation is competition from aspen.

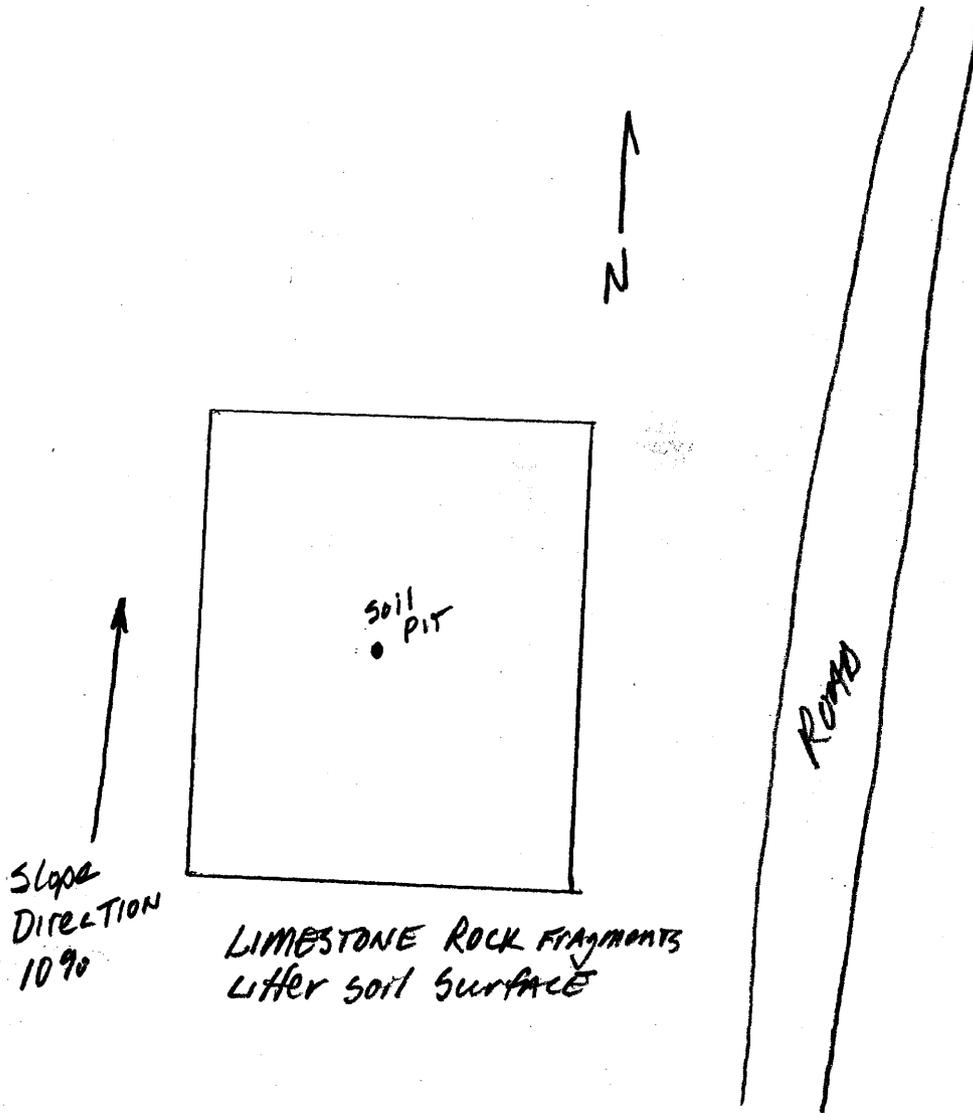
This map unit is in capability subclass VIIe, nonirrigated, and in the High Mountain Loam (Aspen) woodland site.

SOIL DESCRIPTION

Soil type <i>Beje - Trag Complex</i>		File No.
Area <i>Dugout Degras Benchside, Carbon County, UT</i>	Date	Stop No.
Classification <i>fine-loamy mixed, Typic Argi burlis</i>		
Location <i>G-7 Degras benchside very near center of proposed disturbed area</i>		
N. veg. (or crop) <i>Mountain Sagebrush, grasses, snow berry</i>	Climate <i>Frigid</i>	
Parent material <i>Sandstone, siltstone, shales, minor Limestone - Price River Formation</i>		
Physiography <i>Dip slope behind mountain ridge</i>		
Relief <i>Gentle 10% slope</i>	Drainage <i>well drained</i>	Salt or alkali
Elevation <i>~8280</i>	Gr. water <i>none encountered</i>	Stoniness
Slope <i>10%</i>	Moisture	
Aspect <i>North facing slope</i>	Root distrib.	% Clay *
Erosion <i>Slight</i>	% Coarse fragments *	% Coarser than V.F.S. *
Permeability <i>Moderately slow</i>		
Additional notes <i>Soil appears to be representative of the Trag Complex</i>		
<i>20% Bare ground 80% Mountain Sage w/ grass</i>		

* Control section average

Horizon	Depth inches	Color		Texture	Structure	Consistence			Reaction	Boundary	Roots	Rock frags
		Dry	Moist			Dry	Moist	Wet				
A ₁	0-2		Very Dark Gray Brown 10 yr 3/2	SILTY LOAM	Fine granular to fine platy	soft	very friable	non-compacted	Slightly efferv.	Clear sharp	Many fine to med.	5% fine to coarse gravel flat-platy
A ₂	2-11		Dark grayish brown 10 yr 4/2	SILTY LOAM	Very weak blocky	Slightly hard	Friable to sl. firm	weakly cemented plastic	Slight to strong efferv.	Gradual wavy	Many med to fine	<5% fine gravel
B _w	11-16		Olive Brown 2.5 y 4/3	SILTY clayey LOAM	Medium blocky w/ sl granular	Slightly hard	Firm	weakly cemented to plastic	very slightly efferv.	Clear wavy	few fine	<5% fine gravel
B _t	16-50	* clayey film	light olive Brown 2.5 y 5/4	SILTY clayey LOAM	Slightly blocky	hard	Firm	Weakly cemented	very sl. to no efferv.		rare fine	<5% fine gravel



Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
~~July~~ March 2005

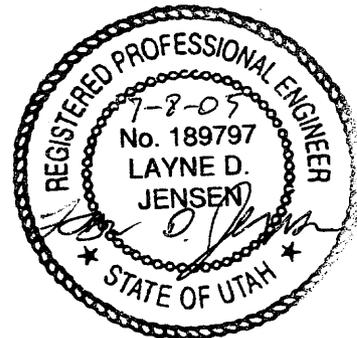
**ATTACHMENT 2-2
TOPSOIL CALCULATIONS**

add to the back of existing information

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July 2005

**ATTACHMENT 2-2
TOPSOIL CALCULATIONS**



G-8

This site is located on a ridge line with very limited soil resources.

12" of soil will be stripped and stockpiled.

A road currently runs through the area that will be disturbed by construction of the drilling pad. No topsoil will be stripped from the road area.

Area to be stripped = 14,662 ft²

Volume of soil to be stripped = (1' X 14,662) = 14,662 ft³
= 543 CY

The topsoil stockpile will be constructed with 2:1 side slopes.

Stockpile Design

<u>Elev.</u>	<u>Area (ft²)</u>	<u>Volume (ft³)</u>
8252	1182	
8253	1984	1583
8254	2738	2361
8255	3153	2946
8256	3058	3106
8257	2838	2948
8258	2519	2679
		<u>15,623 ft³</u>

15,623 ft³ > 14,662 ft³ ∴ OK

G-9

This site has previously been disturbed by logging. Topsoil is limited due to the previous disturbance.

12" of soil will be stripped in all areas other than the road and existing pad areas.

$$\text{Area to be stripped of soil} = 42,504 \text{ ft}^2$$

$$\begin{aligned} \text{Vol. of soil to be stripped} &= (1') (42,504) = 42,504 \text{ ft}^3 \\ &= 1574 \text{ CY} \end{aligned}$$

Since this site will not be reclaimed for approximately 5 years the stockpile will be constructed with 2:1 slopes.

Stockpile Design

<u>Elevation</u>	<u>Area (ft²)</u>	<u>Volume (ft³)</u>
8005	247	
8010	487	1835
8015	692	2947
8020	1235	4817
8025	2036	8177
8030	2637	11,682
8035	2988	14,062
		<u>43,520 ft³</u>

$$43,520 \text{ ft}^3 > 42,504 \text{ ft}^3 \therefore \text{OK}$$

G-10

This site has been disturbed by logging. However, the disturbance appears to be limited to the removal of trees.

18" of soil will be stripped from the area disturbed by pad construction.

$$\text{Area to be stripped} = 42,201 \text{ ft}^2$$

$$\begin{aligned} \text{Vol. of soil to be stripped} &= (42,201 \text{ ft}^2 \times 1.5 \text{ ft}) = 63,301 \text{ ft}^3 \\ &= 2344.5 \text{ CY} \end{aligned}$$

This site will likely be reclaimed within one year of disturbance. Due to limited space for topsoil storage and steep slopes using a 2:1 slope on the topsoil stockpile will not allow all of the topsoil to be stored on-site. Therefore, a slope of 1.5:1 will be used. Using a steeper slope is preferable to hauling the topsoil to an alternate storage site.

Stockpile Design

<u>Elevation</u>	<u>Area (ft²)</u>	<u>Volume (ft³)</u>
7885	234	
7890	297	1327
7895	436	1832
7900	654	2725
7905	805	3647
7910	925	4325
7915	1037	4905
7920	1377	6035
7925	1689	7665
7930	1657	8365
7935	1616	8183
7940	1461	7692
7945	1169	6575
7950	277	3615
		<hr/>
		66891 ft ³

$$66,891 \text{ ft}^3 > 63,301 \text{ ft}^3 \quad \therefore \text{OK}$$

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July ~~March~~ 2005

CHAPTER 3
BIOLOGY

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Attachment 3-2	Threatened, Endangered, and Sensitive Species Information
Attachment 3-3	Information Moved to Confidential Folder in 2005

310 INTRODUCTION

This chapter presents a description of the biological resources found on the Dugout Canyon degas well site areas.

311 Vegetative, Fish and Wildlife Resources

Vegetative, fish, and wildlife resource conditions in and adjacent to the proposed degassification wells are discussed in Section 320 of this submittal and the approved M&RP.

312 Potential Impacts to Vegetative, Fish, and Wildlife Resources

Potential impacts to vegetative, fish, and wildlife resources and the associated mitigation plan is presented in Sections 330 and 340 of this chapter.

313 Description of Reclamation Plan

The reclamation plan used to restore the vegetative, fish, and wildlife resources to a condition suitable for the post mining land use is presented in Section 340.

320 ENVIRONMENTAL DESCRIPTION

321 Vegetation Information

This section and the approved M&RP contain the environmental descriptions of the vegetation for the permit and adjacent areas.

321.100 Plant Communities Within the Proposed Permit Area

During June 2003, the degassification well sites were surveyed by Patrick Collins, Mt. Nebo Scientific. The report and survey for the areas are included in Attachment 3-1. The site for G-6 was moved to a pre-disturbed exploration well pad, the plant communities described in Mr. Collins report reflect the undisturbed portions on the north and south edges of the well pad. Vegetation information for G-7 was obtained from a report prepared by the NRCS Range Management Specialist, Dean Stacy (refer to Attachment 2-1 and 3-1) and the Patrick Collins survey prepared for well site G-3. A photograph of the G-7 site is included in Attachment 3-1. Well site G-3 and the access road can be seen on the photograph.

A vegetation survey of well sites G-8 thru G-10 was completed in July 2005 by Patrick Collins, Mt. Nebo Scientific. These sites have all been pre-disturbed, with a road running through the center of G-8 and remnants of logging activity at both G-9 and G-10. The report and survey for the areas will be included in Attachment 3-1.

321.200 Land Productivity Prior to Mining

Productivity of the well site lands prior to mining are shown in Table 3-1. Refer to Appendix 3-1 for a copy of the NRCS letter pertaining to productivity.

TABLE 3-1
Land Productivity

Well No.	Productivity (lbs.) Per Acre
G-1 (Previously Disturbed)	100
G-2	1,500*
G-3	1,500*

G-4 (Previously Disturbed)	150
G-5	1500*
G-6 (Majority Previously Disturbed)	300*
G-7	1200*
G-8 (Previously Disturbed)	1200
G-9 (Previously Disturbed)	1000*
G-10 (Previously Disturbed)	1000*
Sagebrush, Snowberry, Grass Reference Area	1,500*
Aspen, Maple, Douglas Fir Reference Area	300*

* Community composition is experiencing a declining trend, with decrease in herbaceous production, increase in shrub/tree production.

322 Fish and Wildlife Information

Fish and wildlife information associated with the degas wells is provided in this chapter. A summary of the fish and wildlife resource information for the permit and adjacent areas is contained in Sections 322.100 through 322.200 of the approved M&RP.

322.100 Level of Detail

The scope and level of detail within the "Methane Degassification Amendment" are sufficient to design the protection and enhancement plan for wildlife and fish associated with the degas wells. Additional information pertaining to fish and wildlife in the permit area is located in the M&RP.

322.200 Site-Specific Resource Information

Raptors - An aerial raptor nest survey was done of the area by the Utah Division of Wildlife Resource (DWR, Chris Colt, Leroy Mead) and CFC personnel in May of 2003, refer to the Confidential Folder. ~~A second~~ **Surveys were** completed in May of 2004 **and 2005**, the information will be incorporated into the ~~2004~~ Annual **Reports and Confidential Folder**.

No raptor nests were recorded during the survey (2003) in the area (portions of N1/2SE1/4NW1/4 and N1/2SW1/4NE1/4 of Section 24; a portions of N1/2SW1/4NW1/4 Section 19, Township 13 South, Range 13 East) of the degas wells. Refer to Figure 1-1 for mapped well locations.

During the 2004 raptor survey, there were no active or tended nests identified in the vicinity of the degas wells. **During the 2005 raptor survey (May 12 & 20), there were no active or tended nests identified in the vicinity of degas wells G-9 and G-10. Two golden eagles nests were observed in the cliffs adjacent to degas well G-8 (Nest 9, DWR 2005 Raptor Survey). A single young eagle was observed, but habitually vacates the nest within 45 days of birth.** A raptor survey will be conducted of the well site areas, each year that the wells are in operation.

Bats - No known open mine shafts, caves, adits or other man made structures that might provide habitats for bats are known to exist in the degas project area. The sites are open and the lack of a food source would force the bats to seek habitat and nourishment elsewhere.

Mexican Spotted Owl - In the Summer of 2003, a calling point survey was conducted in the degas well area by EIS Environmental and Engineering Consulting. The survey report concluded that "within the project area, a thorough search did not reveal the presence of any Mexican spotted owls". The report is included in Attachment 3-2. A second survey was completed in May of 2004, the information is incorporated into Appendix 3-3 of the M&RP .

Threatened and Endangered Plant and Wildlife Species - There are no known federally or state listed threatened and endangered plant and wildlife species within the sites planned for degassification wells.

There are no known groundwater or surface water flows to the Colorado or Green Rivers with potential for impact by the drilling of the degas wells. Potential adverse affects to the four Colorado River endangered fish species (refer to table below) would not be likely since there is no direct route to the Colorado River or Green River from the proposed well locations. Per the Windy Gap Process (referenced by personal communication Jerriann Ernstsens, 8/19/03) consumption estimates for the degas wells: evaporation from ventilation - zero, drill holes will not intersect the coal seam being mined, therefore no access to mine ventilation until after area is sealed; coal preparation - zero, no coal preparation at degas sites (see Sections 522 and 523) ; sediment pond evaporation - zero, no sediment pond at degas sites (see Section 732.200); subsidence effects on springs - zero, no anticipated subsidence at degas sites (see Section 525); alluvial aquifer abstractions into mines - zero, no alluvial aquifer abstractions associated with degas drill holes (see Sections 513.500 and 600); postmining inflow to workings - zero, no workings for postmining inflow associated with degas wells (see Sections 513.500 and 600); coal moisture loss - zero, no coal therefore no moisture loss (see Sections 522 and 523); direct diversion - zero, no direct diversions associated with degas wells (see Sections 522 and 523). Mitigation will not be required since the estimated loss for the construction and reclamation of the degas holes is zero acre feet per year.

**Federal and State Listed, Threatened, Endangered and Candidate Species
 Plants and Wildlife
 Carbon County, Utah
 October 2002, Updated 6/7/05**

Common Name	Scientific Name	Status	Habitat Present*
Plants			
Uinta Basin Hookless Cactus	Sclerocactus glaucus T		No habitat available
Graham Beardtongue	Penstemon grahamii	C	No habitat available
Fish			
Humpback Chub	Gila cypha	E	No habitat available
Roundtail Chub**	Gila robusta	T	No habitat available
Bonytail	Gila elegans	E	No habitat available

Colorado Pikeminnow	Ptychocheilus lucius	E	No habitat available
Razorback Sucker	Xyrauchen texanus	E	No habitat available
Birds			
Bald Eagle	Haliaeetus leucocephalus	T	No habitat available
See Confidential Folder			
Yellow-billed Cuckoo	Coccyzus americanus	C	No habitat available
Ferruginous Hawk**	Buteo Regalis	T	No habitat available
Southwestern Willow Flycatcher**	Empidonax traillii extimus	E	No habitat available
Mexican Spotted Owl	Strix occidentalis lucida	T	See Attachment 3-2 and Appendix 3-3 (M&RP)
Mammals			
Black-footed Ferret	Mustela nigripes	EX	No habitat available

* Habitat availability in Carbon County/Dugout Mine/Degas Well Sites.

** Utah State Listed Species - Information verified with Bill Bates, DWR (personal communication 7/17/03)

E = A taxon that is listed by the U.S. Fish and Wildlife Service as "endangered" with the possibility of worldwide extinction.

T = A taxon that is listed by the U.S. Fish and Wildlife Service as "threatened" with becoming endangered.

C = A taxon for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to justify it being a "candidate" for listing as and endangered or threatened.

Source: Utah Division of Wildlife Resources data base - created 10/24/02

Refer to Appendix 3-3 of the M&RP for a listing of Federal and State Listed, Threatened, Endangered and Candidate Species, Plants and Wildlife of Carbon County, Utah (2003).

322.300 Fish and Wildlife Service Review

If requested, Dugout Canyon authorizes the release of information pertaining to Section 322 and 333 to the U. S. Fish and Wildlife Service Regional and Field Office for their review. On the 25th

of May 2005, Leroy Mead of the DWR toured degas well sites G-8, G-9 and G-10. During the tour no wildlife concerns were noted.

323 Maps and Aerial Photographs

Location of the well sites can be seen in Figure 1-1 of this submittal.

323.100 Location and Boundary of Proposed Reference Area

Reference areas for the degassification wells were established during the vegetative study conducted in the Summer of 2003. Well sites G-2, G-3, G-4, G-5, G-7 and G-10 will be compared to the Sagebrush/Snowberry/Grass reference area and G-1, G-6, G-8 and G-9 to the Aspen/Maple/Douglas Fir reference area. Refer to Attachment 3-1 and Figure 3-1 for the location of the reference areas.

323.200 Elevation and Locations of Monitoring Stations

Refer to Section 323.200 of the approved M&RP.

323.300 Facilities for Protection and Enhancement

Section 333.300 and 358.500 of the approved M&RP contain additional discussion pertaining to protective measures to be taken by Dugout Canyon on behalf of wildlife.

323.400 Vegetation Type and Plant Communities

Vegetative types and plant communities are outlined in the vegetative report in Attachment 3-1. Figure 3-2 gives details of the vegetation types located adjacent to the well sites.

330 OPERATION PLAN

331 Measures Taken to Disturb the Smallest Particle Area

The well sites will be sized to disturb the smallest acreage possible and still meet the requirements for the drilling equipment. The drainage control required will be built to satisfy the environmental requirements.

332 Description of Anticipated Impacts of Subsidence

Refer to Section 525.

333 Plan to Minimize Disturbances and Adverse Impacts

General control and mitigation measures addressing potential related biological impacts will include the following:

- Minimizing the total area of disturbance,
- Design, construction, and operation of the well sites to minimize impacts
- Exclusion of wildlife from potentially hazardous areas, and
- Reclamation of disturbed areas when they are no longer needed.

All water associated with the drilling of these wells will be appropriated and hauled and/or pumped to the sites by a licensed contractor. Since the drilling of degas wells does not involve the mining of coal, the USWFS consumption requirements for underground operations do not apply (i.e., evaporation form ventilation, coal preparation, sediment pond evaporation, subsidence of springs, alluvial aquifer abstractions into the mine, postmining inflow to workings, coal moisture loss, direct diversions).

333.100 Minimize Disturbance to Endangered or Threatened Species

Dugout Canyon will apply all methods necessary to minimize disturbances or any adverse effects to threatened or endangered species. See Section 322.200.

333.200 Species and Habitats

All species and habitats within the permit area will be protected to the best of Dugout Canyon's ability.

333.300 Protective Measures

Refer to Section 333.300 of the approved M&RP.

340 RECLAMATION PLAN

341 Revegetation

Revegetation of the sites will occur in two phases at drill site G-1, G-2 and G-3. The first phase is to redistribute topsoil and seed the well area not needed for access and operation of the gas exhaust blower. The second phase will consist of plugging the well and distributing the remaining topsoil and seeding on the remaining pad area. Refer to Section 242.100 for additional detail. Following drilling sites G-4, G-5, G-6, G-7, **G-8, G-9 and G-10** will be reclaimed in one phase due to the quantity of soil moved during the site construction.

The short-term goal of this revegetation plan is the immediate stabilization of the disturbed sites through erosion control. This objective will be achieved through controlled grading practices, proper seedbed preparation to encourage rapid plant establishment, inclusion of rapidly establishing species in the seed mixture to be planted, and mulch application.

The long-term goals are to establish useful, and productive range. These goals will be attained through the selection and placement of desirable and productive plant species and a commitment to monitor and maintain revegetated areas throughout the bond liability period.

The well sites will be fenced to discourage wildlife and livestock from grazing the reclaimed areas until bond release.

341.100 Schedule and Timetable

The reclamation timetable is shown in Figures 5-15 (G-2 and G-3) and 5-26 (G-4 ~~thru G-10~~ ~~G-5, G-6 and G-7~~) of this submittal and the reclamation monitoring schedule is found in Chapter 3, Table 3-3 of the approved M&RP.

341.200 Descriptions

Species and Amounts of Seed - The well sites will be planted with the seed mix listed on Table 3-2. The seed mix will be used in both contemporaneous and final reclamation phases. The seed will be incorporated with a small amount of wood fiber mulch and applied by hydroseeding equipment or broadcast. Refer to Section 234.200 for topsoil stockpile seeding description.

Methods Used for Planting and Seeding - The degassification sites will be graded to final contour, then ripped to relieve compaction. The depth of ripping will be from 18 to 24 inches. Following ripping, topsoil will be applied to the ripped surface and left in a gouged and roughened state.

Mulching Techniques - Wood fiber mulch will be applied on top of the seed with hydroseeding equipment at the rate of 2,000 pounds per acre and anchored with a tackifier in amounts specified by the manufacturer.

Irrigation, Pest, and Disease Control - No irrigation is planned and pesticides will not be used unless previously approved by the Division.

Measures Proposed for Revegetation Success - Refer to Section 356.

341.300 Greenhouse Studies, Field Trials or Other Equivalent Studies

Refer to the Section 341.300 of the approved M&RP.

342 Fish and Wildlife

342.100 Enhancement Measures

Post bond release enhancement measure will include the establishment of vegetation for wildlife food, cover, and the break up of large blocks of monoculture to diversify habitat. **The current blocks of monoculture include large area of sagebrush and mixed brush. According to Dean Stacy, Range Management Specialist, USDA-NRCS "past management practices have allowed the shrub (mainly mountain sage brush) to surpass the 25-35%, while the herbaceous production has declined". By planting reclamation seed mixes with grasses and forbs the planted areas will breakup the monocultures and provide a future seed source.**

In consultation with UDWR (Tony Wright, July 6, 2004) and UDOGM (Jerriann Ernstsens, July 6, 2004) a mitigation project was designated for the Northern Saw Whet Owl to compensate for drilling during the exclusionary period. The project will be completed prior to October 1, 2004. The project will include the construction and installation of 6 to 10 nest boxes on property owned by Canyon Fuel Company, LLC. Because of the UDWR knowledge and experience their personnel will choose the location and install the boxes. Information (goals, procedures, agencies, dates, box locations - township, range, section) concerning the owl mitigation project will be included in the annual report for 2004.

342.200 Plants Used for Wildlife Habitat

Nutritional Value - The nutritional value will be consistent with that of vegetation in the surrounding areas.

Cover - Cover will be comparable to the cover on the associated reference area.

342.300 Cropland

Cropland is not a postmining land use.

342.400 Residential, Public Service, and Industrial Land Use

No residential, industrial or public service use is planned.

350 PERFORMANCE STANDARDS

351 General Requirements

Dugout Canyon commits to conduct all operations in accordance with the plans submitted in Sections R645-301-330 through R645-301-340 of the permit application.

352 Contemporaneous Reclamation

Reclamation activities prior to final reclamation will to the extent feasible, be performed contemporaneously. Contemporaneous reclamation will be performed at the well sites following construction of the wells. Refer to Section 341 for additional details.

353 Revegetation: General Requirements

A vegetative cover will be established on all reclaimed areas to allow for the designated postmining land use of grazing. Refer to Section 411 for additional information.

353.100 Vegetative Cover

The seed mix proposed for revegetation is intended to provide vegetative cover that will be diverse, effective, and permanent. The seed mixture was selected with respect to the climate, potential seedbed quality, erosion control, drought tolerance, and the mixture's ability for quick establishment and spreading.

Native Species - The reclamation vegetation mixture will be comprised of species indigenous to the area and capable of achieving the postmining land use. Diversity of species should allow utilization of plants by wildlife and domestic livestock. The recommended seed mix is comprised of native species.

Extent of Cover - The vegetative cover will be at least equal in extent to the cover at the designated reference areas.

Stabilizing - The vegetative cover mixture is capable of stabilizing the soil surfaces from erosion.

353.200 Reestablished Plant Species

Compatible - The reestablished plant species have been selected to insure their compatibility with the approved postmining use.

Seasonal Characteristics - The revegetation plant species will have the same growing season as the adjacent areas.

Self-Generation - The reestablished plants are species capable of self-generation and plant succession.

Compatibility - The seed mix suggested for revegetation contains plants native to the area and compatible with the plant and animal species of the permit area.

Federal and Utah Laws or Regulations - The seed mix purchased to revegetate the degassification well sites will contain no poisonous or noxious plant (see Section 234.200). No species will be introduced in the area without being approved by the Division.

Table 3-2
Reclamation Seed Mix

<u>SPECIES</u>	<u># pls/acre</u>	<u># pls/sq. ft.**</u>
Grasses, Forbs, and Shrubs		
Kentucky Bluegrass (1,390,000 seeds/lb)*	0.5	16
Mountain Brome (64,000 seeds/lb)*	2.0	3
Sandberg Bluegrass (1,100,000 seeds/lb)*	1.0	25
Bluebunch Wheatgrass (126,000 seeds/lb)*	4.0	12
Bottlebrush Squirreltail (192,000 seeds/lb)*	1.0	4
Rocky Mountain Penstemon (478,000 seeds/lb)*	1.0	11
Mountain Lupine (12,000 seeds/lb)*	3.0	1
Mtn. Snowberry (54,000 seeds/lb)*	4.0	5
Wyoming Big Sage (2,500,000 seeds/lb)*	<u>0.5</u>	<u>29</u>
TOTAL	17	106

* Native Plants

** Rounded nearest whole seed

Grass seed quantities will be doubled if the area is broadcast seeded.

353.300 Vegetative Exception

Dugout Canyon does not require vegetative exception at this time.

353.400 Cropland

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The permit area contains no land designated as cropland.

354 Revegetative: Timing

Dugout Canyon will follow the recommended guidelines for revegetation and planting during the first normal period for favorable planting conditions after replacement of the topsoil. In Utah the planting period is usually Fall due to the precipitation events.

355 Revegetation: Mulching and Other Soil Stabilizing Practices

Mulch and/or other soil stabilizing practices (roughing, etc.) will be used on all areas that have been regraded and covered by topsoil (Section 341.200). Dugout Canyon Mine will exercise care to guard against erosion during and after application of topsoil.

356 Revegetation: Standards for Success

356.100 Success of Revegetation

The success of revegetation will be judged on the effectiveness of the vegetation for postmining land use, the extent of cover on each degassification well site compared to their respective reference areas.

Sampling Techniques - Dugout Canyon will comply with the standards for success, statistically valid sampling techniques for measuring success, and the approved methods outline in the Division's "Vegetation Information Guidelines, Appendix A" for sampling.

The sampling methods to be used during reclamation will be specific to the requirements at the time of reclamation. Nonetheless, according to the currently approved UDOGM guidelines, these sampling methods would be used: sample adequacy, cover (line interception), density (belt transects or plots) and productivity (clipping). The Jaccard's Community Coefficient will be used to calculate acceptable plant similarity and diversity.

Standards for Success - The standards for success will include criteria representative of undisturbed lands in the area of the degas wells as means to evaluate ground cover, production and stocking of the reclaimed site.

356.200 Standards for Success

Standards of success will be applied in accordance with the approved postmining land use as described in this section.

Grazing Land and Pasture Land - The ground cover and production of living plants on the revegetated area will be at least equal to the reference area.

Cropland - There is no area designated as cropland within the degassification well sites.

Fish and Wildlife Habitat - The postmining land use for the degas well sites will be grazing, except on pre-existing roads. Pre-existing roads will be returned to their approximate original contour and compacted.

Industrial, Commercial or Residential - The postmining land use for the permit area is not designated for industrial, commercial, or residential use.

Previously Disturbed Areas - Site G-1, G-4, G-6, **G-8, G-9 and G-10** have been previously disturbed. Sites G-2, G-3, G-5 and G-7 have not been previously disturbed. Standards of success for all sites will be applied in accordance with the postmining land use of grazing as described in this section.

356.300 Siltation Structures

Siltation structures will be maintained until the disturbed areas have been stabilized and revegetated. For additional details on siltation structures, see Sections 542 and 763 of this amendment.

356.400 Removal of Siltation Structures

The land on which siltation structures are located will be revegetated in accordance with the reclamation plan discussed in Section 353 and 357. Refer to Section 763 for addition information pertaining to the removal of siltation structures.

357 Revegetation: Extended Responsibility Period

Dugout Canyon will be responsible for the success of revegetation for a period of 10 years following seeding of the reclaimed area or upon Division bond release.

357.100 Extended Period Begins

The period of extended responsibility will begin after disturbed areas have been reseeded.

357.200 Vegetation Parameters

Vegetation parameters will equal or exceed the approved success standard during the last 2 years of the responsibility period. The success standards are outline in Section 356 of this application.

357.300 Husbandry Practices

The use of husbandry practices are not being requested by Dugout Canyon for the degas well sites.

358 Protection of Fish, Wildlife, and Related Environmental Values

Dugout Canyon will minimize disturbances and adverse impacts on wildlife and their related environments as outline in Section 333 of the approved M&RP and Section 342 of this submittal.

See Chapter 7, Section 731.100 of the approved M&RP for methods to protect water sources in the area.

358.100 Existence of Endangered or Threatened Species

The well sites will not be constructed or operated where they might jeopardize the existence of any endangered or threatened species. Refer to Section 322.200 and Attachments 3-1, 3-2 and 3-3 for additional information pertaining to threatened, endangered, and sensitive species.

State or federally listed endangered or threatened species will be reported to the Division upon its discovery.

358.200 Bald and Golden Eagles

Dugout Canyon understands that there is no permission implied by these regulations for taking of bald or golden eagles, their nests, or eggs. If found, nests will be reported to the Division.

358.300 Taking of Endangered or Threatened Species

Dugout Canyon understands that there is no permission implied by these regulations for taking of endangered or threatened species, their nests, or eggs.

358.400 Replacement of Wetland or Riparian Vegetation

The sites contain no wetland or riparian vegetation.

358.500 Manmade Wildlife Protection Measure

Electric Power Lines - No utilities will exist at the well sites.

Potential Barriers - No potential barriers will exist at any of the well sites, except for the perimeter fence. No ponds exist at the well sites. Refer to Sections 231.100 and 242 for information pertaining to the mud pit.

Canyon Fuel Company, LLC
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**ATTACHMENT 3-1
VEGETATION INVENTORY
NRCS LETTER**

add to the back of existing information

United States Department of Agriculture



Natural Resources Conservation Service
540 West Price River Drive
Field Office
Price, UT 84501
(435) 637-0041
FAX (435) 637-3146

June 3, 2005

REC'D JUN - 6 2005

Ms Vicky Miller
Canyon Fuel Company, LLC
Dugout Canyon Mine
P.O. Box 1029
Wellington, UT 84542

Re: Vegetation Production of Proposed Degas Wells G7-G13 and GUG0105/DUG0205

Dear Ms Miller,

Following our visit to the proposed degas wells for Dugout Canyon Mine, I have made the following determinations for vegetative production and overall, health and trend of the sites. The three ecotypes that will be described in relation to these proposed well sites are sagebrush/grass and browse. It is noted that all of the sites have previously been disturbed (except G13) with differing levels of success in the reestablishment of the Potential Natural Community (PNC).

For a high seral (good condition) rating to be obtained in the *shallow loam sagebrush areas* (Well G7), percent air-dry weight for the primary functional groups should be as such; herbaceous 55-65%, forbs 5-15% and shrubs 25-35%. Although the site had already been disturbed, it was apparent that it was similar to the surrounding undisturbed areas of the same soil mapping unit and Ecological Site Description (ESD). It is apparent that past management practices (grazing and/or fire management) have allowed the shrub (mainly mountain sage brush) to surpass the 25-35%, while the herbaceous production has declined. Although the annual production for the site (1,200 lbs acre⁻¹) is representative of the recent climatic conditions we have experienced, there has been a slight shift in functional group composition (i.e. increase in shrub biomass with a decline in herbaceous biomass).

Well locations G9-13 & DUG0105/DUG0205 are all located in *very steep stony loam browse areas* that have all been previously disturbed (with the exception of G13) and show little resemblance to the PNC for the sites. For this reason, I will reference surrounding areas that have not historically been disturbed and use these values for production estimates. In a high seral state (good condition), this site would demonstrate the following characteristics in regards to annual production; herbaceous 20-30%, forbs 10-15% and shrubs 60-70%. Due to the nature of these sites (high shrub component) and resilience to drought (compared to sites with a higher herbaceous component), production (1,000 lbs acre⁻¹) and functional groups are more representative to the PNC.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

Well location G8 is located within *stony loam browse* that has been previously disturbed, but has shown a higher success in reaching the PNC for the site. In a high seral state (good condition), this site would demonstrate the following characteristics in regards to annual production; herbaceous 15-25%, forbs 10-15% and shrubs 65-75%. Similar to well sites G9-13, the nature of this site along with the higher success of vegetative reestablishment, production (1,200 lbs acre⁻¹) and functional groups are more representative to the PNC.

Please feel free to contact me if you have any further questions or concerns.

Sincerely,



M. Dean Stacy
Range Management Specialist
USDA-NRCS, Price FO

cc: Barry Hamilton, Assistant State Conservationist for Field Operations, Price AO
Gary Roeder, Area Resource Conservationist, Price AO
Wayne Greenhalgh, District Conservationist, Price FO

Canyon Fuel Company, LLC
Dugout Canyon Mine

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ATTACHMENT 3-2
THREATENED, ENDANGERED, AND SENSITIVE SPECIES INFORMATION

**County Lists of Utah's Federally Listed
Threatened(T), Endangered(E), and Candidate(C) Species**

Beaver County

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
California Condor - Historically	<i>Gymnogyps californianus</i>	E Experimental
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T
Yellow-billed Cuckoo - Possibly	<i>Coccyzus americanus</i>	C
Utah Prairie-dog	<i>Cynomys parvidens</i>	T

Box Elder County

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Fat-whorled Pondsnaill	<i>Stagnicola bonnevillensis</i>	C
Lahontan Cutthroat Trout - Introduced	<i>Oncorhynchus clarki henshawii</i>	T
June Sucker - Introduced	<i>Chasmistes liorus</i>	E
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T
Yellow-billed Cuckoo - Possibly	<i>Coccyzus americanus</i>	C
Gray Wolf - Historically	<i>Canis lupus</i>	E Extirpated

Cache County

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Maguire Primrose	<i>Primula maguirei</i>	T
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T
Yellow-billed Cuckoo - Possibly	<i>Coccyzus americanus</i>	C
Brown (Grizzly) Bear - Historically	<i>Ursus arctos</i>	T Extirpated
Canada Lynx - Possibly	<i>Lynx canadensis</i>	T

Carbon County

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>
Uinta Basin Hookless Cactus	<i>Sclerocactus glaucus</i>	T
Graham Beardtongue	<i>Penstemon grahamii</i>	C
Humpback Chub	<i>Gila cypha</i>	E
Bonytail	<i>Gila elegans</i>	E
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	E
Razorback Sucker	<i>Xyrauchen texanus</i>	E
Bald Eagle	<i>Haliaeetus leucocephalus</i>	T
Yellow-billed Cuckoo - Possibly	<i>Coccyzus americanus</i>	C
Mexican Spotted Owl - Possibly	<i>Strix occidentalis lucida</i>	T
Black-footed Ferret - Unconfirmed	<i>Mustela nigripes</i>	E Extirpated

Canyon Fuel Company, LLC
Dugout Canyon Mine

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CHAPTER 4
LAND USE AND AIR QUALITY

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LIST OF ATTACHMENTS

- Attachment 4-1** Information Moved to Confidential Folder in 2005
Attachment 4-2 Surface Land Owner Agreement

410 LAND USE

411 Environmental Description

A statement of the conditions and capabilities of the land to be affected by mining and reclamation operations follows in this section.

411.100 Preming Land Use

The area is utilized for the landowners private use, including hunting and as open range for livestock and wildlife.

411.110 Land Use Map and Narrative

Refer to the same section of the approved M&RP.

411.120 Land Capability

The major plant communities at the well sites are identified in Section 321. No cultivated lands lie within the well boundaries, due to the limiting terrain and lack of water for irrigation. Refer to Section 321.200, Table 3-1 of this submittal for forage production per acre for each well site.

The well site areas are located on the flatter mesa tops and rolling terrain. This type of terrain receives heavier pressure because of more available forage and easier movement by livestock.

411.130 Land Use Description

The wells are located on land administered by Milton & Ardith Thayn Trust and zoned by Carbon County for mining and grazing (MG-1).

No industrial or municipal facilities are located on or immediately adjacent to the well sites.

411.140 Cultural and Historic Resources Information

Cultural and Historic Resource Maps - Archaeological surveys were conducted in 2003 of the well sites G-1 through G-6. Nothing was found that required future investigation. There are no cemeteries, public parks, or units of the National System of Trails or the Wild and Scenic Rivers System located within the well site boundaries. The reports can be found in Attachment 4-1 of this submittal, Appendix 4-1 and 4-3 of the M&RP and in the Confidential Folder. Well site G-7 and G-8 were inventoried by AERC in 1980 (see below), a letter from John Senulis of Senco-Phenix to SHPO has been written requesting proof of clearance for the G-7 and G-8 sites. A copy of the Senco-Phenix letter and SHPO letter will be is included in the confidential folder. when they are received.

Previous research in 1980 by "AERC surveyed several sample blocks in Sections 13 and 24, T13S, R12E and Sections 18, 19 and 30 T13S, R13E. They also surveyed the access road into the Snow Mine site. One archeological site (42CB292) was located. The site was described as "Coal mine located in Pace Canyon consists of one known mine portal which has been closed. Site of historic Snow Mine in Pace Canyon which was active in 1906 but had its primary production period from 1932-1940." The site was relatively pristine at the time and still contained a standing coal loadout and foundation with depth potential. Avoidance was recommended pending further historic research. As noted the site has since been extensively modified" (Attachment 4-1, Senco-Phenix, June 24, 2003, SPUT-455, page 2).

Access to the degas holes will not impact or disturb what remains of the archeological site (42CB292). The road in the bottom of Pace Canyon passes the archeological site, but the closed portal is not visible from the road, therefore there is nothing to draw attention to the site. The loadout referenced in the survey no longer exist at the site.

During June 2005 a Class III intensive walkover survey was performed of the access roads and degas well sites G-9 thru G-13 and site DUG0105/DUG0205 by Senco-Phenix. The well sites are being permitted in groups of three. Wells G-8 thru G-10 are the group currently being presented for consideration for approval. In the canyon where degas well sites G-9 and G-10 are located there was a temporary sawmill site (42CB2435). The major portion of the site has been removed and there is little potential for further information. The site is not considered eligible for the NRHP. Reference the Confidential Binder for further information pertaining to the aforementioned survey. Per the survey "No other cultural resources were located and the potential for undetected remains is remote. A finding of no effect is appropriate and archeological clearance without stipulations is recommended" by Senco-Phenix to SHPO for the G-8 thru G-10 degas well sites.

Dugout Canyon agrees to notify the Division and State Historical Preservation Office (SHPO) of previously unidentified cultural resources discovered in the course of operations. Dugout Canyon also agrees to have any such cultural resources evaluated in terms of NRHP eligibility criteria. Protection of eligible cultural resources will be in accordance with Division and SHPO requirements. Dugout Canyon will also instruct its employees that it is a violation of federal and state law to collect individual artifacts or to otherwise disturb cultural resources.

411.200 Previous Mining Activity

Dugout Canyon has no knowledge of the removal of coal or other minerals in the well site areas.

412 Reclamation Plan

412.100 Postming Land-Use Plan

All uses of the land prior to the wells construction/operation and the capacity of the land to support prior alternate uses will remain available throughout the life of the sites.

Dugout Canyon intends the postmining land use to be livestock and wildlife grazing and other uses as dictated by the land owner (hunting, roads, etc.). Final reclamation activities will be completed in a manner to provide the lands able to parallel the premining land use.

412.200 Land Owner or Surface Manager Comments

Milton & Ardith Thayn Trust is the landowner. Canyon Fuel Company, LLC has a surface land owner agreement with the Thayne Trust for the drilling of degassification holes (Attachment 4-2). Prior to drilling the landowner will be contacted and the requirements related to drilling as outlined in the surface land owner agreement will be met. A copy of the letter will be included in Attachment 4-2.

413 Performance Standards

413.100 Postmining Land Use

Postmining land uses are discussed in Section 412.100. The postmining lands will be reclaimed in a timely manner and capable of supporting such uses (see Chapters 2, 3, 5, and 7).

413.200 Determining Premining Uses of Land

Refer to Section 411.100.

413.300 Criteria for Alternative Postmining Land Uses

No alternative postmining land uses have been planned.

414 Alternative Land Use

No alternative postmining land uses have been planned.

420 AIR QUALITY

421 Air Quality Standards

Dugout Canyon activities will be conducted in compliance with the requirements of the Federal Clean Air Act and the Utah Air Conservation Rules.

422 Compliance Efforts

See Fugitive Dust Control Plan, Section 424.

423 Monitoring Program

Refer to the same section in the approved M&RP.

424 Fugitive Dust Control Plan

Operational areas that are used by mobile equipment will be water sprayed to control fugitive dust. The application of water will be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition unless it is below freezing.

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July ~~March~~ 2005

425 Additional Division Requirements

Refer to the same section of the approved M&RP.

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
~~July~~ March 2005

ATTACHMENT 4-1

Information Moved to Confidential Folder in 2005

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July ~~March~~ 2005

CHAPTER 5
ENGINEERING

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510 INTRODUCTION

This chapter provides a discussion of general engineering aspects, an operation plan, a reclamation plan, design criteria, and performance standards related to the degassification well sites. The activities associated with the construction and reclamation of the well sites have been or will be designed, located, constructed, maintained, and reclaimed in accordance with the operation and reclamation plans.

511 General Requirements

The permit application includes descriptions of construction, maintenance, and reclamation operations of the proposed well sites with maps and plans. Potential environmental impact as well as methods and calculations utilized to achieve compliance with the design criteria are also presented.

512 Certification

Where required by the regulations, cross sections and maps in this permit application have been prepared by or under the direction of, and certified by, qualified registered professional engineers or land surveyors. As appropriate, these persons were assisted by experts in the fields of hydrology, geology, biology, etc.

512.100 Cross Sections and Maps

Cross sections for the degassification well pads are shown on Figures 5-2, 5-6, 5-10, 5-18, 5-21, 5-24 and typical road cross sections are shown on Figures 5-13 and 5-14. **Cross sections for the degassification well pads G-8, G-9 and G-10 are shown on figures located in Attachment 5-1.**

512.200 Plans and Engineering Designs

Excess Spoil - No excess spoil will be generated from the well sites.

Durable Rock Fills - No durable rock fills will exist at the well sites.

Coal Mine Waste - No coal mine waste will exist at the well sites.

Impoundments - Refer to Section 733.200 of this submittal.

Primary Roads - Short sections of road are required to access well sites G-2 and G-5. These access roads are classified as primary roads. Topsoil will be stripped from the road alignment and stored with the topsoil stripped from the pad area prior to grading the new access road. Well sites G-1(not drilled), G-3 thru G-10, ~~G-4, G-6 and G-7~~ are on existing roads, no access roads will be constructed.

Variance from Approximate Original Contour - No variance from approximate original contour is required for the well sites.

513 Compliance with MSHA Regulations and MSHA Approval

513.100 Coal Processing Waste Dams and Embankments

No coal processing waste dams and embankments will exist at the well sites.

513.200 Impoundments and Sedimentation Ponds

Refer to Section 733.200 of this submittal.

513.300 Underground Development Waste, Coal Processing Waste, and Excess Spoil

No underground waste, coal processing waste, and excess spoil will exist at the well sites.

513.400 Refuse Piles

No refuse piles will exist at the well sites.

513.500 Underground Openings to the Surface

The well will be equipped with a valve that will be closed and locked when not in use. A typical well head is shown in Figure 5-16.

513.600 Discharge to Underground Mine

No discharge to the underground mine will occur at the well sites.

513.700 Surface Coal Mining and Reclamation Activities

No surface coal mining, or reclamation activities associated with surface coal mining will occur at the well sites.

513.800 Coal Mine Waste Fire

No coal waste will be developed, therefore, no coal waste fires will occur at the well sites.

514 Inspection

514.100 Excess Spoil

No excess spoil will be stored at the well sites.

514.200 Refuse Piles

No refuse piles will exist at the well sites.

514.300 Impoundments

Refer to Section 733.200 of this submittal.

515 Reporting and Emergency Procedures

515.100 Slides

Refer to Section 515.100 in the approved M&RP.

515.200 Impoundments Hazards

No impoundments will exist at the well sites.

515.300 Temporary Cessation of Operations

If temporary cessation of the mining operations does occur, the wells will remain open. Once liberation of the methane gas is completed, the wells will be sealed as discussed in Section 542.700 of this submittal.

520 OPERATION PLAN

521 General

See Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-10) for the contour map showing pre-disturbance and drilling phase contours. These figures also show the disturbed area boundary and the new access road contours. Figures 5-3, 5-7, 5-11, 5-19, 5-22, 5-25, 5-29 and Attachment 5-1 (G-8 thru G-10) show the layout of the well sites during the drilling phase. Figures 5-4, 5-8, 5-12 show the layout of the well sites during the operational phase and the area to be reclaimed at the completion of drilling. Cross sections for each site can be found on Figures 5-2, 5-6, 5-10, 5-18, 5-21, 5-24, 5-28 and Attachment 5-1 (G-8 thru G-10).

521.100 Cross Sections and Maps

Existing Surface and Subsurface Facilities Features - No buildings are located on or within 1,000 feet of any of the well sites.

Landowner, Right-of-Entry, and Public Interest - The land which the wells will be drilled on is owned by the Milton and Ardith Thayn Trust. Canyon Fuels, LLC has reached an agreement with the Thayn trustees to allow access for the construction and drilling of the wells (see Attachment 4-2).

Mining Sequence and Planned Subsidence - Refer to Section 525.

Land Surface Configuration - Surface contours of undisturbed well sites are included in Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-10).

Surface Facilities - No permanent surface facilities will exist at the well sites.

521.200 Signs and Markers

Mine and Permit Identification Signs - A mine and permit identification sign will be displayed at each well site. This sign will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until after the release of all bonds for the well site areas. The sign will contain the following information:

- Mine name,
- Company name,
- Company address and telephone number
- MSHA identification number, and
- Permanent program permit identification number

Perimeter Markers - The perimeter of all areas affected will be clearly marked before beginning mining activities. The markers will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until after the release of all bonds for the permit area.

Buffer Zone Markers - Stream buffer zone markers will not be required at any of the ~~three~~ well sites.

Topsoil Markers - Markers will be placed on all topsoil stockpiles. These markers will be a design that can be easily seen and read, will be made of durable material, will conform to local regulations, and will be maintained until topsoil is redistributed on the well sites.

Construction Markers - Not applicable.

522 Coal Recovery

No coal recovery will be performed at the well sites.

523 Mining Methods

No mining will be performed at the well sites.

524 Blasting and Explosives

No explosives are to be used at the well sites.

525 Subsidence

No subsidence will occur at the well sites, as a result of drilling and development of the degassification well sites. Subsidence could occur at the well site because of underground mining see Section 525 of the approved M&RP.

526 Mine Facilities

526.100 Mine Structures and Facilities

No buildings exist or are proposed at the well sites; therefore, no existing building will be used in connection with or to facilitate this proposed coal mining and reclamation plan.

526.200 Utility Installation and Support Facilities

No utilities are to be installed at the well sites. A portable methane exhaust unit will be temporarily installed to draw methane to the surface from the mined panel. The exhaust blower will be started by using propane from portable tanks. Once started and running, the unit will be powered by burning the extracted methane gas. Excess methane will be vented to the atmosphere. The blower is approximately 12-feet long by 6-feet wide and about 10-feet tall. It is not known how long the degassification of the longwall panel will take.

527 Transportation Facilities

527.100 Road Classification

Well sites will be developed near existing private roads as shown on Figures 1-1, 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-10). The new access roads will be classified as primary roads and will be maintained by the permittee (see Figure 5-14).

527.200 Description of Transportation Facilities

The well sites were chosen close to existing roads in the area to limit surface disturbance. The existing roads were constructed and are maintained by the land owner. The existing roads are

approximately 20 feet wide and are shown on Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 (G-8 thru G-10). See Figure 5-13 for a typical cross section of the existing roads.

528 Handling and Disposal of Coal, Excess Spoil, and Coal Mine Waste

No disposal of coal, excess spoil, and coal mine waste will occur at the well sites.

529 Management of Mine Openings

The perimeter of the sites, including the topsoil stockpiles will be fenced with gates on the access roads. The well casing will have a valve that is closed and locked. The valve will also prevent access by animals or other material. Mine openings will be monitored in accordance with Federal and State Regulations.

During the life of the methane wells, the sites will be inspected as needed by mine personnel to verify the continued operation of the pumping equipment and general site conditions.

530 OPERATIONAL DESIGN CRITERIA AND PLANS

531 General

This section contains the general plans for the construction of sediment controls and general construction and maintenance of the well sites.

The decision to construct each well will be based on the amount of methane encountered during mining. If small amounts of methane are encountered and the mine's ventilation system can dilute the methane, no well will be drilled. The proposed well site locations are shown on Figure 1-1.

532 Sediment Control

Sediment control measures for the well sites are described in Sections 732 and 742 of this submittal. Runoff control structures at the well sites have been designed to convey runoff in a non-erosive manner. Sediment yields in the well permit area are minimized by:

- Disturbing the smallest practicable area during the construction of the well site and
- Contemporaneously reclaiming areas suitable for such reclamation.

533 Impoundments

No impoundments will exist at the well sites.

534 Roads

Refer to Section 527 of this submittal.

535 Spoil

No spoil will be generated at the well sites.

536 Coal Mine Waste

No coal mine waste will be stored at the well sites.

537 Regraded Slopes

537.100 Division Approval

No mining or reclamation activities will be conducted in the permit area that requires approval of the Division for alternative specifications or for steep cut slopes.

537.200 Regrading of Settled and Revegetated Fills

Upon completion of the well site, the areas not required for the exhaust blower will be regraded to approximate original contour. Because of the nature of the well site, settling is not anticipated. However, if settlement does occur, these areas will be regraded.

540 RECLAMATION PLAN

541 General

541.100 Commitment

Upon the permanent cessation of methane venting, Dugout Canyon Mine will seal the wells and permanently reclaim all affected areas in accordance with the R645 regulations and this reclamation plan.

541.200 Surface Coal Mining and Reclamation Activities

Not applicable.

541.300 Underground Coal Mining and Reclamation Activities

Upon completion of the methane venting activities the wells will be reclaimed.

541.400 Environmental Protection Performance Standards

The plan presented is designed to meet the requirements of R645-301 and the environmental protection performance standards of the State Program.

542 Narratives, Maps, and Plans

542.100 Reclamation Timetable

A timetable for the completion of each major step in the reclamation plan is presented in Figure 5-15 (G-2 and G-3) and 5-26 (G-4 ~~thru G-10~~ G-5, G-6 and G-7).

542.200 Plan for Backfilling, Soil Stabilization, Compacting, and Grading

Following completion of the venting activities, the well site will be prepared for contouring and soil distribution. Details regarding topsoil placement and revegetation are provided in Section 242 and Section 353, respectively.

Sedimentation Pond Removal and Interim Sediment Control - See Section 542.500 of this submittal.

542.300 Final Surface Configuration Maps and Cross Sections

The sites will be regraded to the approximate original contour, the contours representing the pre-disturbance topography also represent the reclamation topography. Refer to Figures 5-2, 5-6, 5-10, 5-18, 5-21, 5-24, 5-28 and Attachment 5-1 (G-8 thru G-10) to see cross sections representing the final surface configuration.

542.400 Removal of Temporary Structures

The well sites will not have surface structures.

542.500 Removal of Sedimentation Pond

No sediment pond will be constructed at the well sites.

542.600 Roads

The roads which existed prior to the drilling program will be retained after reclamation. The access roads established during the drilling program will be reclaimed after methane extraction has been completed. See Section 242 for additional detail concerning the reclamation plan.

542.700 Final Abandonment of Mine Openings and Disposal Areas

All openings will be sealed in accordance with Federal and State Regulations. The casings will be plugged at the bottom to hold concrete. A lean concrete mixture will be poured into the casing until the concrete is within five (5) feet of the surface. At that time the casing will be cut off at ground level and the rest of the casing will be filled with lean concrete. The concrete will be allowed to harden before final reclamation is completed.

542.800 Estimated Cost of Reclamation

Refer to the Appendix 5-6 of the existing M&RP. It is anticipated that the cost of reclamation of the well sites is adequately covered by the Dugout Canyon Reclamation Bond, refer to Chapter 8 for additional detail.

550 RECLAMATION DESIGN CRITERIA AND PLANS

551 Casing and Sealing of Underground Openings

Permanent sealing is described in Section 542.700.

552 Permanent Features

552.100 Small Depressions

No permanent small depressions will be created as part of the well site construction and reclamation.

552.200 Permanent Impoundments

See Section 515.200 of this submittal.

553 Backfilling and Grading

553.100 Disturbed Area Backfilling and Grading

Approximate Original Contour - The well sites will be returned to their approximate original contour after reclamation is completed.

Erosion and Water Pollution - Sediment controls will consist of gouging the surface to create depressions and mounds which store and impede the movement of water. As vegetation becomes established on the reclaimed surface, erosion potential will be further minimized.

Post-Mining Land Use - The disturbed area will be reclaimed in a manner that supports the approved post-mining land use. Refer to Sections 411 and 412 for additional detail.

553.200 Spoil and Waste

Spoil - No spoil will be generated within the well sites.

Coal Processing Waste - No coal processing waste will be generated within the well sites.

553.250 Refuse Piles

No refuse piles will exist at the well sites.

553.300 Exposed Coal Seams, Acid and Toxic Forming Materials and Combustible Materials

No coal seams will be left exposed at the well sites. All wells will be sealed according to Federal and State regulations.

553.400 Cut and Fill Terraces

No cut and fill terraces will be constructed at the well sites.

553.500 Highwall From Previously Mined Areas

No highwalls exist or will be built at the well sites.

553.600 Previously Mined Area

No previously mined areas exist at the well sites.

553.700 Backfilling and Grading - Thin Overburden

No surface mining and reclamation activities involving thin overburden will occur at the well sites.

553.800 Backfilling and Grading - Thick Overburden

No surface mining and reclamation activities involving thick overburden will occur at the well sites.

553.900 Regrading of Settled and Revegetated Rills

If settlement or rills occur at the well sites, they will be regraded and revegetated. Refer to Section 244.300.

560 PERFORMANCE STANDARDS

Dugout Canyon Mine well sites will be conducted in accordance with the approved permit and the requirements of R645-301-510 through R645-301-553.

FIGURE 5-26
Reclamation Schedule - Well G-4 thru G-10, ~~G-5 and G-6 and G-7~~

Task	Weeks to Complete from Start of Reclamation Activities		
	1	2	3
Plug Well			
Regrade Site to Original Contour			
Rip Subsoil			
Place Topsoil and Roughen			
Seed and Mulch			
<p>The schedule assumes that weather conditions are conducive. Schedule is for each individual well not wells collectively. If necessary the timing may be extended.</p>			

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
~~March~~ July 2005

ATTACHMENT 5-1
Degas Wells G-8, G-9 and G-10

E.2,273,500

N.491,000

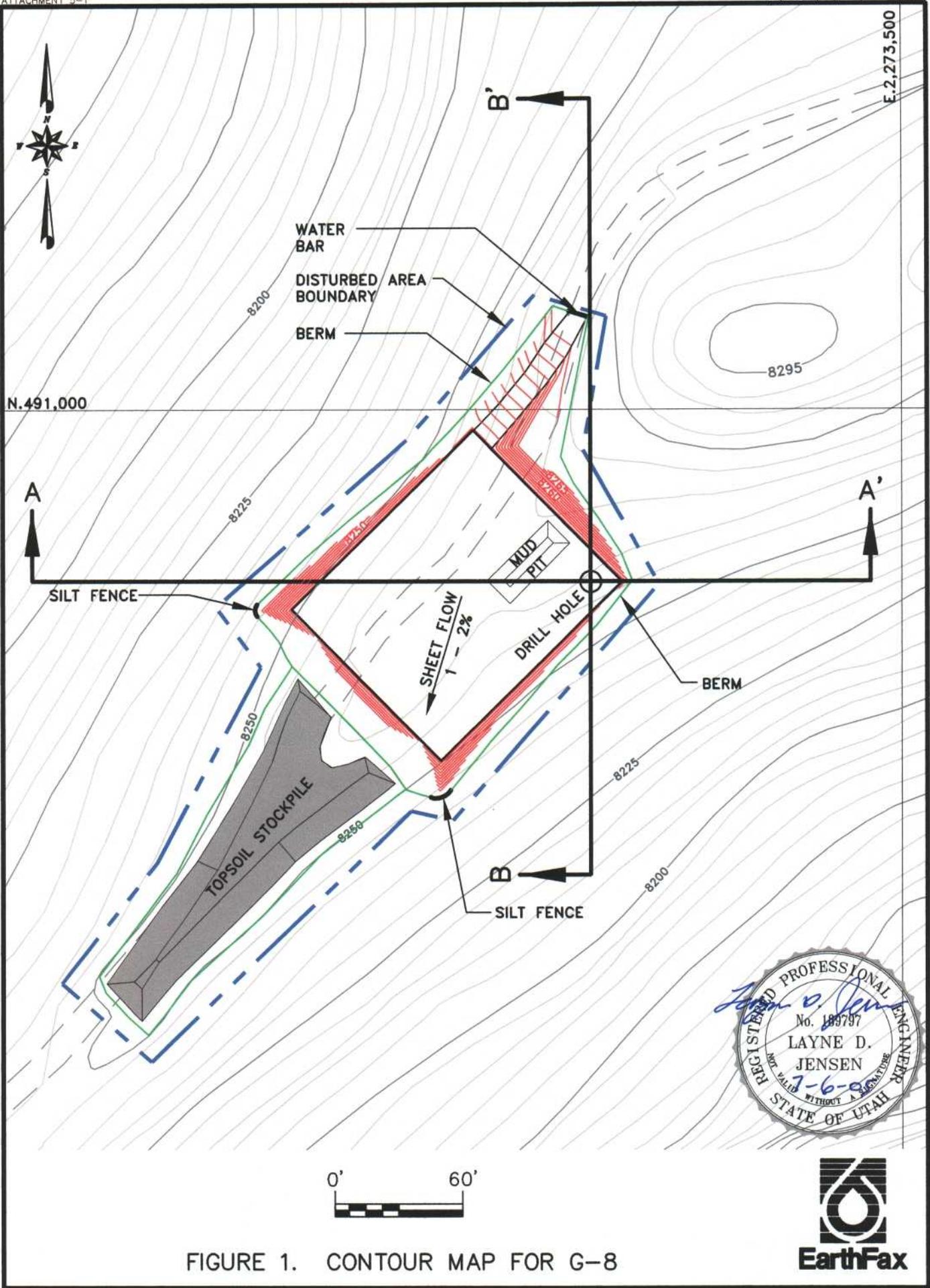


FIGURE 1. CONTOUR MAP FOR G-8



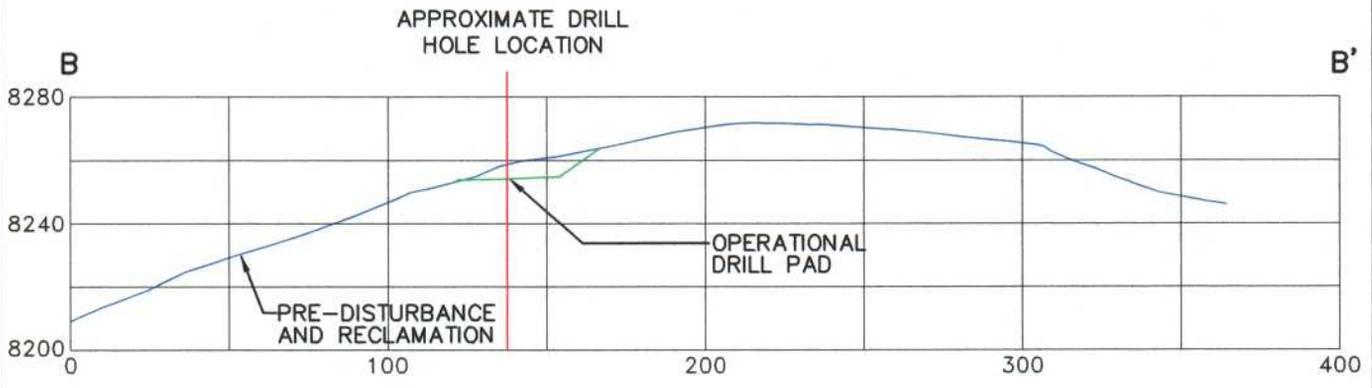
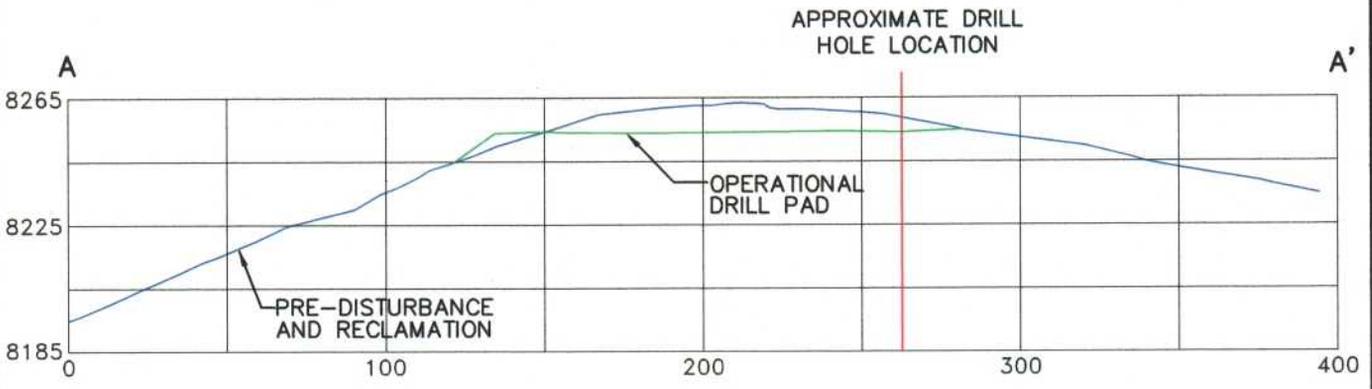
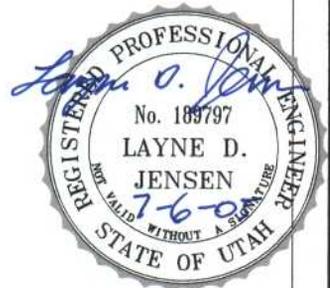
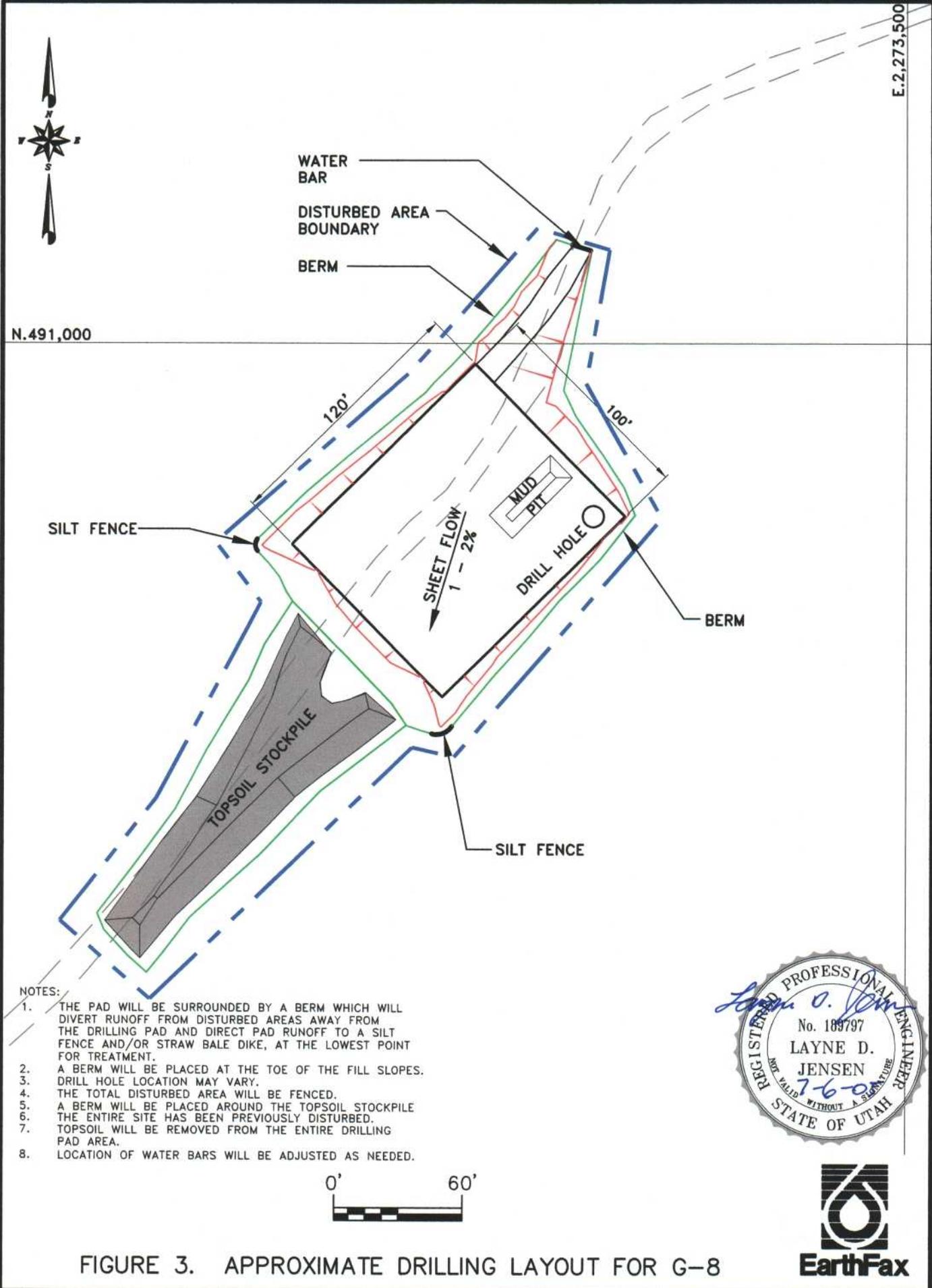


FIGURE 2. TYPICAL CROSS-SECTIONS FOR G-8



EarthFax

FIGURE 3. APPROXIMATE DRILLING LAYOUT FOR G-8

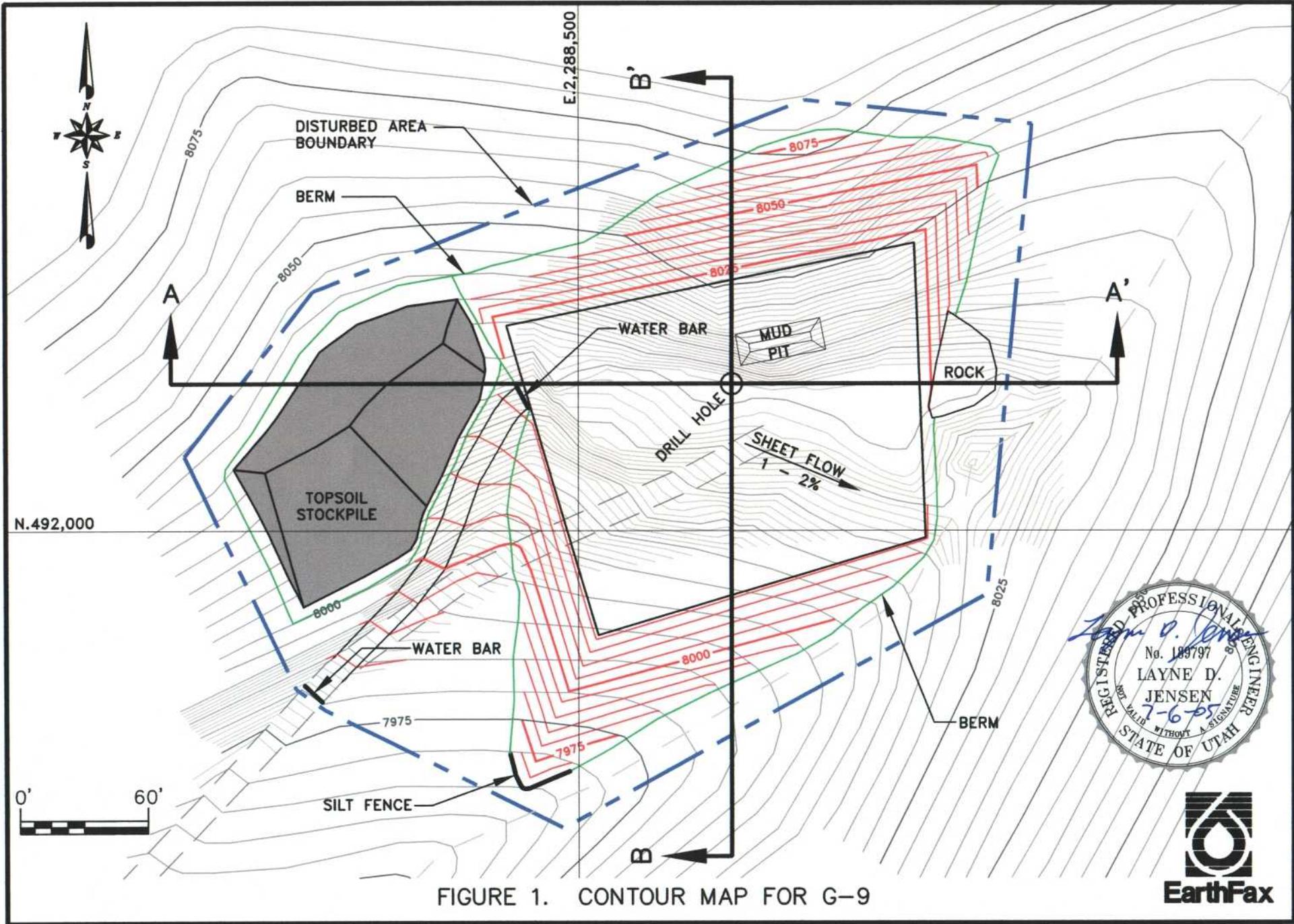


FIGURE 1. CONTOUR MAP FOR G-9



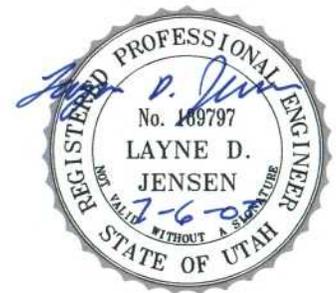
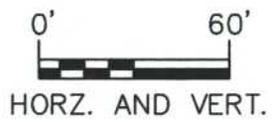
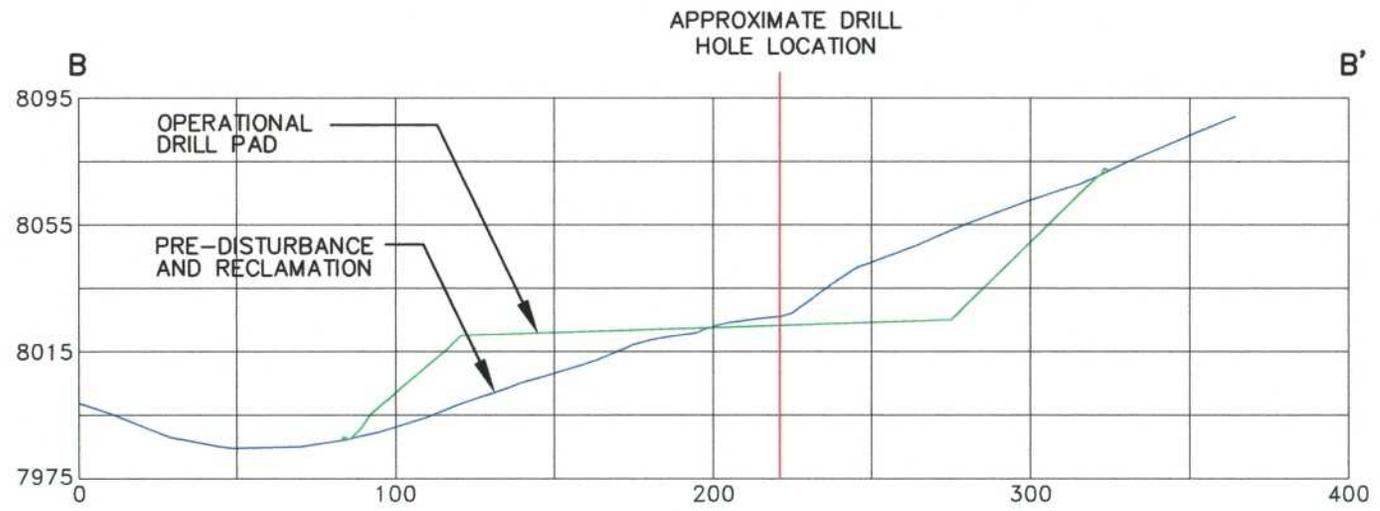
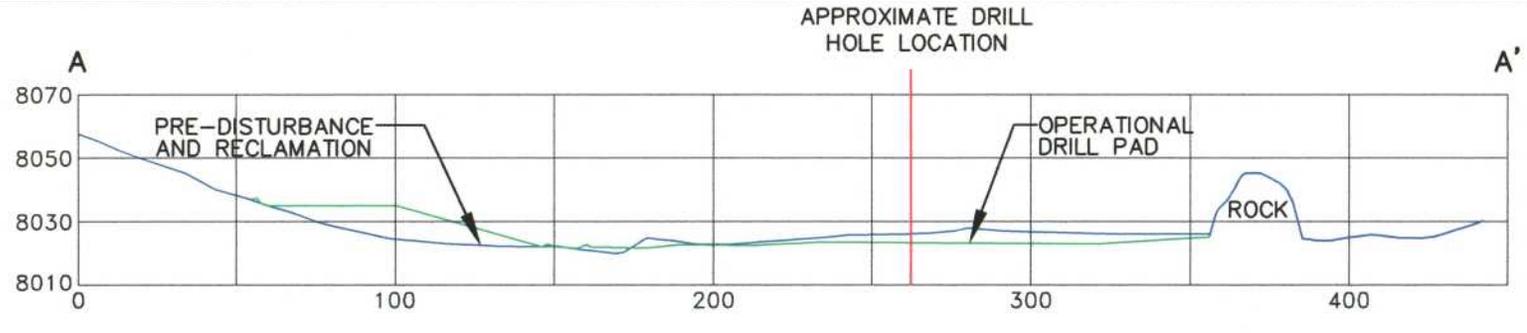


FIGURE 2. TYPICAL CROSS-SECTIONS FOR G-9

NOTES:

1. THE PAD WILL BE SURROUNDED BY A BERM WHICH WILL DIVERT RUNOFF FROM DISTURBED AREAS AWAY FROM THE DRILLING PAD AND DIRECT PAD RUNOFF TO A SILT FENCE AND/OR STRAW BALE DIKE, AT THE LOWEST POINT FOR TREATMENT.
2. A BERM WILL BE PLACED AT THE TOE OF THE FILL SLOPES. DRILL HOLE LOCATION MAY VARY.
3. THE TOTAL DISTURBED AREA WILL BE FENCED.
4. A BERM WILL BE PLACED AROUND THE TOPSOIL STOCKPILE.
5. THE ENTIRE SITE HAS BEEN PREVIOUSLY DISTURBED.
6. TOPSOIL WILL BE REMOVED FROM THE ENTIRE DRILLING PAD AREA.
7. LOCATION OF WATER BARS WILL BE ADJUSTED AS NEEDED.

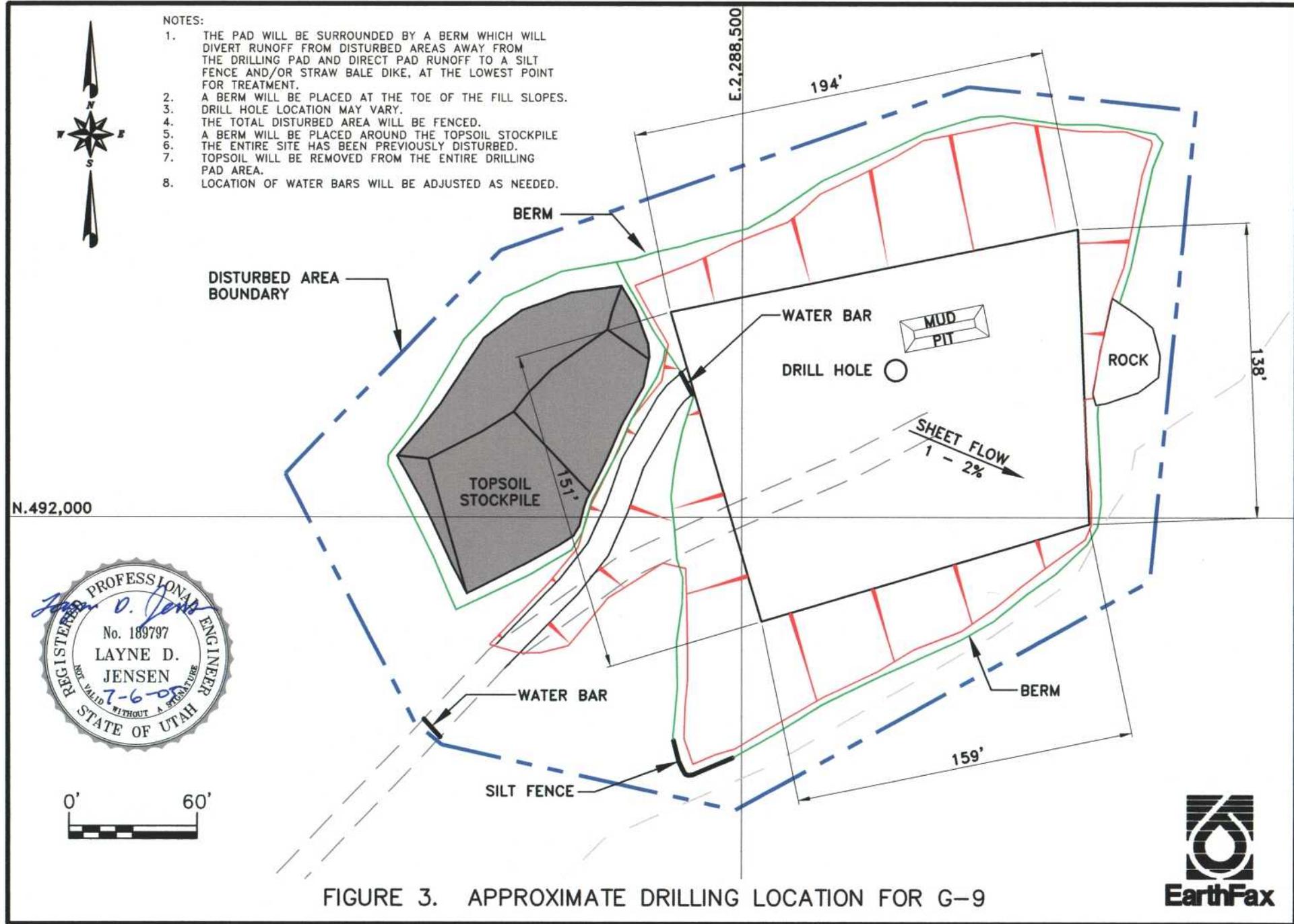


FIGURE 3. APPROXIMATE DRILLING LOCATION FOR G-9



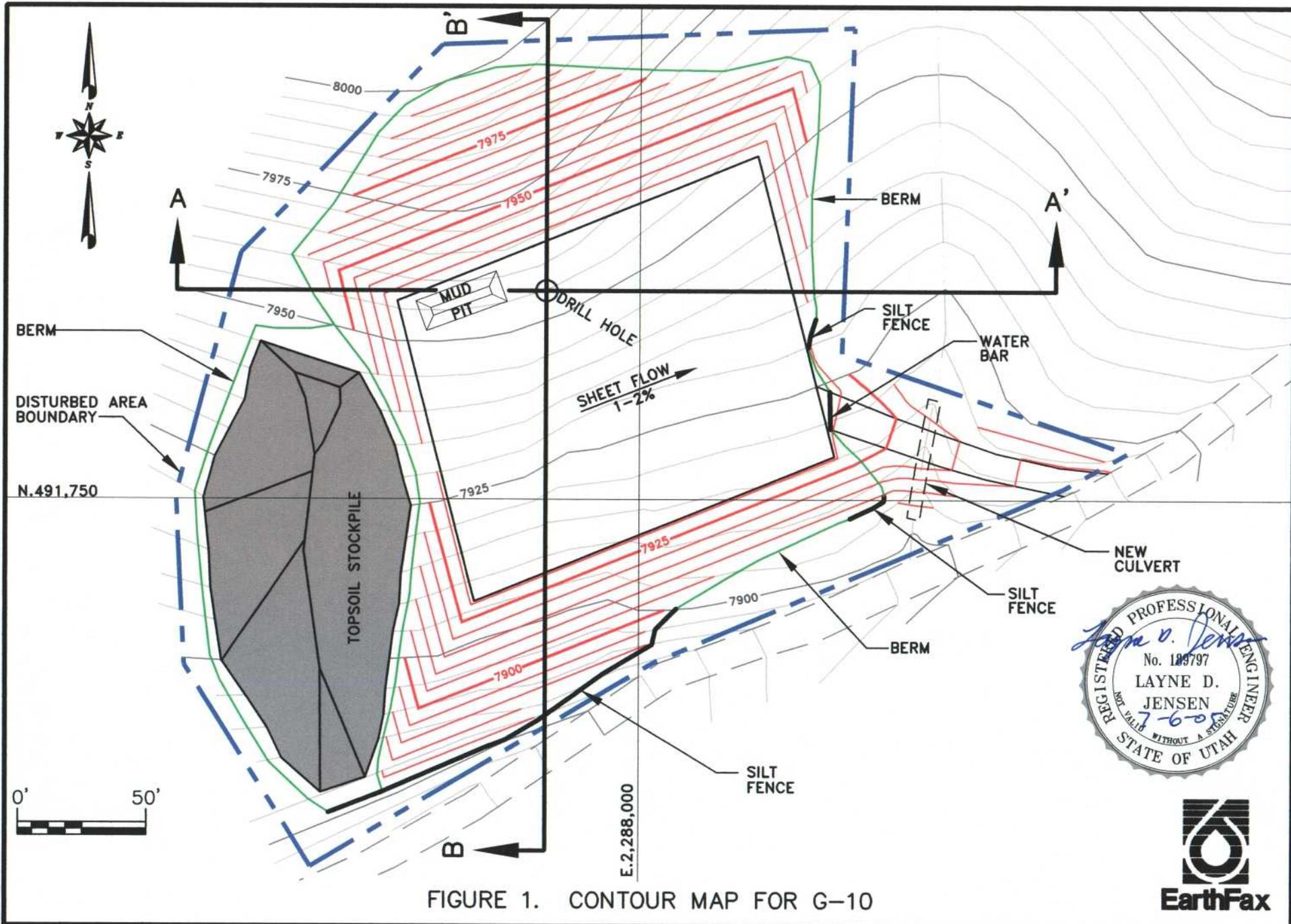


FIGURE 1. CONTOUR MAP FOR G-10



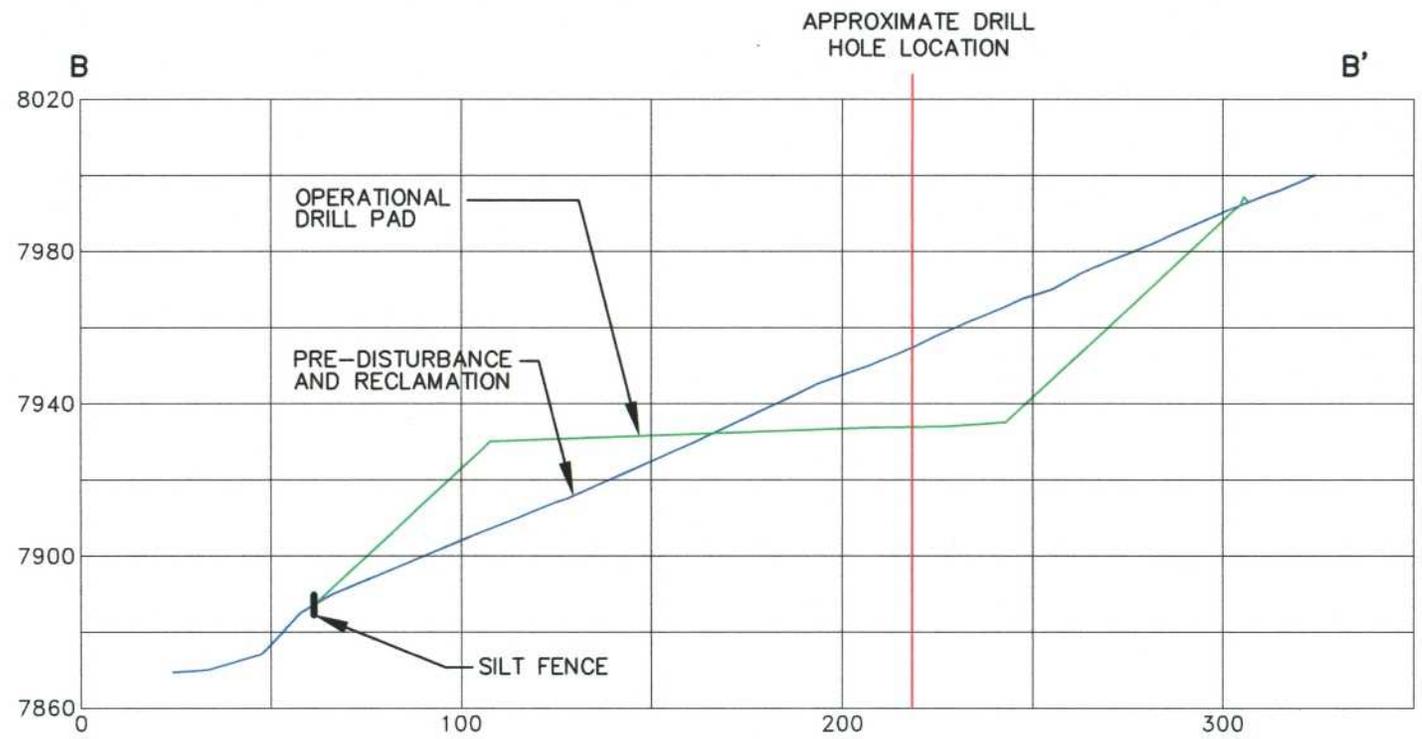
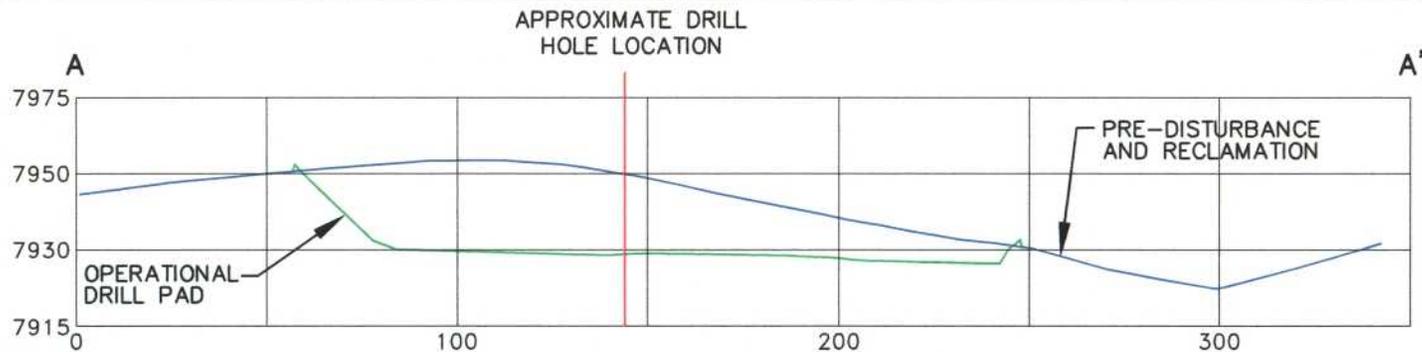
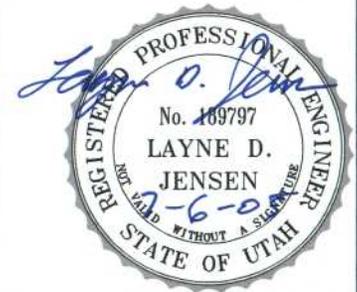
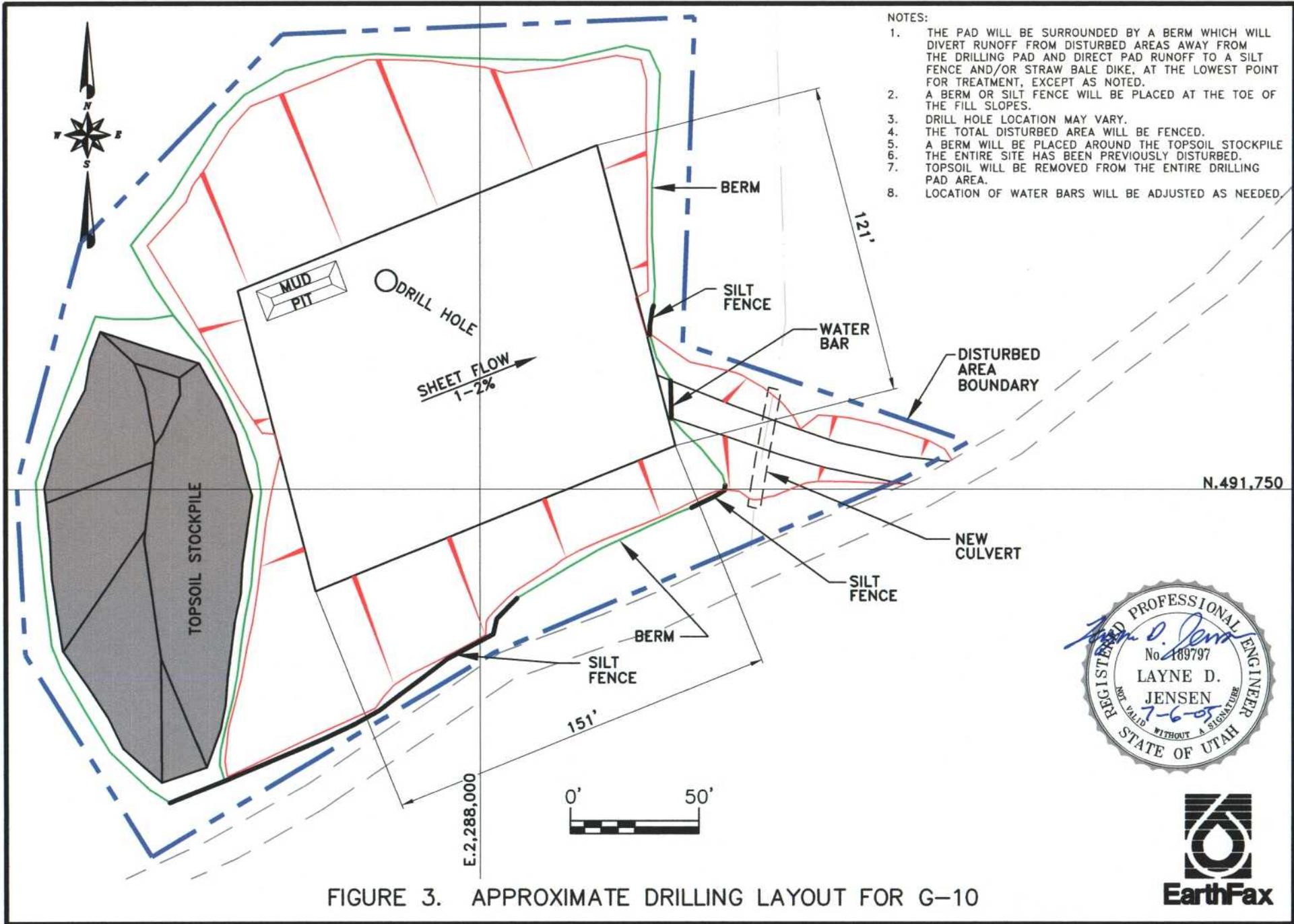


FIGURE 2. TYPICAL CROSS-SECTIONS FOR G-10





- NOTES:
1. THE PAD WILL BE SURROUNDED BY A BERM WHICH WILL DIVERT RUNOFF FROM DISTURBED AREAS AWAY FROM THE DRILLING PAD AND DIRECT PAD RUNOFF TO A SILT FENCE AND/OR STRAW BALE DIKE, AT THE LOWEST POINT FOR TREATMENT, EXCEPT AS NOTED.
 2. A BERM OR SILT FENCE WILL BE PLACED AT THE TOE OF THE FILL SLOPES.
 3. DRILL HOLE LOCATION MAY VARY.
 4. THE TOTAL DISTURBED AREA WILL BE FENCED.
 5. A BERM WILL BE PLACED AROUND THE TOPSOIL STOCKPILE.
 6. THE ENTIRE SITE HAS BEEN PREVIOUSLY DISTURBED.
 7. TOPSOIL WILL BE REMOVED FROM THE ENTIRE DRILLING PAD AREA.
 8. LOCATION OF WATER BARS WILL BE ADJUSTED AS NEEDED.

FIGURE 3. APPROXIMATE DRILLING LAYOUT FOR G-10



Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July ~~March~~ 2005

CHAPTER 7
HYDROLOGY

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LIST OF ATTACHMENTS

Attachment 7-1 Hydrology Calculations

710 INTRODUCTION

711 General Requirements

This chapter presents a description of the following:

- Proposed operations and the potential impacts to the hydrologic balance;
- Methods of compliance with design criteria and the calculations utilized to show compliance; and
- Applicable hydrologic performance standards.

712 Certification

All maps, plans, and cross sections presented in this chapter have been certified by a qualified, registered professional engineer.

713 Inspection

Inspections are not required since no permanent impoundments will exist at the well sites.

720 ENVIRONMENTAL DESCRIPTION

721 General Requirements

This section presents a description of the pre-mining hydrologic resources within the well pad and their adjacent areas that may be affected or impacted by the proposed coal mining and reclamation operations.

722 Cross Sections and Maps

722.100 Location and Extent of Subsurface Water

Figure 7-1 in the approved M&RP shows a generalized hydrostratigraphic cross section of the permit and adjacent areas including the well sites. Section 724.100 of the approved M&RP provides baseline groundwater conditions.

722.200 Location of Surface Water Bodies

Plate 7-2 in the approved M&RP shows the locations of surface-water bodies and existing or pending water rights. Section 724.200 of the approved M&RP provides baseline surface water conditions.

722.300 Locations of Monitoring Stations

Plate 7-1 in the approved M&RP shows the location of surface water and groundwater monitoring stations.

722.400 Locations and Depth of Water Wells

Refer to Section 722.400 and Plate 7-1 of the approved M&RP for information pertaining to the groundwater monitoring wells. Refer to Appendix 7-9 of approved M&RP for details pertaining to the Gilson well.

722.500 Surface Topography

Surface topography features at the well sites and adjacent areas are shown on Figures 1-1, 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 **Degas Wells G-8, G-9 and G-10**. Refer to Plate 1-4 in the M&RP for well locations.

723 Sampling and Analysis

Refer to Section 723 of the approved M&RP.

724 Baseline Information

Refer to Section 724 of the approved M&RP.

724.100 Groundwater Information

Refer to Section 724.100 of the approved M&RP.

724.200 Surface Water Information

Refer to Section 724.200 of the approved M&RP.

724.300 Geologic Information

Geologic information related to the well sites and adjacent areas is presented in Chapter 6 of this submittal and in the approved M&RP.

724.400 Climatological Information

Climatological data are summarized in Appendix 4-1 behind the Air Quality Permit of the approved M&RP and RA Attachment 7-5 of the Refuse Pile Amendment.

724.500 Supplemental Information

Refer to Section 724.500 of the approved M&RP.

724.600 Survey of Renewable Resource Lands

Refer to Section 724.600 of the approved M&RP.

724.700 Alluvial Valley Floor Requirements

Information regarding the presence or absence of alluvial valley floors in the well sites and adjacent areas is presented in Chapter 9 of this submittal and the approved M&RP.

725 Baseline Cumulative Impact Area Information

The CHIA currently in place for the Dugout Canyon Mine covers the well sites. The hydrologic and geologic information required for the Division to develop a Cumulative Hydrologic Impact Assessment (CHIA) is presented in the approved M&RP.

726 Modeling

No groundwater or surface water modeling was conducted in support of this submittal.

727 Alternative Water Source Information

Not applicable.

728 Probable Hydrologic Consequences

This section addresses the probable hydrologic consequences of construction and reclamation operations at the well sites. Mitigation measures are discussed generally in this section and in detail in Section 730 of the approved M&RP.

728.100 Potential Impacts of Surface and Groundwater

Potential impacts of the well sites in this area on the quality and quantity of surface and groundwater flow may include contamination from materials associated with the drilling of the wells. The potential impact is addressed in Section 728.300 of this submittal and the approved M&RP.

728.200 Baseline Hydrologic and Geologic Information

Baseline geologic information is presented in Chapter 6 of the approved M&RP. Baseline hydrologic information is presented in Section 724.100 and 724.200 of the approved M&RP.

728.300 PHC Determination

Potential Impacts to the Hydrologic Balance - Potential impacts of the Dugout Canyon Mine on the hydrologic balance of the well sites and adjacent areas are addressed in the subsections of this submittal and the approved M&RP.

Acid and Toxic Forming Materials - No acid or toxic forming materials have been identified in the soils or strata of the Dugout Canyon Mine (Chapter 6, Section 623 of this submittal). Additional information is located in Appendix 6-2 of the approved M&RP.

Groundwater - During drilling of the wells, the groundwater encountered will be affected. Drilling mud will be used to seal the groundwater aquifers. Once drilling is completed, the casing will be

grouted in the well hole. This will seal the aquifers to prevent any groundwater from migrating down the outside of the casing into the mine.

Potential Hydrocarbon Contamination - Hydrocarbon products will not be stored at the well sites, however fuels, greases, and other oils may leak from equipment during drilling operations. Absorbent materials will be used for the collection of leaked fuels, greases, and other oils. The saturated absorbent materials will be disposed of at an appropriate landfill facility.

729 Cumulative Hydrologic Impact Assessment (CHIA)

The Cumulative Hydrologic Impact Assessment currently in place for the Dugout Canyon Mine includes the well sites and adjacent areas.

730 OPERATION PLAN

731 General Requirements

731.100 Hydrologic - Balance Protection

Groundwater Protection - The effect on groundwater at the well sites is expected to be minimal. Groundwater encountered during drilling will be sealed off, refer to Section 728.300.

Surface Water Protection - To protect the hydrologic balance, construction, maintenance, and reclamation operations will be conducted to handle earth materials and runoff in a manner that prevents, to the extent possible, additional contributions of suspended solids to stream flow outside the permit area, and otherwise prevent water pollution.

During initial drilling, the sites will be graded to ensure that storm runoff will flow towards the berms surrounding the ~~entire~~ drilling pad area. The berms will direct the runoff to the lowest point(s) within

the pad area where a silt fence and/or straw bale dike(s) will treat the runoff (see Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1). The berm placed at the top of the drilling pad cut slopes will divert runoff around the drilling pad. Thus reducing the runoff affected by the drilling pad.

~~After drilling, the pad size will be reduced for exhausting operations.~~ The pad will be re-graded to cause the storm runoff to sheet flow towards a silt fence and/or straw bale dike. A berm will be placed at the top of the fill slope to direct any runoff from the operational pad to the silt fence and/or straw bale dike(see Figures 5-4, 5-8, 5-12, 5-19, 5-22, 5-25, 5-29 and Attachment 5-1). The silt fences and/or straw bale dikes will be periodically inspected, and accumulated sediment will be removed as needed to maintain functionality. The sediment from the silt fence and/or straw bale dikes will be piled on the pad and will be used for fill during final reclamation of the well site. During the drilling phase a berm and silt fence will be installed at the toe of the fill slope as shown on Figures 5-1, 5-5, 5-9, 5-17, 5-20, 5-23, 5-27 and Attachment 5-1 to treat any runoff from the drilling pad.

731.200 Water Monitoring

No water monitoring will be conducted at the degas well sites. Refer to approved M&RP for a description of water monitoring.

731.300 Acid or Toxic Forming Materials

No acid or toxic forming materials are anticipated at the well sites (see Section 728.300).

731.400 Transfer of Wells

Refer to Section 731.400 of the approved M&RP.

731.500 Discharge

No discharges to underground workings.

731.600 Stream Buffer Zones

Stream Channel Diversions - No stream channel diversions are planned at the well sites.

Buffer Zone Designation - None of the drilling sites are adjacent to a **perennial** stream, therefore the establishment of a stream buffer zone is not necessary.

731.700 Cross Section and Maps

Not applicable.

731.800 Water Rights and Replacement

Refer to Sections 728.300 and 731.800 of the approved M&RP.

732 Sediment Control Measures

The sediment control measures within the well sites have been designed to prevent additional contributions of sediment to stream flow or to runoff outside the well sites. In addition, the well sites have been designed to minimize erosion to the extent possible.

The structures to be used for runoff control at the well sites are berms, silt fences and/or straw bale dikes.

732.100 Siltation Structures

Berms, silt fences and straw bales dikes will be used to treat runoff.

732.200 Sedimentation Pond

The drilling sites will not have sedimentation ponds.

732.300 Diversions

Refer to Section 731.100 of this submittal.

732.400 Road Drainage

No diversion ditches will be constructed along the primary roads leading to the well sites. See Figures 5-13 and 5-14 for typical road cross sections. Where needed roads accessing the drill sites will have a water bar constructed at the base of the road to divert water off the road prior to the runoff reaching the drilling pad.

733 Impoundments

733.100 General Plans

Not applicable.

733.200 Permanent and Temporary Impoundments

No permanent impoundments will exist at the well sites.

734 Discharge Structures

A berm will surround the entire drill pad at each well site during the drilling phase (**excepted as noted**). The berm will divert undisturbed runoff around the drilling pad and direct runoff from the pad to a silt fence/straw bale dike at the lowest point within the well pad disturbed area. A silt fence and/or straw bale dike will be the discharge structure for each of the well sites during the operational phase.

735 Disposal of Excess Spoil

There will be no excess spoil generated at the well sites.

736 Coal Mine Waste

There will be no coal mine waste generated or stored at the well sites.

737 Non-Coal Mine Waste

There will be no non-coal mine waste disposed at the well sites.

738 Temporary Casing and Sealing of Wells

Refer to Section 542.700 of this submittal.

740 DESIGN CRITERIA AND PLANS

741 General Requirements

This submittal includes general well site plans that incorporate design criteria for the control of drainage.

742 Sediment Control Measures

742.100 General Requirements

Design - Sediment control measures have been formulated to prevent additional contributions of sediment to stream flow or to runoff outside the well site area; and minimize erosion to the extent possible.

Measures and Methods - Sediment control methods will include silt fences, berms, and straw bales to reduce runoff and trap sediment.

742.200 Siltation Structures

General Requirements - Additional contributions of suspended solids and sediment or runoff outside the well site area will be prevented to the extent possible using silt fences, berms, and straw bale dikes. ~~Siltation structures (berms, silt fences and/or straw bale dikes) will be installed before the topsoil is removed from the well site.~~ Construction activities will not occur during major precipitation events.

Design - All hydrology calculations were made using the 10-year, 24-hour precipitation event. Hydrology calculations are in Attachment 7-1. Locations of the berms and silt fences are shown on Figures 5-1, 5-4, 5-5, 5-8, 5-9, 5-12, 5-17, 5-20, 5-23, 5-27 **and Attachment 5-1.**

742.300 Diversions

No diversion ditches will be constructed as part of the drilling or operational phases.

742.400 Road Drainage

Refer to Section 732.400 of this submittal.

743 Impoundments

No impoundments will exist at the well sites.

744 Discharge Structures

No discharge structures have been planned or designed.

745 Disposal of Excess Spoil

There will be no excess spoil generated at the well sites.

746 Coal Mine Waste

746.100 General Requirements

There will be no coal mine waste used at the well sites.

746.200 Refuse Piles

There will be no refuse piles at the well sites.

746.300 Impounding Structures

Refer to Section 733.200 of this submittal.

746.400 Return of Coal Processing Waste to Abandoned Underground Workings

No coal processing waste will be generated at the well sites.

747 Disposal of Non-Coal Mine Waste

All non-coal mine waste will be dispose of at an approved landfill.

748 Casing and Sealing Wells

Refer to Section 542.700 of this submittal.

750 PERFORMANCE STANDARDS

751 Water Quality Standards and Effluent Limitations

Water encountered during drilling and runoff water will be treated using silt fence and/or straw bale dikes prior to leaving the site. Should it become necessary the water encountered during drilling will be pumped into a tank and hauled from the site for disposal at a licensed facility.

752 Sediment Control Measures

All sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs presented in Section 732, 742, and 760 of this submittal.

752.100 Siltation Structures and Diversions

Siltation structures will be located, maintained, constructed and reclaimed according to plans and designs presented in Section 732, 742, and 763 of the submittal.

752.200 Road Drainage

Refer to Section 732.400 of this submittal.

753 Impoundments and Discharge Structures

Refer to Section 733.200 of this submittal.

754 Disposal of Excess Spoil, Coal Mine Waste and Non-Coal Mine Waste

There will be no excess spoil or coal mine waste generated at the well sites. Refer to Section 747 of this submittal regarding non-coal waste disposal.

755 Casing and Sealing

Refer to Section 542.700 of this submittal.

760 RECLAMATION

761 General Requirements

A detailed reclamation plan for the well sites is presented in Section 540. No structures will exist at the well sites.

762 Roads

Refer to Section 542.600.

762.100 Restoring the Natural Drainage Patterns

The natural drainage patterns will be restored after degassification is completed.

762.200 Reshaping Cut and Fill Slopes

Cut and fill slopes will be reshaped at the well sites.

763 Siltation Structures

763.100 Maintenance of Siltation Structures

All siltation structures will be maintained until removed in accordance with the approved reclamation plan.

763.200 Removal of Siltation Structures

When a siltation structure is removed, the land on which the siltation structure was located will be regraded and revegetated in accordance with the reclamation plan presented in Section 540.

764 Structure Removal

A timetable for the reclamation of the sites is presented in Figures 5-15 (G-2 and G-3) and 5-26 (G-4 thru G-10 ~~G-5, G-6 and G-7~~).

Canyon Fuel Company, LLC
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765 Permanent Casing and Sealing of Wells

Refer to Section 542.700 of this submittal.

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Dugout Canyon Mine

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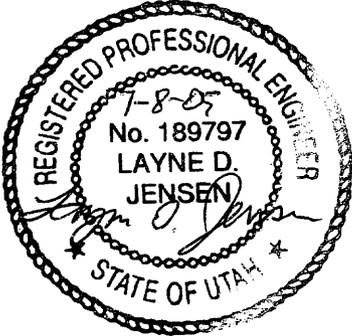
**ATTACHMENT 7-1
HYDROLOGY CALCULATIONS**

add to the back of existing information

Canyon Fuel Company, LLC
Dugout Canyon Mine

Methane Degassification Amendment
July 2005

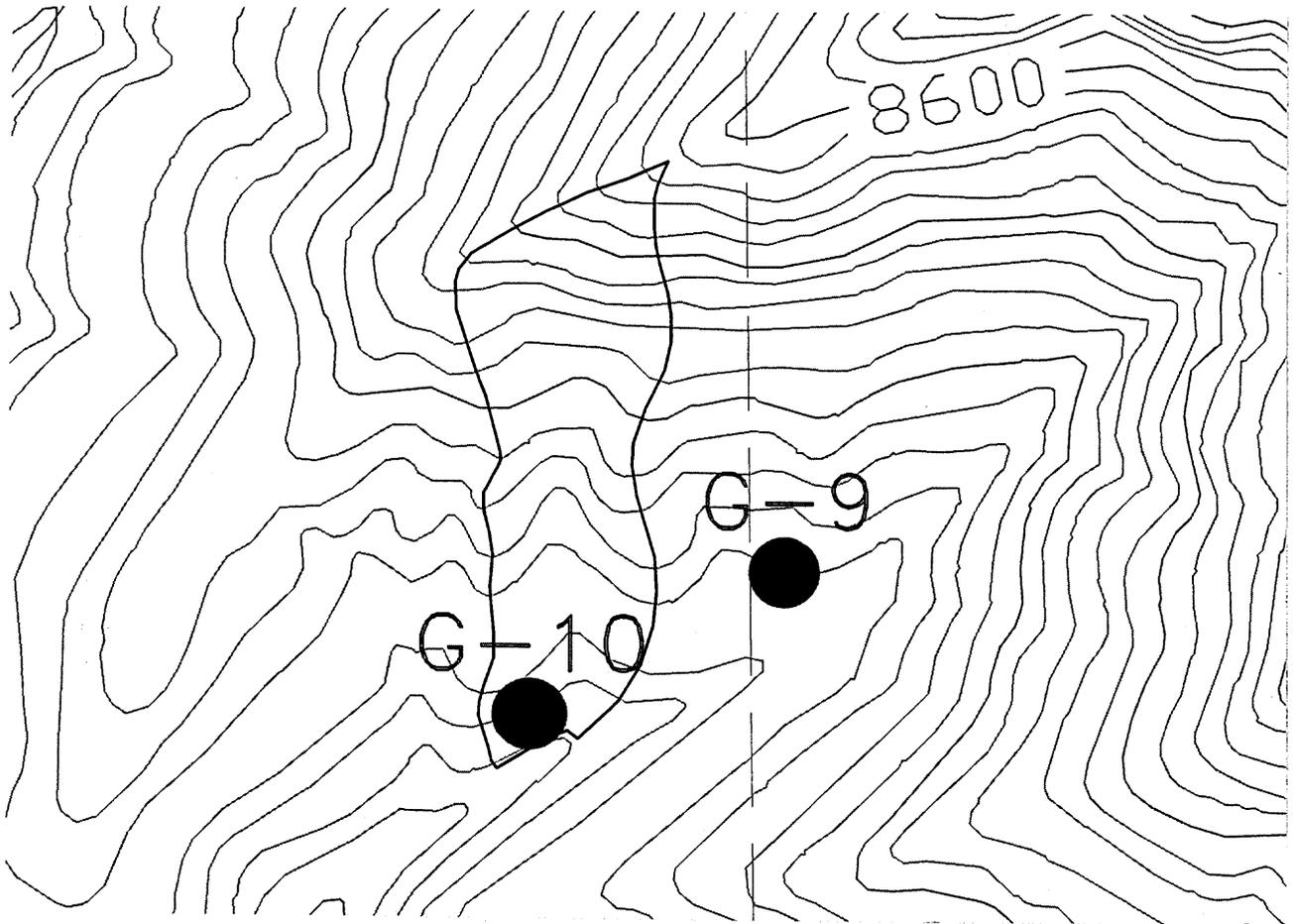
**ATTACHMENT 7-1
HYDROLOGY CALCULATIONS**



G-10 culvert

To access the pad for G-10 a road will need to be built over a small drainage.

The watershed Area is shown below



Scale 1" = 400'

Details regarding the watershed can be seen on the following page.

Curve Number

Soils in the area are a mix of Hydrologic soil group B and D with the majority being B. Assume a hydrologic soil group of C

The vegetation is mountain shrub, w/ some Douglas fir left after logging. Assume Pinon-juniper type in poor condition. Mountain shrub being close to Pinon-Juniper classification.

CN = 85 see page 3

Watershed Area a	Drainage Area (ac)	Curve Number	S (in)	Y (%)	I (ft)	L (hr)	Time of Conc. (hr)	Peak Flow (cfs)
G-10 WS	8.91	85	1.765	55	1300	0.045	0.075	3.02

Notes

S = 1000/CN - 10

Y = average watershed slope = (length of contour lines)(contour interval)/(watershed area)

I = hydraulic length

L = watershed lag = $(I^{0.8}(S+1)^{0.7}) / (1900(Y)^{0.5})$

Time of Concentration + 1.67L

Peak Flow is based on a 10-yr 6-hr storm event

Table 2-2d.—Runoff curve numbers for arid and semiarid rangelands¹

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹Average runoff condition, and L_s = 0.28. For range in humid regions, use table 2-2c.

²Poor <30% ground cover (litter, grass, and brush overstory)
 Fair 30 to 70% ground cover.
 Good >70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Triangular Hydrograph Calculations using
SCSHYDRO Program

Watershed I.D.:
G-10 Watershed

INPUT SUMMARY

STORM :	WATERSHED :
Dist.= SCS Type 'b'	Area = 8.91 acres
Depth = 1.35 inches	CN = 85.00
Duration = 6.0 hrs	Time conc.= 0.08 hrs

OUTPUT SUMMARY

Runoff depth: 0.360 inches
Initial abstr: 0.353 inches
Peak flow: 3.02 cfs (0.336 iph)
at time: 2.510 hrs

G-10 Culvert Design

Peak Flow = 3.02 cfs (pg 4)

Use at least an 18" culvert

Without developing a headwater the culvert can handle 5.5 cfs (see page 6) Assuming a 5' headwater the inlet capacity is 15 cfs. (pg 6)

Check culvert capacity and outlet velocity

Slope = $10/34 = 29.4\%$

Culvert Capacity = 30.8 cfs pg 6

Outlet Velocity = 11.09 fps pg 6

Outlet Riprap $D_{50} = 15"$ pg 11

Reclamation Channel

The site will be returned to the same topography as before construction of the pad began.

The slopes are: min slope = $5/22 = 22.7\%$

max. slope = $5/16 = 31.3\%$

Bottom width = 1 ft

Side slopes = 2:1

Depth = 1 ft

Riprap $D_{50} = 6"$ pg 11

Max Depth = 0.42 ft < .1

Max Velocity = 6.51 ft/s

Freeboard = 0.58 ft

See pages 7-8 for calculation sheets

See page 9 for channel cross-section

G-10 CULVERT

Worksheet for Circular Channel

Project Description

Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Input Data

Mannings Coeffic	0.024
Slope	294000 ft/ft
Diameter	18 in
Discharge	3.02 cfs

Results

Depth	0.32 ft
Flow Area	0.3 ft ²
Wetted Perime	1.43 ft
Top Width	1.22 ft
Critical Depth	0.66 ft
Percent Full	21.1 %
Critical Slope	0.017498 ft/ft
Velocity	11.09 ft/s
Velocity Head	1.91 ft
Specific Energ	2.23 ft
Froude Numbe	4.15
Maximum Disc	33.19 cfs
Discharge Full	30.85 cfs
Slope Full	0.002817 ft/ft
Flow Type	supercritical

7

G-10 RECL. CHAN. MIN. SLOPE Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coeffic	0.048 $K_{50} = 6''$ Slope = 22.7 %
Slope	227000 ft/ft
Left Side Slope	2.00 V : H
Right Side Slope	2.00 V : H
Bottom Width	1.00 ft
Discharge	3.02 cfs

Results	
Depth	0.42 ft < 1.0 ft \therefore ok freeboard = 0.58 ft
Flow Area	0.5 ft ²
Wetted Perim	1.93 ft
Top Width	1.42 ft
Critical Depth	0.59 ft
Critical Slope	0.070608 ft/ft
Velocity	6.02 ft/s
Velocity Head	0.56 ft
Specific Energy	0.98 ft
Froude Number	1.78
Flow Type	supercritical

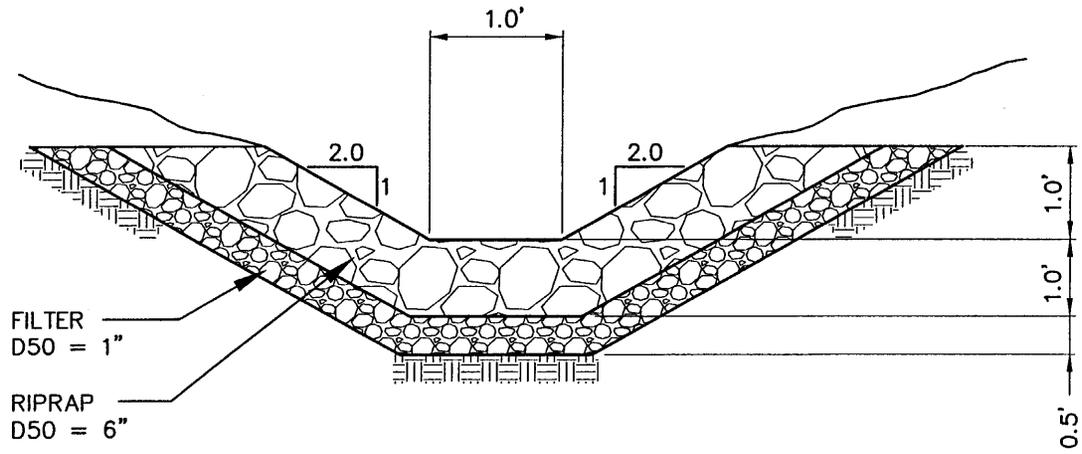
G-10 RECL. CHAN. MAX SLOPE
Worksheet for Trapezoidal Channel

8

Project Description	
Worksheet	Trapezoidal Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coeff	0.050 <i>0.50 = 6" Slope = 31.3%</i>
Slope	0.313000 ft/ft
Left Side Slope	2.00 V : H
Right Side Slope	2.00 V : H
Bottom Width	1.00 ft
Discharge	3.02 cfs

Results	
Depth	0.39 ft
Flow Area	0.5 ft ²
Wetted Perim	1.87 ft
Top Width	1.39 ft
Critical Depth	0.59 ft
Critical Slope	0.078171 ft/ft
Velocity	<u>6.51 ft/s</u> <i>< 7.5 fps ∴ ok</i>
Velocity Head	0.66 ft
Specific Energy	1.05 ft
Froude Number	1.99
Flow Type	supercritical

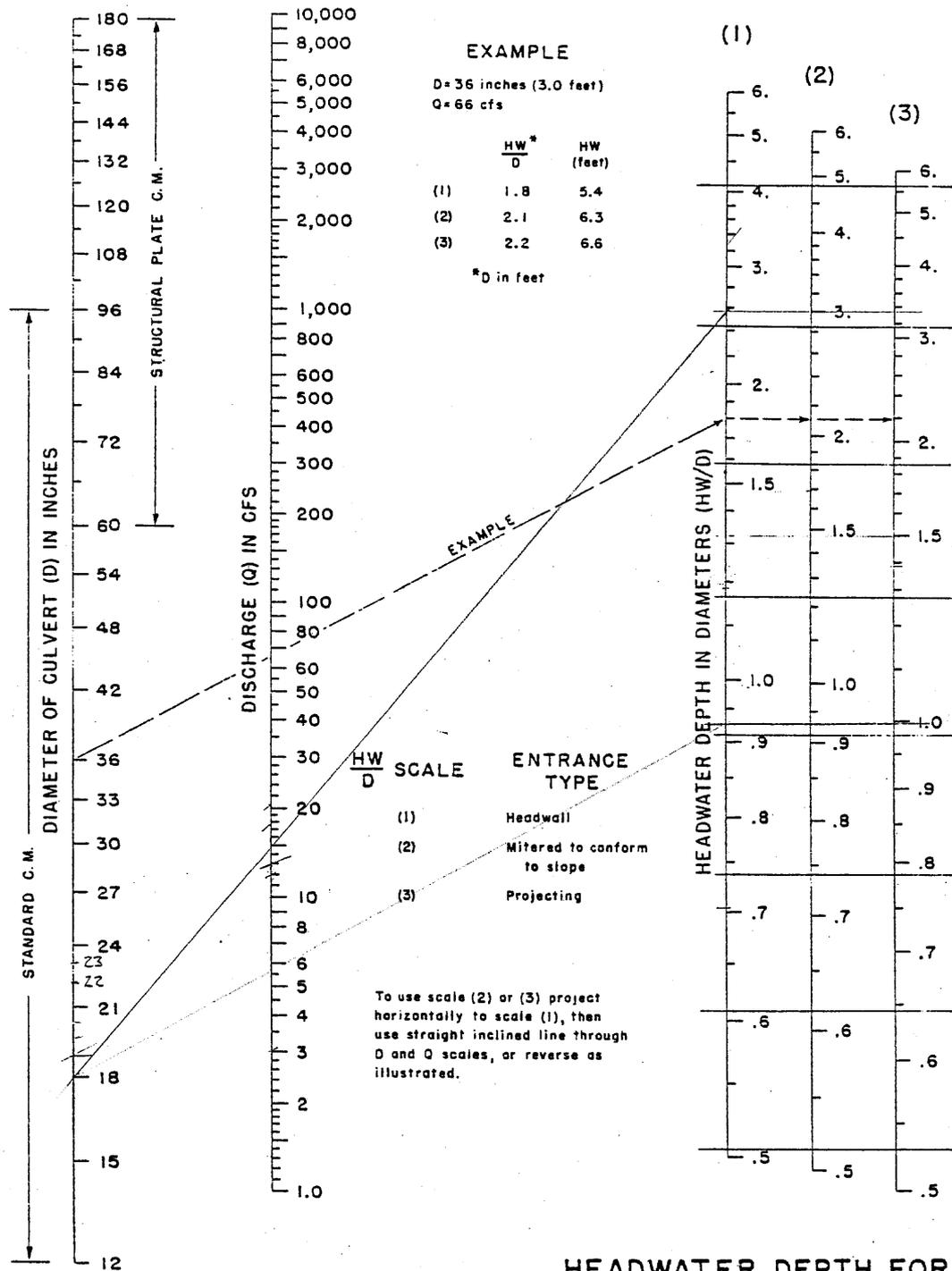


NO SCALE

G-10 RECLAMATION CHANNEL



CHART 5



BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR
 C. M. PIPE CULVERTS
 WITH INLET CONTROL

5-23

Ref (U.S. Dept. of Transportation, 1977)

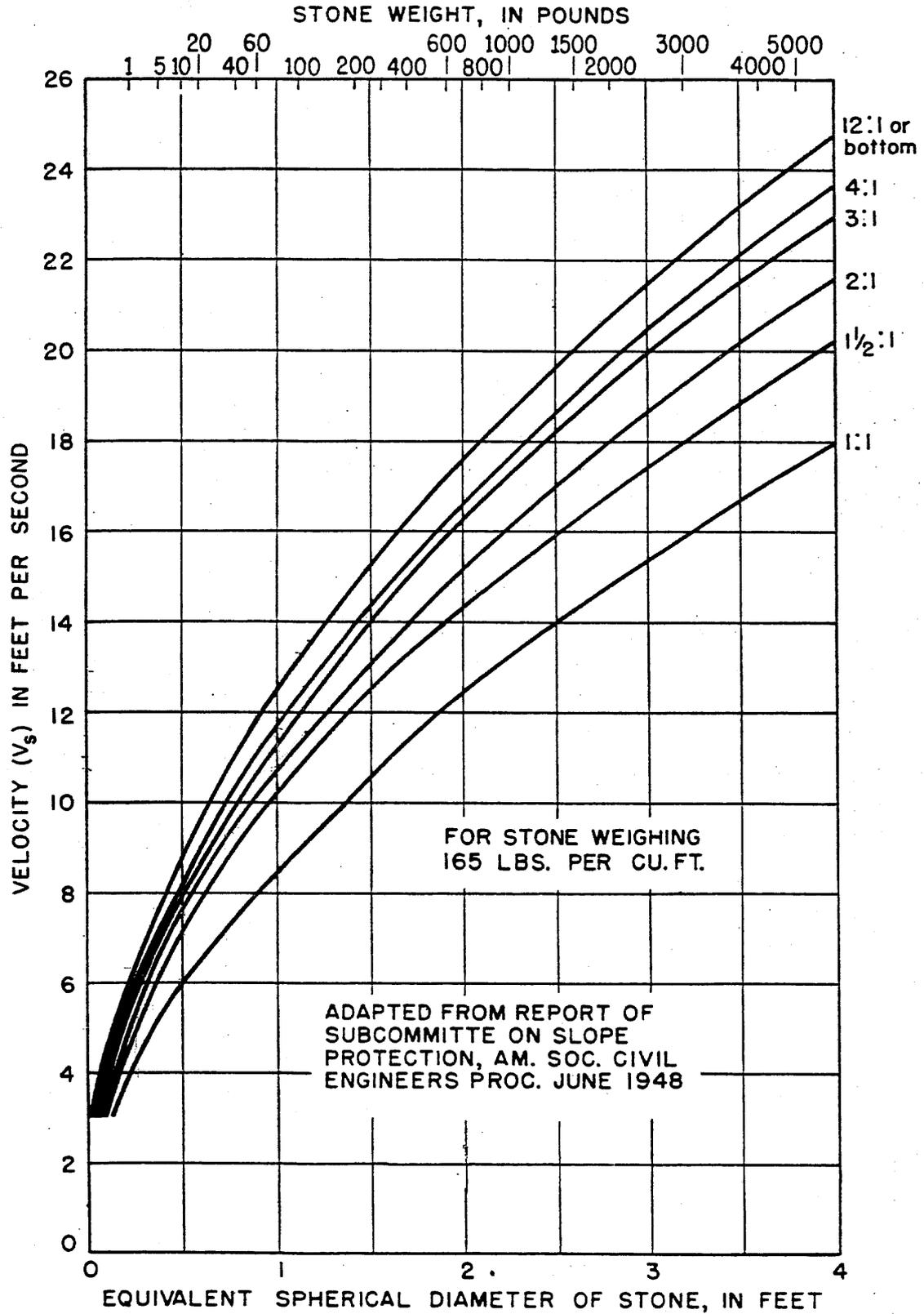


FIG. 2-SIZE OF STONE THAT WILL RESIST DISPLACEMENT FOR VARIOUS VELOCITIES AND SIDE SLOPES

Searcy, J.K. 1967. Use of Riprap for Bank Protection, U.S. Dept. of Transportation, Bureau of Public Roads, U.S. Government Printing Office, Washington D.C.

G-8

Topsoil Stockpile Containment Calculation

The volume of runoff to be contained will be based on a 10-yr 24-hr storm event of 2.0". A Hydrologic soil group of D will be assumed to be conservative.

CN = 89 (Dirt road) Very conservative estimate since the stockpile will be gouged and seeded.

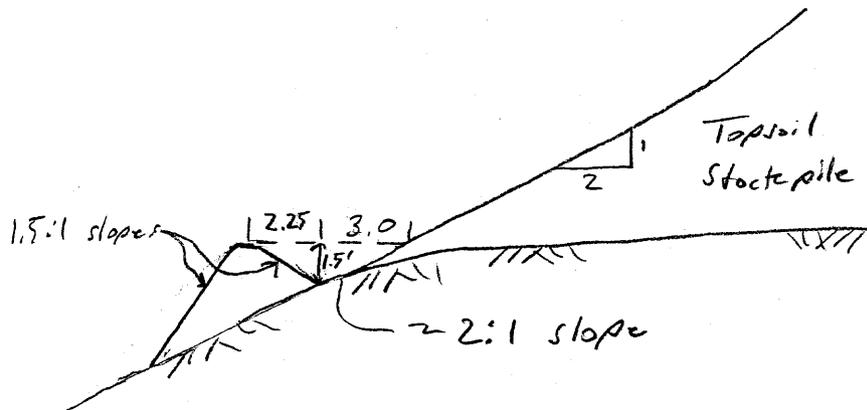
$$\text{Runoff Depth} = \frac{(P - 0.25)^2}{P + 0.8(S)}$$

$$S = \frac{1000}{CN} - 10 = \frac{1000}{89} - 10 = 1.24$$

$$\text{Runoff Depth} = \frac{(2.0 - 0.2(1.24))^2}{2.0 + 0.8(1.24)} = 1.03''$$

$$\text{Area within the berm} = 8706 \text{ ft}^2$$

$$\text{Runoff Volume} = (8706 \times 1.03''/12) = 747 \text{ ft}^3$$



$$\text{Area} = \frac{1}{2}(1.5)(2.25) + \frac{1}{2}(1.5)(3.0) = 3.94 \text{ ft}^2$$

berm should be built on contour to maximize storage. Berm length on contour = 280 ft

$$\text{Containment Volume} = (280') \times (3.94 \text{ ft}^2) = 1103 \text{ ft}^3$$

1103 > 747 ∴ OK

G-9

Topsoil Stockpile Containment Calculations.

Rainfall Depth = 2.0" (10-yr 24-hr)
Hydrologic soil group is a mix of B+D Assume C

CN = 87 (Dirt Road) Very conservative since the topsoil stockpile will be gouged and seeded.

$$S = 1000/87 - 10 = 1.494$$

$$\text{Runoff Depth} = \frac{(2.0 - 0.2(1.494))^2}{2.0 + 0.8(1.494)} = \frac{2.894}{3.195} = 0.91"$$

$$\text{Stockpile Area} = 12,425 \text{ ft}^2$$

$$\text{Runoff Volume} = (12,425 \text{ ft}^2) \times (0.91"/12) = 938 \text{ ft}^3$$

The stockpile will be gouged. The object of gouging is to eliminate all runoff and therefore erosion.

To quantify storage of the gouges I will assume a 2' x 3' x 2' deep depression every 80 ft². Assume a 1 ft² bottom.

$$\text{Gouge Volume} = \frac{1}{2}((2' \times 3') + 1)(2) = 7 \text{ ft}^3 \quad \text{Using Average End Area.}$$

$$\text{Gouge Capacity} = (12,425/80)(7 \text{ ft}^3) = 1087 \text{ ft}^3$$

$$1087 \text{ ft}^3 > 938 \text{ ft}^3 \therefore \text{OK}$$

Although the gouges should prevent runoff a berm will also provide additional storage if some of the gouges fail

The berm should have a minimum height of 1.5'

Assuming a conservative storage area of 4 ft² and a berm length of 60' An additional 240 ft³ of storage is available inside the berm.

G-10

The topsoil stockpile for this site is on a steep slope which makes total containment of the runoff very difficult.

To prevent the loss of any topsoil three sediment control methods will be used.

As possible the stockpile will be gauged before seeding.

The stockpile will be surrounded by a berm other than on the down slope end of the stockpile which will have a silt fence.

The berm will prevent runoff from up gradient from impacting the topsoil stockpile. The gauges will retain runoff and therefore sediment on the pile. The silt fence will treat any runoff not captured by the gauges.

The combination of these sediment control methods will prevent loss of the topsoil resource.