

C/041/002 Incoming



Canyon Fuel Company, LLC

A Subsidiary of Arch Western Bituminous Group, LLC.

#4450

R

Sufco Mine

Kenneth E. May
General Manager
597 South SR24
Salina, Utah 84654
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November 12, 2013

Permit Supervisor, Utah Coal Regulatory Program
Utah Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, UT 84114-5801

Re: Sediment Overflow Pond As-Built Amendment Deficiencies, Sufco Mine, Permit Number C/041/0002,
Task ID#4393

Dear Sirs:

Please find enclosed with this letter an amendment to the Sufco Mine Permit to address the as-built for the overflow pond at Sufco. We have included one redline/strikeout copy of the text and of the maps associated with this amendment.

An Order1 soil survey of the overflow pond soils completed by Robert Long is included in Appendix 2-2 as requested, as is a revised exhibit of the topsoil pile stored from the construction of the overflow sediment pond. The narrative of Section 2.2.4 was revised to be more clear, there areas which have the potential to provide growth medium/substitute topsoil for final reclamation, but the applicant cannot state accurate quantity or suitability of these soils. If you have questions or need addition information please contact Vicky Miller at (435)286-4481.

CANYON FUEL COMPANY, SUFCO Mine

Kenneth E. May
General Manager

Encl.

cc: DOGM Correspondence File

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DIV. OF OIL, GAS & MINING

CHAPTER 2

SOILS

2.2.4 Substitute Topsoil

~~The Applicant will collect substitute topsoil from the sediment pond dam slope, the fill slope above the sediment pond and from other suitable locations during final reclamation. A random composite sample will be taken for every 2000 tons as the soil is collected. The Applicant plans to utilize existing soil resources used in the surface pad construction. These soil resources will be supplemented with appropriate fertilizers and amendments (Section 2.30).~~

During final reclamation suitable growth medium/substitute topsoil will be collected at potential locations such as the upper sediment pond dam, the fill slope above the upper sediment pond and soil resources used to construct the original surface pad. The applicant has no sound method for calculating the quantity of growth medium/substitute topsoil available from these potential locations. The preconstruction topography is poor or non-existent and a record of the quantity of material used for the construction of these locations is not available. A random composite sample will be taken for approximately every 2,000 tons as the soil is collected to determine suitability as growth medium/substitute topsoil. The soil resources will be supplemented as described in Section 2.4.3.

2.30 Operation Plan

2.3.1 General Requirements

2.3.1.1 Removing and Storing Soil Methods

The SUFCO Mine has been in operation since 1941. At the time the main facilities in East Spring Canyon were constructed, no topsoil was segregated and saved. Topsoil and other fill material was used in construction of the surface facilities pad. However, soils removed from the Link Canyon Substation No. 1 area are to be stored in the outslope of the substation pad. Additionally, the soils removed from the Link Canyon Substation No.2 area will be stored in a small stockpile adjacent to the substation pad. The mix of topsoil and subsoil will be used as substitute topsoil at the time of reclamation. Soils removed from the Link Canyon Mine Portal area will be stored in a topsoil pile located south of the disturbed portal pad area out of the floodplain (Plate 5-2F). The majority of the portal area has been previously disturbed and only thin topsoil layers exist in

used as bedding material. The remaining sand will be spread over the disturbed area and also used to supplement the existing surface runoff control berms already in the tank area.

A 300,000 gallon fire water tank will be constructed in the fall of 2001 north of the mine site substation which is located on the hill side above the portals and mine buildings. Construction of the tank will require the removal of soils and weathered bedrock. The soils in the area consist of soils Type X as described in Section 2.2.2.3 of this chapter. A profile of the exposed soil in a cut adjacent to the substation and within the tank area was measured and described. The identified A 1 horizon extended from 1.5- to 7.5-inches below ground surface. The area had an average of 1.5 inches of vegetative litter from sage brush, pinyon, and junipers. The AC horizon extended from a depth of 7.5- to 12.0-inches below the surface. The Cca horizon extended from a depth of 12.0-inches to approximately 42-inches. Underlying this unit was weathered bedrock of sandstone and siltstone. A copy of the field log data sheet is included in Appendix 2-2.

Salvaged soil volumes for the disturbance related to construction of the fire water tank are based on the measured thicknesses described above of the A 1 (topsoil) horizon, underlying AC and Cca horizons (subsoils), and the cut and fill calculations provided on Figure 5-OE of Chapter 5 of this permit. The A1 horizon in the area appeared to have a maximum thickness of 6-inches. As described previously in this section, where the topsoil is less than 6-inches thick, a lift of 6-inches of topsoil and subsoil will be taken and stockpiled as topsoil. The removal of the first 6-inches of soil will be observed and measured in the field by the site construction supervisor or a trained representative. The total area where soil salvage will be performed is approximately 0.07 acres (3,049 sq ft). Based on this area, the following volumes of salvaged soils ~~were estimated: have been calculated:~~

A1 or topsoil - maximum thickness 0.5 ft.

0.5 ft X 3,049 sq ft = 1,525 cu ft (~56 cu yds)

~~The volume of salvagable topsoil Total volume may vary varied from the volume originally calculated since one due to large sandstone boulders present in the cut area and reduced the salvable topsoil significantly, from the estimate ~56 cu yds to 8.2 cu yds. Actual size of the boulder is unknow at this time.~~

AC and Cca horizon - average thickness of approximately 3 ft
3 ft X 3,049 sq ft = 9,147 cu ft (~339 cu yds)*

~~*Total volumes may vary from calculated since one large sandstone boulder is present in the cut area. Actual size of the boulder is unknown at this time.~~

The topsoil will be removed first and transported for storage at the waste rock storage site. It will be signed and stored separately from other piles located at the site. The subsoils will be removed to a depth of 42-inches or to the boundary with the weathered bedrock. Approximately 109 cu yds of subsoil and weathered bedrock will be used as fill material at the water tank site. The remaining subsoils will be transported to the waste rock site and stored with the subsoils removed previously from the minesite. Storage of the topsoil and subsoil piles will be done in accordance with Section 2.3.1.4 of this M&RP.

The topsoil removed from construction of the overflow pond and overflow pond access road will be stockpiled on a stable surface southwest of the overflow pond, see Plate 7-4A. According to Plate 2-1 the overflow pond site consists of type T soil. The A horizon is 0 to 2 inches in depth and the B horizon is 2-12 inches in depth. The topsoil stockpile will be segregated between A and B horizons. Much of the site of the overflow pond is on steep hill sides where topsoil is less than 6 inches deep. Assuming an average of 12 inches of removal the following quantities have been calculated:

0.167 ft X 49,950 sq ft = 8,342 cu ft (~309 cy) horizon A
0.833 ft X 49,950 sq ft = 41,608 cu ft (~1,541 cy) horizon B
Total 309 cy + 1,541 cy = 1,850 cy

A site specific soil survey will be completed for the Overflow Pond prior to disturbance and this information will be utilized in determining topsoil salvage depth. During topsoil removal observations and measurements in the field will be conducted by the site construction supervisor or a trained representative. **Actual volume of topsoil removed and stockpiled for the Overflow Pond was 1,488 cubic yards.**

During the topsoil removal operation for the temporary access road for the construction of the bypass culvert portion of the overflow pond, the total depth of soil removal will be based upon the color change between the upper most and underlying layer and the use of a tape measure. For calculation purposes, the upper layer of soils was assumed to average 12-inches. Therefore, the total material removed prior to excavating the bypass culvert trench is:

$13000 \text{ sq ft} \times 1.0 \text{ ft} = 13000 \text{ cubic feet}$ or approximately 482 cubic yards.

The 482 yards of salvaged soils will be removed and placed adjacent to the new bypass culvert trench location. The remaining material, C2 horizon, will be excavated from the trench and temporarily stored adjacent to the excavation but not mixed with the 482 cubic yards of salvaged soil. After the culvert is placed, the excavated C2 material will be replaced in the trench and any remaining material will be evenly spread over the disturbed trench area. The salvaged 482 cubic yards of soils will then be spread over the disturbed area. The surface will be left in a roughened state to reduce erosion. Reseeding of the area followed the completion of construction in 2010. ~~Will take place as soon as practical.~~

2.3.1.2 Suitability of Topsoil Substitutes/Supplements

See Section 2.3.3.2

2.3.1.3 Testing of Topsoil Handling and Reclamation Procedures Regarding Revegetation

The Applicant will exercise care to guard against erosion during and after application of topsoil and will employ the necessary measures to ensure the stability of topsoil on graded slopes. Erosion control measures will include surface roughing and erosion mat placement on slope areas thought to be unstable. The Applicant will fill, regrade, or otherwise stabilize any rills or gullies deeper than nine (9) inches which form in areas which have been regraded and topsoiled. The areas adjacent to any rills or gullies which have been filled, regraded or otherwise stabilized, will be reseeded or stabilized accordingly.

Methods used to evaluate success of revegetation and stabilization appear in page 37 of Appendix 2-2. Erosion monitor pins will be placed on the slopes at the time of reseeding. Locations of the erosion pins will be obtained via a random number generator. The pin locations will be surveyed and revegetation analyses conducted annually following completion of reseeding, until the release of the bond.

2.3.1.4 Construction, Modification, Use, and Maintenance of Topsoil Storage Piles

The topsoil storage piles (Plate 2-1) at the SUFCO Mine in East Spring Canyon area consist of small amounts of topsoil, from the substation pad (27 cubic yards) and the area where the sediment pond (1,200 cubic yards) was constructed. The topsoil materials were segregated and stockpiled. The stockpiled materials were selectively placed in small area exemption areas within the permit area on stable surface areas below the sediment pond (0.105 acres) and on the south end of the substation pad (0.02 acre). The topsoil small area exemption stockpiles are isolated with no means of access from the main surface area to protect the topsoil from contaminants and unnecessary compaction that would interfere with vegetation. A topsoil storage sign was installed at the base of each stockpile. The stockpiles were protected from wind and water erosion by being revegetated with a quick growing vegetative cover (proposed seed mix minus the shrubs and trees) and by installing silt fence below the stockpiles to help trap sediment coming off the stockpile. This topsoil will not be moved or disturbed until required for redistribution during final reclamation.

Topsoil from the Overflow Pond will be placed in a topsoil pile located southwest of the overflow pond area. This storage area will be protected with berms and/or silt fences, a three-strand barbwire fence, and revegetated with a quick growing vegetative cover (standard seed mix in section 3.4.1.2 minus the shrubs and trees) to control erosion. The surface of the topsoil pile will be pitted to reduce runoff and erosion. This soil will not be moved or disturbed until it is required for redistribution during final reclamation. **A figure of the surveyed topsoil stockpile and estimated quantity of soil stored in the pile is included in Appendix 2-2. Plate 5-2B shows the as-built features associated with the overflow pond.**

APPENDIX 2-2

**Report of Studies of Vegetation and Soils for
SUFCO Mine**



Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801

(307) 672-8945

Soil Analysis Report

Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Date Reported: 10/2/2009

Work Order: S0909487

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	PE			PE		
							Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	SAR	
S0909487-001	S-1-09	0-6	7.8	45.9	0.64	3.2	4.90	1.08	0.25	0.62	0.36	
S0909487-002	S-1-09	6-13	7.5	49.8	0.97	1.7	7.86	1.91	0.17	0.85	0.38	
S0909487-003	S-1-09	13-20	7.3	49.1	1.90	2.0	18.0	4.19	0.17	1.54	0.46	
S0909487-004	S-1-09	20-32	6.9	37.4	3.92	8.0	34.5	33.1	0.29	1.15	0.20	
S0909487-005	S-1-09	32-42	7.0	43.5	3.59	9.5	32.4	30.3	0.12	0.91	0.16	
S0909487-006	S-1-09	42-54	7.4	40.0	2.31	4.6	15.9	17.1	0.22	2.03	0.50	
S0909487-007	S-1-09	54-72	7.6	36.1	2.07	3.4	16.2	12.6	0.38	1.49	0.39	
S0909487-008	S-3-09	0-8	7.3	56.9	0.80	9.5	5.83	2.44	0.41	0.58	0.28	
S0909487-009	S-3-09	8-19	7.3	58.4	0.45	7.9	2.82	1.52	0.08	0.24	0.16	
S0909487-022	S-3-09	19-30	6.5	86.0	0.43	3.8	2.29	1.61	0.20	0.43	0.31	
S0909487-010	S-3-09	30-39	7.2	35.1	0.61	3.2	4.01	1.74	0.13	0.40	0.24	
S0909487-011	S-3-09	39-45	7.5	34.8	0.51	2.6	3.41	1.36	0.13	0.24	0.15	
S0909487-012	S-3-09	45-60	8.0	24.4	0.36	0.8	1.71	0.93	0.12	0.42	0.36	
S0909487-013	S-3-09	60-73	8.1	26.5	0.31	1.4	2.28	0.91	0.20	0.16	0.13	
S0909487-014	S-3-09	73-82	7.7	53.3	0.53	4.4	3.42	1.17	0.19	0.17	0.11	
S0909487-015	S-3-09	82-94	8.3	21.4	0.25	0.4	2.60	1.33	0.45	0.17	0.12	
S0909487-016	S-4-09	0-6	7.4	34.5	1.36	4.1	5.53	5.25	0.25	4.67	2.01	
S0909487-017	S-4-09	6-12	7.2	51.0	0.84	6.7	4.06	2.35	0.24	2.36	1.32	
S0909487-018	S-4-09	12-24	7.2	60.6	0.76	5.3	3.81	2.53	0.19	1.63	0.92	
S0909487-019	S-4-09	24-36	7.1	37.5	0.80	6.5	4.02	2.56	0.18	1.71	0.95	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAQ= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801

(307) 672-8945

Soil Analysis Report

Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Sand			Silt %	Clay %	Texture	Very Fine		CO3 %
			Sand %	Silt %	Clay %				Sand %	Sand %	
S0909487-001	S-1-09	0-6	50.0	25.0	25.0	25.0	Sandy Clay Loam	21.9	9.3	9.3	
S0909487-002	S-1-09	6-13	48.0	26.0	26.0	26.0	Sandy Clay Loam	21.6	7.6	7.6	
S0909487-003	S-1-09	13-20	40.0	29.0	29.0	31.0	Clay Loam	15.2	9.3	9.3	
S0909487-004	S-1-09	20-32	42.0	33.0	33.0	25.0	Loam	9.0	25.6	25.6	
S0909487-005	S-1-09	32-42	52.0	24.0	24.0	24.0	Sandy Clay Loam	6.3	19.1	19.1	
S0909487-006	S-1-09	42-54	32.0	39.0	39.0	29.0	Clay Loam	4.4	29.8	29.8	
S0909487-007	S-1-09	54-72	34.0	37.0	37.0	29.0	Clay Loam	5.8	32.9	32.9	
S0909487-008	S-3-09	0-8	69.0	18.0	18.0	13.0	Sandy Loam	11.8	12.0	12.0	
S0909487-009	S-3-09	8-19	81.0	11.0	11.0	8.0	Loamy Sand	7.3	10.1	10.1	
S0909487-022	S-3-09	19-30	98.0	<0.1	<0.1	2.0	Sand	5.9	1.3	1.3	
S0909487-010	S-3-09	30-39	72.0	16.0	16.0	12.0	Sandy Loam	14.0	12.5	12.5	
S0909487-011	S-3-09	39-45	66.0	17.0	17.0	17.0	Sandy Loam	13.7	16.7	16.7	
S0909487-012	S-3-09	45-60	87.0	7.0	7.0	6.0	Loamy Sand	0.6	11.5	11.5	
S0909487-013	S-3-09	60-73	80.0	10.0	10.0	10.0	Loamy Sand	10.7	21.6	21.6	
S0909487-014	S-3-09	73-82	44.0	33.0	33.0	23.0	Loam	13.5	21.8	21.8	
S0909487-015	S-3-09	82-94	92.0	3.0	3.0	5.0	Sand	4.4	11.1	11.1	
S0909487-016	S-4-09	0-6	78.0	12.0	12.0	10.0	Sandy Loam	11.5	15.9	15.9	
S0909487-017	S-4-09	6-12	64.0	23.0	23.0	13.0	Sandy Loam	16.2	19.2	19.2	
S0909487-018	S-4-09	12-24	39.0	41.0	41.0	20.0	Loam	19.6	21.4	21.4	
S0909487-019	S-4-09	24-36	74.0	15.0	15.0	11.0	Sandy Loam	13.4	17.0	17.0	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/21/2009
Work Order: S0909487

Project: Sufco Sed. Pond
Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Selenium ppm	Boron ppm	Nitrogen		Available		Total	
					Nitrate ppm	Phosphorus ppm	Potassium meq/100g	Carbon %	TOC %	
S0909487-001	S-1-09	0-6	<0.02	1.36	4.8	4.2	0.08	5.0	4.0	
S0909487-002	S-1-09	6-13	<0.02	0.94	32.3	26.4	0.05	3.6	2.7	
S0909487-003	S-1-09	13-20	<0.02	0.90	64.0	16.6	0.05	4.5	3.5	
S0909487-004	S-1-09	20-32	0.21	4.49	61.8	4.3	0.03	19.9	16.9	
S0909487-005	S-1-09	32-42	0.07	5.50	44.3	3.7	0.02	29.9	27.7	
S0909487-006	S-1-09	42-54	0.04	2.27	20.2	3.3	0.02	9.1	5.6	
S0909487-007	S-1-09	54-72	0.02	1.32	12.7	6.3	0.03	6.2	2.5	
S0909487-008	S-3-09	0-8	<0.02	2.44	18.0	17.7	0.07	35.8	34.6	
S0909487-009	S-3-09	8-19	<0.02	4.39	0.3	3.1	0.01	49.4	48.4	
S0909487-022	S-3-09	19-30	<0.02	5.14	5.6	3.7	<0.01	67.8	67.7	
S0909487-010	S-3-09	30-39	<0.02	2.58	10.1	54.1	0.02	2.5	1.1	
S0909487-011	S-3-09	39-45	<0.02	1.79	7.0	40.4	0.01	3.0	0.9	
S0909487-012	S-3-09	45-60	<0.02	0.44	<0.1	18.0	<0.01	1.4	0.3	
S0909487-013	S-3-09	60-73	<0.02	0.81	1.0	27.8	<0.01	2.3	<0.1	
S0909487-014	S-3-09	73-82	<0.02	2.11	6.7	16.6	0.03	4.1	1.5	
S0909487-015	S-3-09	82-94	<0.02	0.44	<0.1	7.3	<0.01	1.0	<0.1	
S0909487-016	S-4-09	0-6	<0.02	1.20	<0.1	8.0	0.01	9.6	8.1	
S0909487-017	S-4-09	6-12	<0.02	2.22	<0.1	12.6	0.02	10.6	8.2	
S0909487-018	S-4-09	12-24	<0.02	1.82	1.1	11.2	0.02	11.1	8.6	
S0909487-019	S-4-09	24-36	<0.02	1.54	1.5	5.6	0.01	26.1	24.1	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009
Work Order: S0909487

Project: Sufco Sed. Pond
Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Total Sulfur %	T.S.		Neutral.		T.S.	
				AB µ/1000t	ABP µ/1000t	Potential µ/1000t	ABP µ/1000t		
S0909487-001	S-1-09	0-6	0.04	1.17	87.0	87.0	85.9		
S0909487-002	S-1-09	6-13	0.02	0.71	74.0	74.0	73.3		
S0909487-003	S-1-09	13-20	0.04	1.18	84.1	84.1	82.9		
S0909487-004	S-1-09	20-32	0.20	6.20	248	248	242		
S0909487-005	S-1-09	32-42	0.28	8.69	188	188	180		
S0909487-006	S-1-09	42-54	0.05	1.61	297	297	296		
S0909487-007	S-1-09	54-72	0.01	0.37	309	309	308		
S0909487-008	S-3-09	0-8	0.18	5.58	100	100	94.6		
S0909487-009	S-3-09	8-19	0.25	7.73	85.7	85.7	78.0		
S0909487-022	S-3-09	19-30	0.31	9.63	13.8	13.8	4.16		
S0909487-010	S-3-09	30-39	<0.01	<0.01	115	115	115		
S0909487-011	S-3-09	39-45	0.02	0.51	174	174	174		
S0909487-012	S-3-09	45-60	<0.01	<0.01	92.6	92.6	92.6		
S0909487-013	S-3-09	60-73	<0.01	<0.01	187	187	187		
S0909487-014	S-3-09	73-82	0.02	0.62	218	218	217		
S0909487-015	S-3-09	82-94	<0.01	<0.01	86.9	86.9	86.9		
S0909487-016	S-4-09	0-6	0.05	1.70	130	130	128		
S0909487-017	S-4-09	6-12	0.07	2.17	208	208	205		
S0909487-018	S-4-09	12-24	0.20	6.13	202	202	196		
S0909487-019	S-4-09	24-36	0.23	7.17	170	170	163		

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond
Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical		PE		PE		PE	
					Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	SAR	
S0909487-020	S-4-09	36-48	7.1	44.5	0.85	5.1	4.72	3.20	0.21	1.46	0.73	
S0909487-021	S-4-09	48-54	7.1	45.6	0.90	5.5	5.34	3.34	0.23	1.57	0.75	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A. Secor
Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801

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Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Very Fine					
			Sand %	Silt %	Clay %	Texture	Sand %	CO3 %
S0909487-020	S-4-09	36-48	70.0	18.0	12.0	Sandy Loam	15.8	12.3
S0909487-021	S-4-09	48-54	65.0	22.0	13.0	Sandy Loam	13.8	14.4

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AA0= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

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Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Selenium ppm	Boron ppm	Nitrogen		Available		Total	
					Nitrate ppm	Phosphorus ppm	Potassium meq/100g	Carbon %	TOC %	
S0909487-020	S-4-09	36-48	<0.02	1.70	<0.1	7.0	0.02	29.8	28.5	
S0909487-021	S-4-09	48-54	<0.02	1.34	0.3	7.2	0.01	19.7	18.2	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2Oso= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Total Sulfur %	T. S.		Neutral.		T. S.	
				AB	ABP	Potential	ABP	AB	ABP
				1/1000t	1/1000t	1/1000t	1/1000t	1/1000t	1/1000t
S0909487-020	S-4-09	36-48	0.45	14.0	113	113	99.1		
S0909487-021	S-4-09	48-54	0.27	8.32	125	116			

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2SO4= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAC= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T. S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A. Secor
Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909486001

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Date Reported: 10/2/2009

Work Order: S0909486

Lab ID	Sample ID	Depths Inches	pH S.U.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	PE		PE		PE	
							Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	SAR	
S0909486-001	S-2-09	2-5	7.4	51.8	1.18	7.6	4.90	4.24	1.67	2.12	0.99	
S0909486-002	S-2-09	5-10	7.5	30.8	0.69	3.9	3.14	2.15	1.26	0.95	0.58	
S0909486-003	S-2-09	10-18	7.7	31.8	0.81	4.2	3.81	1.93	1.34	1.09	0.64	
S0909486-004	S-2-09	18-28	7.8	31.1	0.71	2.6	2.41	1.75	0.95	1.54	1.07	
S0909486-005	S-2-09	28-40	8.0	38.0	0.74	4.7	1.94	2.06	1.06	2.60	1.84	
S0909486-006	S-2-09	40-51	8.0	24.7	0.46	1.7	1.45	1.01	0.75	0.87	0.79	
S0909486-007	S-2-09	51-65	7.8	27.0	0.52	2.1	2.30	1.28	0.81	0.80	0.60	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

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Soil Analysis Report
Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0909486001

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Date Reported: 10/2/2009

Work Order: S0909486

Lab ID	Sample ID	Depths Inches	Sand			Clay %	Texture	Very Fine		Nitrogen		Available	
			%	Silt %	Sand %			CO3 %	Nitrate ppm	Phosphorus ppm	Potassium meq/100g		
S0909486-001	S-2-09	2-5	54.0	26.0	20.0	Sandy Clay Loam	14.2	20.7	0.6	30.4	0.10		
S0809486-002	S-2-09	5-10	72.0	16.0	12.0	Sandy Loam	6.5	21.6	0.1	11.2	0.05		
S0909486-003	S-2-09	10-18	64.0	21.0	15.0	Sandy Loam	9.7	21.9	0.9	17.8	0.06		
S0909486-004	S-2-09	18-28	56.0	29.0	15.0	Sandy Loam	11.7	31.3	<0.1	5.6	0.04		
S0909486-005	S-2-09	28-40	52.0	27.0	21.0	Sandy Clay Loam	<0.1	25.2	<0.1	6.4	0.07		
S0909486-006	S-2-09	40-51	82.0	10.0	8.0	Loamy Sand	38.7	21.0	<0.1	3.6	0.03		
S0909486-007	S-2-09	51-65	70.0	20.0	10.0	Sandy Loam	5.1	24.6	<0.1	3.8	0.03		

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A. Secor
Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0909486001

Project: Sulco Sed. Pond

Date Received: 9/23/2009

Date Reported: 10/2/2009

Work Order: S0909486

Lab ID	Sample ID	Depths Inches	Total		Neutral	
			Carbon %	TOC %	Potential V/1000t	Potential
S0909486-001	S-2-09	2-5	9.4	6.9	207	
S0909486-002	S-2-09	5-10	4.2	1.6	216	
S0909486-003	S-2-09	10-18	5.5	2.9	219	
S0909486-004	S-2-09	18-28	5.7	1.9	313	
S0909486-005	S-2-09	28-40	5.1	2.1	252	
S0909486-006	S-2-09	40-51	3.0	0.5	210	
S0909486-007	S-2-09	51-65	4.3	1.4	246	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A. Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0910070001

Project: Sufco Sed Pond

Date Received: 10/6/2009

Date Reported: 10/13/2009

Work Order: S0910070

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	PE			PE		
							Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	Sulfur meq/L	SAR
S0910070-001	S-5-09	1-5	7.3	73.2	0.85	13.0	4.96	1.80	1.08	0.91	0.49	
S0910070-002	S-5-09	5-12	7.6	33.8	0.76	4.2	2.97	1.18	0.58	2.47	1.71	
S0910070-003	S-5-09	12-18	7.6	37.5	0.70	4.7	3.61	1.49	0.75	0.73	0.46	
S0910070-004	S-5-09	18-30	7.6	39.9	0.78	3.6	3.34	1.69	0.46	1.96	1.24	
S0910070-005	S-5-09	30-43	7.6	42.7	0.70	5.1	3.21	1.55	0.27	1.40	0.91	
S0910070-006	S-5-09	43-47	7.5	38.5	1.65	4.8	9.74	3.45	0.38	1.82	0.71	
S0910070-007	S-5-09	47-63	7.6	28.8	1.78	1.6	10.2	4.39	0.33	2.58	0.95	
S0910070-008	S-5-09	63-68	7.5	32.6	2.77	1.9	17.6	6.91	0.64	3.79	1.08	
S0910070-009	S-5-09	68-76	7.6	36.1	3.18	1.8	18.5	10.6	0.91	6.02	1.58	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osoj= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A. Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0910070001

Project: Sufco Sed Pond
Date Received: 10/6/2009

Date Reported: 10/13/2009
Work Order: S0910070

Lab ID	Sample ID	Depths Inches	Sand			Silt %	Clay %	Texture	Very Fine			Nitrogen		Available	
			%	Sand %	CO3 %				Nitrate ppm	Phosphorus ppm	Potassium meq/100g				
S0910070-001	S-5-09	1-5	57.0	26.0	17.0	17.0	Sandy Loam	20.4	23.0	0.3	13.2	0.87			
S0910070-002	S-5-09	5-12	63.0	22.0	15.0	15.0	Sandy Loam	7.2	30.3	0.3	6.88	0.37			
S0910070-003	S-5-09	12-18	69.0	19.0	12.0	12.0	Sandy Loam	12.9	24.6	5.9	7.14	0.44			
S0910070-004	S-5-09	18-30	60.0	22.0	18.0	18.0	Sandy Loam	11.1	26.8	4.6	6.53	0.37			
S0910070-005	S-5-09	30-43	53.0	26.0	21.0	21.0	Sandy Clay Loam	5.1	27.9	<0.1	6.31	0.32			
S0910070-006	S-5-09	43-47	63.0	17.0	20.0	20.0	Sandy Clay Loam	2.3	24.5	0.5	6.26	0.24			
S0910070-007	S-5-09	47-63	73.0	12.0	15.0	15.0	Sandy Loam	6.4	33.3	0.5	4.04	0.13			
S0910070-008	S-5-09	63-68	57.0	24.0	19.0	19.0	Sandy Loam	4.7	25.9	0.9	4.00	0.29			
S0910070-009	S-5-09	68-76	57.0	23.0	20.0	20.0	Sandy Clay Loam	4.9	27.4	0.9	4.08	0.33			

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2Osoi= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PysS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A. Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report

Canyon Fuel Company, LLC.
397 South 800 West
Salina, UT 84654

Report ID: S0910070001

Project: Sufco Sed Pond

Date Received: 10/6/2009

Date Reported: 10/13/2009

Work Order: S0910070

Lab ID	Sample ID	Depths Inches	Total		Neutral	
			Carbon %	TOC %	Potential U/1000t	Potential
S0910070-001	S-5-09	1-5	13.7	11.0	230	
S0910070-002	S-5-09	5-12	5.8	2.1	303	
S0910070-003	S-5-09	12-18	4.7	1.7	246	
S0910070-004	S-5-09	18-30	5.2	1.9	268	
S0910070-005	S-5-09	30-43	5.8	2.4	279	
S0910070-006	S-5-09	43-47	5.5	2.6	245	
S0910070-007	S-5-09	47-63	4.0	<0.1	333	
S0910070-008	S-5-09	63-68	4.0	0.9	259	
S0910070-009	S-5-09	68-76	4.0	0.7	274	

These results apply only to the samples tested.

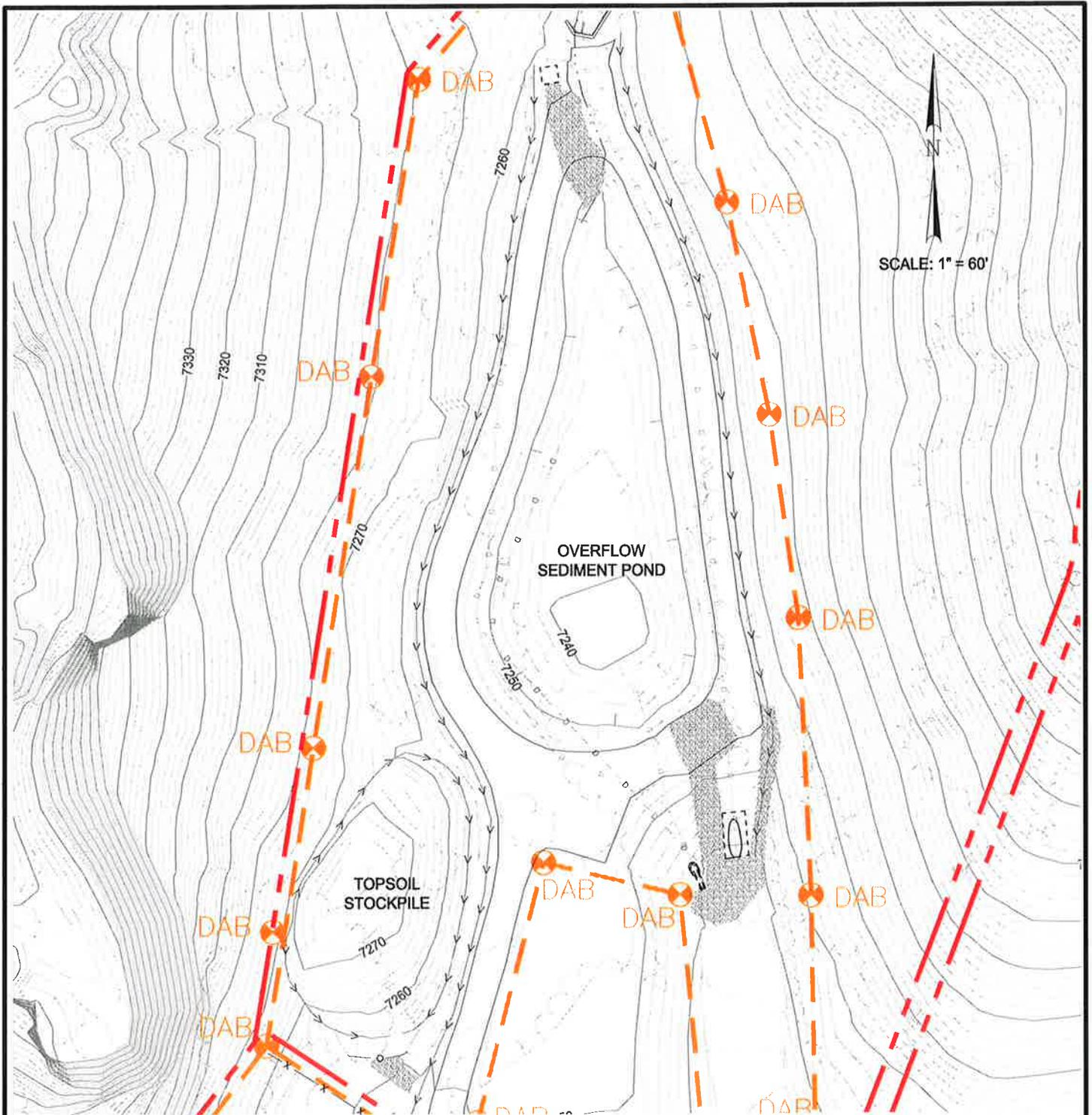
Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Unadjusted Cut yards	Fill yards	Net yards	Method
TOPSOIL	topsoil	topsoil-base	topsoil-pile	0	1486 Cu. Yds.	1486 (F)	Grid
				0	1488 Cu. Yds.	1488 (F)	Composite
				0	1488 Cu. Yds.	1488 (F)	End area



Canyon Fuel Company, LLC
SUFco Mine
 597 South SR 24 - Salina, UT 84654
 (435) 286-4980 Phone
 (435) 286-4499 Fax

Sufco - Overflow Sediment Pond
Topsoil Stockpile Quantity Exhibit

SCALE: 1" = 60' DATE: 10/31/2013 DRAWN BY: K.B.B.
 ENGINEER: V.M. CHECKED BY: K.B.B. PROJ: ####
 FILE NAME: H:\SURVEY\IN\SURFACE\YARD\SED Pond_Staking-09\dwg

SHEET NO.
Appendix
2-2

**Soil Survey
Settling Pond Construction Area
SUFCO Mine**

Prepared by

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Springville, Utah 84663
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by

Robert E. Long, CPSS

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for

CANYON FUEL COMPANY, LLC.

SUFCO MINE
397 South 800 West
Salina, Utah 84654

October 15, 2009

SUFCO Settling Pond Soil Survey

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Purpose of This Soil Survey

The purpose of this soil survey was to determine the depths of topsoil that can be salvaged in an area that is proposed for construction of a settling pond at the SUFCO mine in Sevier County, Utah. Suitable and “unacceptable” sources of soil materials within the proposed project boundaries were identified during this soil survey.

Project Area

The proposed settling pond area is approximately 24 miles east of Salina, Utah and 9 miles west of Emery, Utah, figure 1. The proposed area is in a side drainage of Convulsion Canyon (West half of Section 12, Township 22 South, Range 4 East, Salt Lake Base Meridian), figure 2. The area is located on lands administered by the Fishlake National Forest. Elevation ranges from approximately 7,230 to 7,320 feet.

The SUFCO settling pond area is drained by a tributary of Quitcupah Creek, which flows into Ivie Creek and then into Muddy Creek.

Native vegetation in the proposed settling pond area consists of Gamble oak, Rocky mountain juniper in the wooded upland areas; and willows along the drainage. Portions of the very steep slope on the west side of the project have been seeded with crested wheatgrass.

Climate

An official U.S. Weather Bureau station is located at the SUFCO mine office building Salina 24E, Utah. The period of available records is July 1986 through December 2000. Average annual precipitation is 14.58 inches. The four wettest months are May (1.27 inches), July (1.23 inches), August (1.92 inches), and September (1.60 inches). The average annual air temperature is 42.7°F. The precipitation pattern is ustic. The soil temperature regime is either frigid or cryic depending on physiographic setting and aspect (USDA – Fishlake National Forest, 2009). Table 1 contains a summary of climate data for the Salina 24E station.

Table 1. Climate data for U.S. Weather Bureau station (Salina 24E, Utah) maintained by the SUFCO mine (Western Regional climate Center, 2009).

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Ave Max Temp °F	32.0	35.2	42.6	50.4	60.2	70.9	77.4	75.3	67.1	55.1	39.1	32.0	53.3
Ave Max Temp °F	14.9	18.1	23.7	29.7	37.1	44.7	51.3	50.7	42.7	32.9	21.8	14.9	32.0
Ave Total Precip. Inches	1.15	1.12	1.15	1.08	1.27	0.94	1.23	1.92	1.60	1.31	1.00	0.82	14.58

How this Soil Survey was Made

This soil survey was made in accordance with the guidelines for an order 2 soil survey as detailed in the *Soil survey Manual* (USDA 1993). Soils were classified using *Keys to Soil Taxonomy, Tenth Edition* (USDA 2006). Five soil profiles were described using the *Field Guide for Describing and Sampling Soils* (Schoeneberger et. al. 2002). Three of the soil profiles were examined, described, and sampled on existing cutbanks (S-1-09, S-2-09, and S-5-09). One soil profile was examined, described, and sampled in a freshly dug backhoe pit (S-3-09). The remaining soil profile was examined, described, and sampled using a spade and auger (S-4-09). The soil profiles were examined, described, and sampled by Robert Long, Certified Professional Soil Scientist (ARPACS No. 02346) on September 18 and October 1, 2009.

Samples of each soil horizon were placed in trays inside micromonolith boxes for each soil profile. Larger soil samples were collected from each horizon and placed in clean gallon size plastic bags. The larger soil samples were submitted for laboratory analysis.

The soil map unit lines were delineated using ARCmap 9.3 software and using natural NAIP 1 meter color aerial photography (Utah GIS Portal, 2009).

Analysis of Soil Samples

Soil samples (36) from the 5 representative soil profiles were submitted to Intermountain Labs in Sheridan, Wyoming for analysis. Report dates for the lab analysis were October 2 and 13, 2009. Analysis of soil samples was conducted for parameters outlined by the Utah Division of Oil, Gas, and Mining *Guidelines for Management of Topsoil and Overburden* (Utah DOGM, 2005), Table 2. Results of the lab analysis are in appendix B.

Samples from all five soil profiles were analyzed for the parameters listed for *Topsoil*. Samples from three of the soil profiles were also analyzed for the additional parameters listed for *Overburden*.

Table 2. Soil analysis parameters for topsoil and overburden (Utah DOGM, 2005).

Topsoil Suitability Parameters	
Paste pH	Available Phosphorus
Saturation percent	Particle Size Analysis (% very fine sand, sand, silt, and clay)
Electrical Conductivity (ECe)	Organic Matter Percent
Soluble Na, K, Mg, and Ca	CaCo3 Percent
Sodium Adsorption Ratio	Extractable Potassium
Additional Analyses for Topsoil and Overburden	
Soluble Selenium	Soluble Boron
Alkalinity	

Laboratory data reports of the soil sample analyses are in Appendix C.

Geology and Setting

The proposed SUFCO settling pond soil survey area is located at the bottom of a side drainage of Convulsion Canyon on the Old Woman Plateau. The evaluated soil profiles were in Quaternary alluvium (Qa) on stream terraces and the toeslopes of alluvial fans. The alluvium has been derived from the Upper Bluegate (sandstone and marine shale), Star Point (sandstone), Blackhawk (fluvial sandstone and carbonaceous shale), and Castlegate (sandstone) formations (Utah Geologic Survey, 2005).

National Forest Soil Survey

The Fishlake National Forest has conducted an order 3 soil survey in the area of the proposed SUFCO settling pond soil survey (USDA 2009). Three Fishlake NF soil map units were mapped in the Settling Pond area. Figure 3 contains the portion of the Fishlake National Forest soil survey that encompasses the SUFCO Settling Pond soil survey. Table 3 contains the soil map unit names for Fishlake National Forest map units near or within the SUFCO Settling Pond soil survey.

Table 3. Fishlake National Forest soil map units near or adjacent to the SUFCO Settling Pond soil survey.

Map Unit	Taxonomic Family	Percent Composition	Slope
3A	Rock Outcrop and Torriorthents	0 to 100	15 to 80
69	Cumulic Haplustolls, fine-loamy, mixed, superactive, frigid	65	0 to 8
	Fluvaquentic Haplustolls, coarse-loamy, mixed, frigid	25	
73	Ustic Haplocryalfs, loamy-skeletal, mixed, superactive	40	25 to 60
	Ustic Eutrocryepts, coarse-loamy, mixed, superactive	40	

Soil Survey

Soils in the SUFCO Settling Pond soil survey area have been grouped into four soil map units based on taxonomic classification, physiographic setting, slope, and previous disturbance. The composition of these map units is described in table 4. The soil survey map is figure 4.

Table 4. Soil survey legend.

Map Unit	Percent	Soil Type ¹	Taxonomic Classification	Slope Percent	Modal Pedon
1	50	A	Ustic Haplocryepts, coarse-loamy, mixed, superactive	4 to 15	S-2-09
	40	B	Fluventic Haplocryepts, coarse-loamy, mixed, superactive	8 to 18	S-5-09
	10		Other similar soils		
2	85	C	Reclaimed coal mine spoil	45 to 80	S-1-09
	12	A	Ustic Haplocryepts, coarse-loamy, mixed, superactive	5 to 20	
	3	B	Fluventic Haplocryepts, coarse-loamy, mixed, superactive	3 to 8	
3	95	D	Fluvaquentic Haplustepts, coarse-loamy, mixed, frigid	1 to 5	S-4-09
	3	B	Fluventic Haplocryepts, coarse-loamy, mixed, superactive	3 to 15	
	2	A	Ustic Haplocryepts, coarse-loamy, mixed, superactive	4 to 20	
4	85	E	Coal mine waste over native soils	4 to 8	S-3-09
	10	C	Reclaimed coal mine spoil	5 to 45	
	5	A	Ustic Haplocryepts, coarse-loamy, mixed, superactive	5 to 10	

1. Fishlake National Forest soils are only classified to the taxonomic family level.

Map Unit Descriptions

Soil Map Unit 1

Soil map unit 1 consists of very deep "native" soils which formed in alluvium from sandstone and shale parent material. Slopes range from 4 to 18 percent. This soil map unit is on toeslopes and footslopes of canyon sideslopes, alluvial fans, and stream terraces.

This map unit consists of: 50 percent soil type A; 40 percent soil type B; and 10 percent other similar soils.

Soil profile S-2-09 is representative of type A soils in map unit 1. The soil surface is covered with 2 inches of partially decomposing leaves and needles. The mineral soil surface is a very dark grayish brown (moist) sandy clay loam to 5 inches. The lower surface is a dark grayish brown (moist) sandy loam to 10 inches. The sub-surface is an olive brown (moist) sandy loam to 28 inches. The lower sub-surface is a dark grayish (moist) brown sandy clay loam to 40 inches. The subsoil is a light olive brown (moist)

loamy sand to 51 inches and a light yellowish brown (moist) sandy loam to 65 inches. The primary limiting features for using soil type as a topsoil source are the calcium carbonate content (20.7 to 31.3 percent) and sandy soil textures. The upper 16 inches of soil profile S-2-09 could be salvaged for use as topsoil.

Soil profile S-5-09 is representative of type B soils in map unit 1. This soil profile has 5 distinct episodes of deposition, below the present soil surface. The surface is covered with 1 inch of partially decomposing leaves and needles. The mineral soil surface is a very dark grayish brown and dark grayish brown (moist) sandy loam to 12 inches. The surface of the first buried soil is a dark olive brown sandy loam to 18 inches. The subsurface of this buried soil is an olive brown (moist) sandy loam to 30 inches. The second buried surface is a brown (moist) sandy clay loam to 43 inches. The third buried surface is a very dark gray (moist) sandy clay loam to 47 inches. The next horizon is a brown (moist) very channery sandy loam to 63 inches. The next buried surface is a brown (moist) sandy loam to 68 inches. The subsurface below this lowest buried surface is a light olive brown sandy clay loam to 76 inches. The primary limiting features for using soil type B as a topsoil source are the calcium carbonate content (23.3 to 33.3 percent) and sandy soil textures. The upper 17 inches of soil profile S-5-09 could be salvaged for use as topsoil.

Vegetation in these areas consists of Gamble oak and Rocky mountain juniper.

Soil Map Unit 2

Soil map unit 2 consists of areas where coal mine spoils were dumped over cliffs and then allowed to cascade down the very steep slopes. These areas have been reclaimed with 12 to 18 inches of topsoil over the coal mine spoils. The areas in this map unit form alluvial cones and alluvial fans with slopes of 50 to 80 percent.

This soil map unit consists of 85 percent reclaimed coal mine spoil; 12 percent soil type A; and 3 percent soil type B. Soil type A occurs on alluvial fan footslopes and undisturbed steep areas. Soil type B occurs on alluvial fan toeslopes.

Soil profile S-1-09 is representative of the reclaimed coal waste (soil type C) areas in map unit 2. The surface is a brown very dark grayish brown (moist) sandy clay loam to 13 inches. The lower surface is a very dark grayish brown (moist) clay loam to 20 inches. The buried coal waste is a dark grayish brown (moist) extremely channery loam to 32 inches. The lower coal waste is very dark grayish brown (moist) channery sandy clay loam to 42 inches. The subsoil is a grayish brown (moist) clay loam to 72 inches. The upper 16 to 17 inches of soil profile S-1-09 could be salvaged for use as topsoil, but none of the salvaged topsoil should be mixed with the underlying coal waste.

Vegetation in these areas consists of crested wheatgrass, cheatgrass, and scattered rabbitbrush.

Soil Map Unit 3

Soil map unit 3 is the alluvial area where mine discharge water is at or near the surface. The mine discharge water was flowing when the soils investigation was conducted on September 18 and October 1, 2009.

This soil map unit consists of 95 percent soil type D; 3 percent soil type B on the footslopes of stream terraces; and 2 percent soil type A on the shoulders of stream terraces.

Soil profile S-4-09 is representative of soil type D in map unit 3. This soil profile had aquic soil conditions at the surface, a water table at 10 inches, and a buried surface at 24 inches. The surface is a brown (moist) sandy loam to 6 inches. The subsurface is a very dark gray (moist) sandy loam to 12 inches. The subsoil is a dark gray (moist) loam to 24 inches. The buried surface is a grayish brown (moist) sandy loam to 36 inches. The buried subsurface is a grayish brown (moist) sandy loam to 48 inches. The buried subsoil is a very dark grayish brown (moist) sandy loam to 54 inches where cobbles stopped the auger. The upper 18 to 24 inches of soil profile S-4-09 could be salvaged for use as topsoil. Fine particles of coal (visually estimated at 4 to 10 percent) were observed from 24 to 54 inches. The upper 24 inches of this soil profile could be salvaged as topsoil.

Vegetation in these areas consists primarily of willows and sedges.

Soil Map Unit 4

Soil map unit 4 consists of a small area of alluvial soils that has been covered with 18 to 30 inches of waste coal. The single delineation of this map unit is located on a stream terrace in the southwest part of the soil survey area.

This map unit consists of 85 percent soils buried under coal waste (soil type E); 10 percent reclaimed coal mine spoil (soil type C); and 5 percent soil type A.

Soil profile S-3-09 is representative of the soils covered with coal waste (soil type E) in map unit 4. The surface is a black (moist) sandy loam mixed with coal waste to 8 inches. The lower surface is black (moist) loamy sand mixed with coal waste to 19 inches. There is coal waste (sand texture) from 19 to 30 inches. The surface of the underlying soil is very dark grayish brown (moist) sandy loam to 39 inches. The upper subsurface is a brown (moist) sandy loam to 45 inches. The lower subsurface is a pale brown (moist) sandy loam to 60 inches. The subsoil is a brown (moist) sandy loam to 73 inches. The buried surface is dark grayish brown (moist) sandy loam to 82 inches. The buried subsoil is a grayish brown (moist) sandy loam to 94 inches.

The surface coal waste will need to be excavated in disturbed areas and covered with a minimum four feet of suitable cover. Portions of the underlying soil is suitable for use as

Section Two

Soil Survey

topsoil, but field examination will be necessary to determine which materials should be stockpiled as "Topsoil".

Vegetation in map unit 3 is very sparse and limited to small clumps of crested wheatgrass, rabbitbrush, and a single small Rocky mountain juniper.

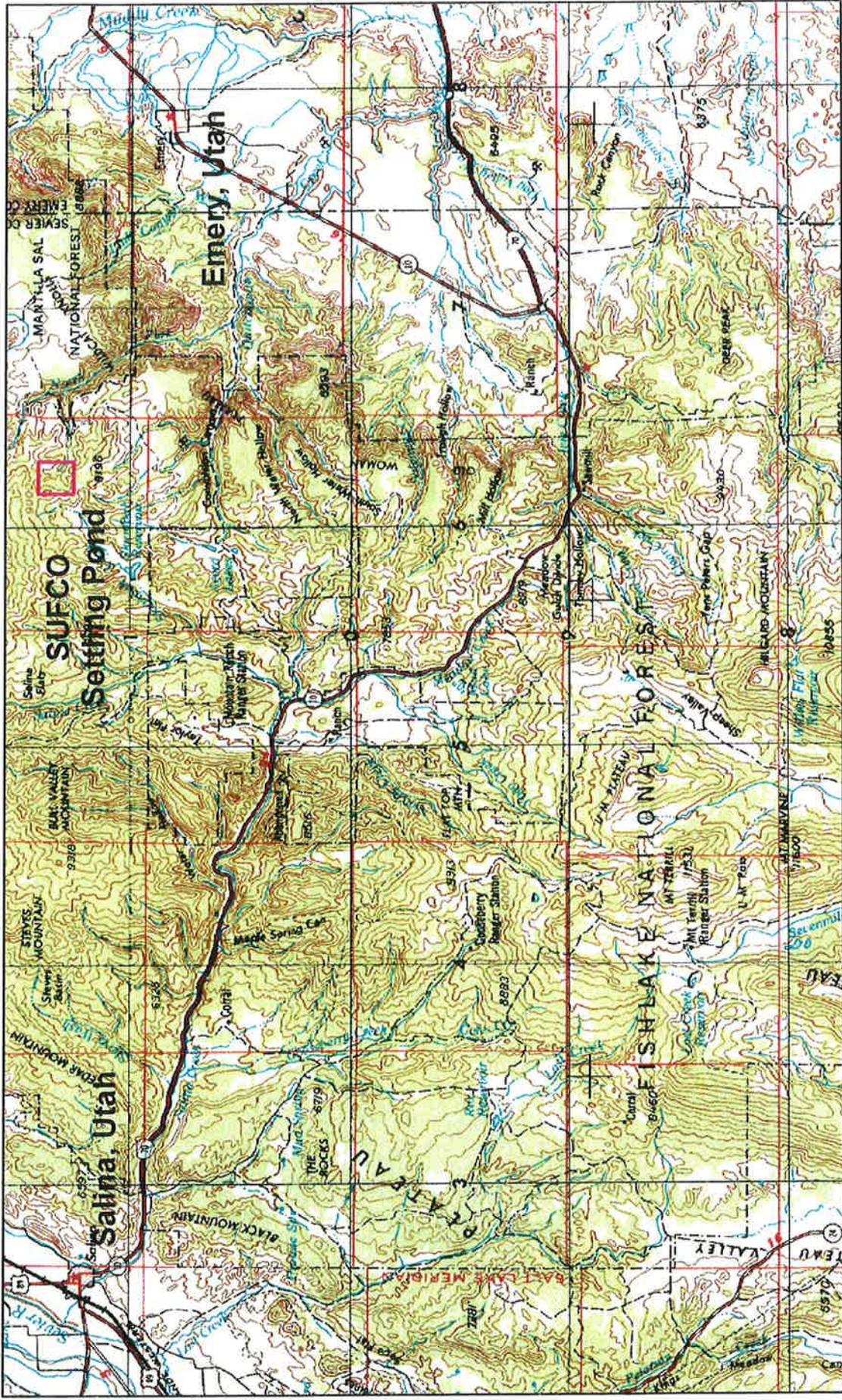


Figure 1. General location of proposed SUFCO settling pond. 1:250,000

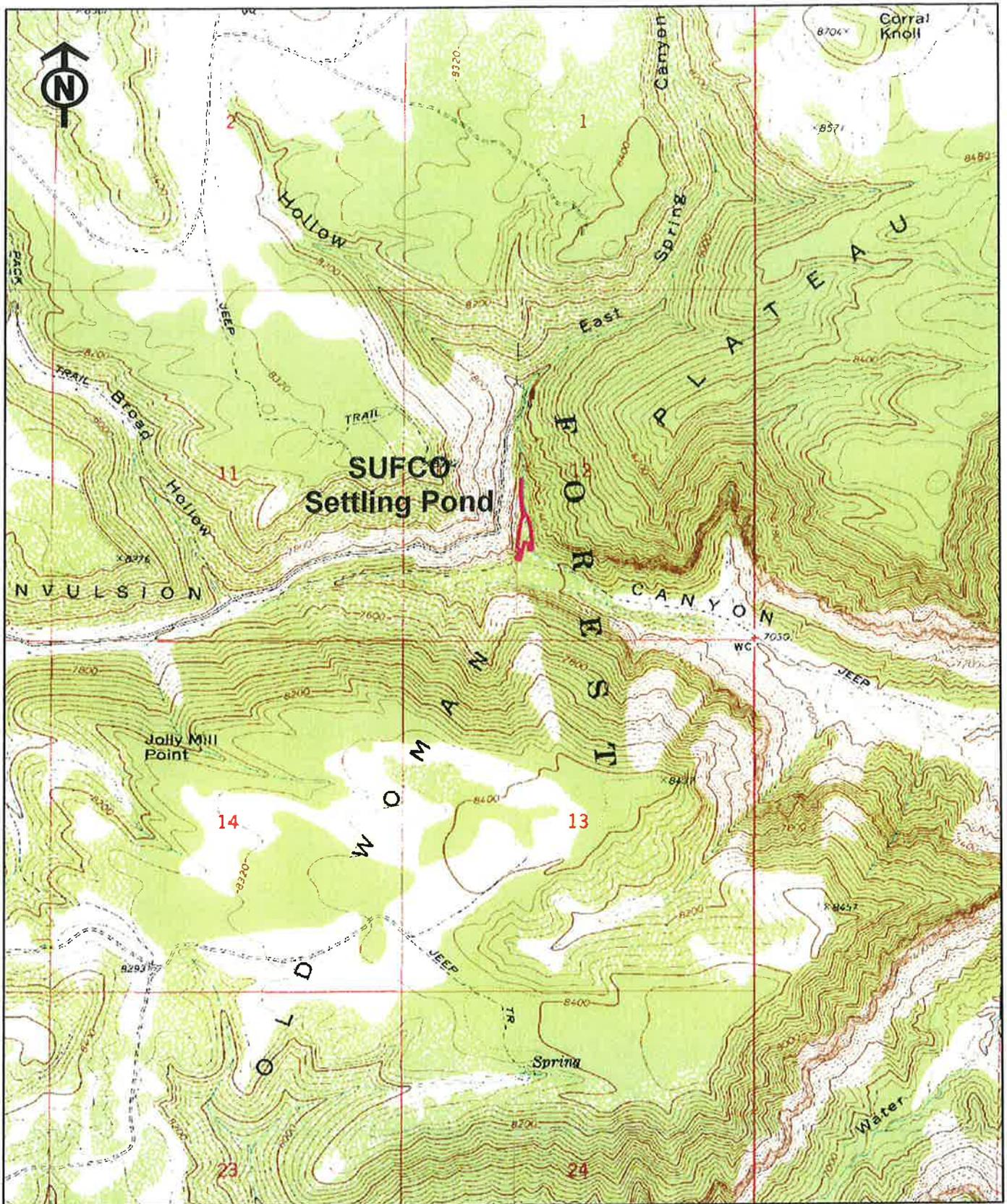
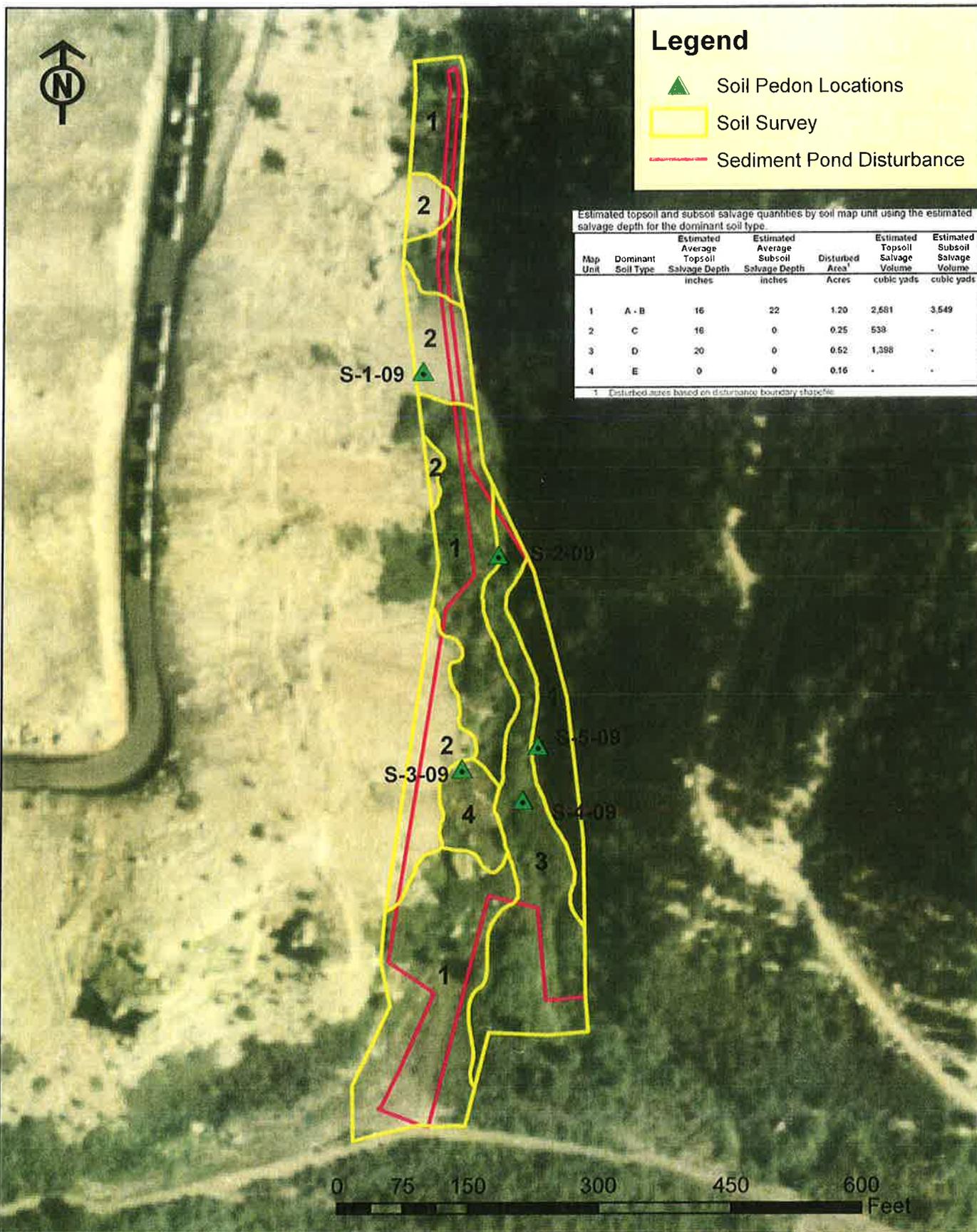


Figure 2. Location of proposed SUFCO settling pond in Section 12, Township 22 South, Range 4 East, Salt Lake Base Meridian. Acord Lakes USGS 7.5' quadrangle.

1:24,000



Legend

- ▲ Soil Pedon Locations
- Soil Survey
- Sediment Pond Disturbance

Estimated topsoil and subsoil salvage quantities by soil map unit using the estimated salvage depth for the dominant soil type.

Map Unit	Dominant Soil Type	Estimated Average Topsoil Salvage Depth inches	Estimated Average Subsoil Salvage Depth inches	Disturbed Area ¹ Acres	Estimated Topsoil Salvage Volume cubic yards	Estimated Subsoil Salvage Volume cubic yards
1	A - B	16	22	1.20	2,581	3,549
2	C	16	0	0.25	538	-
3	D	20	0	0.52	1,388	-
4	E	0	0	0.16	-	-

1 Disturbed acres based on disturbance boundary shapefile.

Prepared By: Long Resource Consultants, Inc. <i>Morgan, Utah</i>	Prepared For: Canyon Fuel Company, LLC SUFCO Mine - Salina, Utah	October 14, 2009	Scale: 1:1,800
			Figure 4. Soil survey map for settling pond area.

Soil Limiting Features

Topsoil salvage depths were determined by the depth to carbonates, texture, saturation percent, available water capacity, selenium, boron, and total organic carbon. Calcium carbonate accumulation and sandy soil texture are the primary limiting features for the native soils in the SUFCO settling pond project area. Selenium, boron, and total organic carbon are limiting features in materials with coal waste.

The determination of good, fair, poor, or unsuitable qualities of the topsoil and subsoil is based on the soil suitability criteria established by the Utah Division of Oil Gas and Mining's *Guidelines for Management of Topsoil and Overburden* (Utah DOGM, 2005). The Utah DOGM suitability guidelines are summarized in table 5.

Table 5. Soil suitability and unsuitability criteria (Utah DOGM, 2005).

Criteria	Good	Fair	Poor	Unacceptable
Topsoil Suitability				
Saturation %	25 to 55	≥56 to 80	<25 or >80	
pH	6.5 to 8.2	6.0 to 6.4 8.2 to 8.5	5.5 to 6.0 8.6 to 9.0	<5.5 >9.0
EC (mS/cm 25°C)	0 to 4	4 to 8	8 to 15	>15
SAR	0 to 4	5 to 10	10 to 14	>14
CaCO ₃ %	<15	15 to 30	>30	
Texture	sl, l, sil, scl, vsl, fsl	cl, sicl, sc, ls, lfs	sic, s, sc, c, cos, fs, vfs	g, vcos
Total Organic Carbon	<10%			≤10%
Available Water Capacity	>0.10 moderate	0.05 to 0.10 low	<0.05 very low	
K factor	<0.37	0.37	>0.37	
Overburden Suitability				
Soluble Selenium	≥ 0.15 mg/kg	Unacceptable in rooting zone (top 4 feet of fill) and/or ephemeral drainages.		
	≥ 0.10 mg/kg	Unacceptable level for top 4 feet in surface-water impoundments or intermittent/perennial drainages including 100 year flood plain.		
Available Boron	≥ 5.0 mg/kg			
Acid/Base Potential	≤ 0 tons CaCO ₃ /1000 tons overburden			

Topsoil Salvage Limitations

Topsoil and overburden limitations are explained by soil profile for each sample horizon. Horizon depths have been highlighted to specify suitability based on the most limiting feature. The suitability ratings are: Good, Fair, Poor, and Unacceptable.

S-1-09

0 to 6 inches

No limitations based on lab analysis and field evaluation.

6 to 13 inches

No limitations based on lab analysis and field evaluation.

13 to 20 inches

Suitability is "Fair" based on clay loam soil texture.

20 to 32 inches

Suitability is "Unacceptable" based on selenium level (0.21 ppm) and Total Organic Carbon (16.9%); carbonates content (25.6%) is in the upper portion of the "Fair" category; available Boron is acceptable (4.49 ppm), but close to the "Unacceptable level of 5.0 ppm. This horizon contained an estimated 75 percent sandstone and shale channers.

32 to 42 inches

Suitability is "Unacceptable" based on available boron (5.50 ppm) and Total Organic Carbon (27.7%) above acceptable levels of 5.0 ppm and 10%, respectively.

42 to 54 inches

Suitability is "Fair" based on the carbonate content (29.8%) and clay loam texture. This horizon contained an estimated 30 percent sandstone gravels and 5 percent sandstone cobbles.

54 to 72 inches

Suitability is "Poor" based on carbonate content (32.9%). Clay loam texture is "Fair". This horizon contained an estimated 50 percent angular sandstone gravels and 20 percent angular sandstone cobbles.

S-2-09

2 to 5 inches

Suitability is "Fair" based on carbonate content (20.7%) and available water capacity (0.08 inches/inch). This horizon contained an estimated 5 percent subangular sandstone gravels and 15 percent subangular sandstone boulders.

5 to 10 inches

Suitability is "Fair" based on carbonate content (21.6%) and available water capacity (0.07 inches/inch). This horizon contained an estimated 5 percent subangular sandstone gravels and 15 percent subangular sandstone boulders.

10 to 18 inches

Suitability is "Fair" based on carbonate content (21.9%) and available water capacity (0.08 inches/inch). This horizon contained an estimated

Section Three

Topsoil Salvage

5 percent subangular sandstone gravels and 15 percent subangular sandstone boulders.

18 to 28 inches Suitability is "Poor" based on carbonate content (31.3%). Available water capacity (0.08 inches/inch) is "Fair". This horizon contained an estimated 15 percent subangular sandstone gravels and 15 percent subangular sandstone boulders.

28 to 40 inches Suitability is "Fair" based on carbonate content (25.2%) and available water capacity (0.09 inches/inch). This horizon contained an estimated 20 percent subangular sandstone gravels and 10 percent subangular sandstone boulders.

40 to 51 inches Suitability is "Poor" based on saturation percent (24.7%) and available water capacity (0.04 inches/inch). The loamy sand texture is "Fair". This horizon contained an estimated 15 percent subangular sandstone gravels and 10 percent subangular sandstone boulders.

51 to 65 inches Suitability is "Fair" based on carbonate content (24.6%) and available water capacity (0.08 inches/inch). This horizon contained an estimated 5 percent subangular sandstone gravels and 5 percent subangular sandstone boulders.

S-3-09

0 to 8 inches suitability is "Unacceptable" based on Total Organic Carbon (34.6%). Saturation Percent (56.9%) is "Fair".

8 to 19 inches suitability is "Unacceptable" based on Total Organic Carbon (48.4%). Saturation Percent (58.4%) is "Fair". Available Boron level is 4.39 ppm.

19 to 30 inches suitability is "Unacceptable" based on Total Organic carbon (67.7%) and available Boron (5.15 ppm). Saturation percent (86.0%) is "Poor".

30 to 39 inches suitability is "Good".

39 to 45 inches suitability is "Fair" based on carbonate content (16.7%).

45 to 60 inches suitability is "Poor" based on low Saturation Percent (24.4%). Loamy sand texture is "Fair".

60 to 73 inches suitability is "Fair" based on Loamy Sand texture and carbonate content (21.6%).

73 to 82 inches suitability is "Fair" based on carbonate content (21.8%).

Section Three

Topsoil Salvage

82 to 94 inches suitability is "Poor" based on Sand texture and low Saturation Percent (21.4%).

S-4-09

0 to 6 inches suitability is "Fair" based on carbonate content (15.9%).

6 to 12 inches suitability is "Fair" based on carbonate content (19.2%).

12 to 24 inches suitability is "Fair" based on carbonate content (21.4%) and Saturation Percent (60.6%).

24 to 36 inches suitability is "Unacceptable" based on Total Organic Carbon (24.1%). Carbonate content (24.1%) is "Fair".

36 to 48 inches suitability is "Unacceptable" based on Total Organic Carbon (28.5%).

48 to 54 inches suitability is "Unacceptable" based on Total Organic Carbon (18.2%).

S-5-09

1 to 5 inches suitability is "Fair" based on carbonate content (23.0%) and saturation percent (73.2%). The total organic carbon (TOC) in this horizon exceeds the Utah DOGM limit. But, after consultation with Intermountain Labs and review of the field description sheet it was determined that the elevated TOC is due to the high organic matter content (Secor, personal communication, 2009). No coal could be visually identified in the box sample, and there was an organic layer of leaves and needles on top of this horizon. This appeared to be some of the best topsoil in the project area, based on the field evaluations.

5 to 12 inches suitability is "Poor" based on carbonate content (30.3%), but it is "Fair" when the reported lab value is rounded to the nearest integer value (30%). Available water capacity is "Fair" (0.09 in/inch). Carbonate content and horizon thickness should be monitored during topsoil salvage. This horizon contained an estimated 10 percent very fine angular gravels.

12 to 18 inches suitability is "Fair" based on carbonate content (24.6%) and available water content (0.10 in/inch). This horizon contained an estimated 15 percent fine angular gravels.

Section Three

Topsoil Salvage

- 18 to 30 inches** suitability is "Fair" based on carbonate content (26.8%) and available water content (0.09 in/inch). This horizon contained an estimated 20 percent subangular channers.
- 30 to 43 inches** suitability is "Fair" based on carbonate content (27.9%). This horizon contained an estimated 5 percent subangular channers.
- 43 to 47 inches** suitability is "Fair" based on carbonate content (24.5%). This horizon contained an estimated 1 percent subangular channers.
- 47 to 63 inches** suitability is "Poor" based on carbonate content (33.3%). This horizon contained an estimated 45 percent subangular channers and 2 percent boulders.
- 63 to 68 inches** suitability is "Fair" based on carbonate content (25.9%) and available water content (0.09in/inch). This horizon contained an estimated 8 percent subangular channers and 2 percent boulders.
- 68 to 76 inches** suitability is "Fair" based on carbonate content (27.4%) and available water content (0.09 in/inch). This horizon contained an estimated 5 percent subangular channers and 2 percent boulders.

Topsoil and Subsoil Salvage Depths

Table 6 identifies the estimated depths of topsoil and subsoil that may be salvaged based on field evaluations of soil profiles and laboratory analysis of soil samples. Actual depths will vary across the project area and should be monitored. Field data sheets are in appendix A. Results of the laboratory analysis of soil samples are in appendix B.

Soils with greater than 30 percent calcium carbonate and sandy (loamy sand or sand) textures were not included in the topsoil salvage depth. The topsoil salvage depth for soil profile S-5-09 included the 5 to 12 inch horizon, since the value reported by the lab was 30.3 and rounding to the nearest unit would result in a value of 30; and the resulting soil mixture of salvaged topsoil was estimated to have a weighted carbonate average of less than 30 percent.

Subsoil salvage depths do not include "Unacceptable" levels of selenium, boron, or total organic carbon. These parameters exceed the "Unacceptable" values in the SUFCO settling pond project area when coal waste or mine spoil is present.

Table 6. Estimated topsoil salvage depths by soil map unit, based on dominant soil(s).

Soil Map Unit	Topsoil Salvage Depth ^{1, 2} inches	Subsoil Salvage Depth ¹ inches	Limiting Topsoil Features
1	15 to 18	22	Topsoil limited by calcium carbonate content. Subsoil limited by loamy sand textures.
2	15 to 18	0	Topsoil salvage limited by soil texture and underlying coal waste and mine spoil. Topsoil salvage should not include any "Unacceptable" materials (selenium, boron, and total organic carbon).
3	18 to 24	0	Topsoil salvage limited by soil texture and depth to coal waste mixed with soil.
4	0	*	Coal waste on surface makes topsoil salvage in this area impossible. Subsoil salvage may be possible in this area after the coal waste has been removed; but actual subsoil salvage depths should be monitored in the field after the coal has been removed.

1. Topsoil and subsoil suitability based on Utah DOGM (2005).
 2. Subsoil salvage depth estimate limited to 65 below surface, additional material may be available when monitored in the field.

Coal Waste and Mine Spoils

Unacceptable levels of selenium (≥ 0.15 mg/kg in upland areas and ≥ 0.10 mg/kg in impoundments or drainages), boron (≥ 5.0 mg/kg), and total organic carbon (≥ 10.0 percent) were identified in mine spoil and coal waste materials. Disturbance of these materials during construction of the SUFCO settling pond will require disposal in accordance with Utah Division of Oil, Gas, and Mining *Guidelines for Management of Topsoil and Overburden* (Utah DOGM 2005).

The Utah DOGM guidelines stipulate that soil or overburden with "Unacceptable" levels of selenium cannot be placed in the "top 4 feet of fill" or in "ephemeral drainages" (Utah DOGM 2005, table 8 on page 18).

Utah DOGM guidelines suggest that soil or overburden with "Unacceptable" levels of boron be selectively buried (Utah DOGM, 2005). Specific burial depths are not mentioned in the Utah DOGM guidelines. Therefore, it is suggested that the Utah DOGM guidelines for selenium be applied to materials with "Unacceptable" boron levels.

Utah DOGM guidelines (Utah DOGM, 2005, page 22) stipulate that "No surface coal is acceptable on post-law site..."

Topsoil and Subsoil Quantities

Table 7 details the estimated salvage quantities of topsoil and subsoil in the proposed disturbance area. Actual quantities will vary, depending on actual salvage depths and the area disturbed.

Table 7. Estimated topsoil and subsoil salvage quantities by soil map unit using the estimated salvage depth for the dominant soil type.

Map Unit	Dominant Soil Type	Estimated Average Topsoil Salvage Depth inches	Estimated Average Subsoil Salvage Depth inches	Disturbed Area¹ Acres	Estimated Topsoil Salvage Volume cubic yads	Estimated Subsoil Salvage Volume cubic yads
1	A - B	16	22	1.20	2,581	3,549
2	C	16	0	0.25	538	-
3	D	20	0	0.52	1,398	-
4	E	0	0	0.16	-	-

1. Disturbed acres based on disturbance boundary shapefile.

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Appendix A

Field Description Sheets

for

Soil Profiles

USDA USDA-NRCS PEDON DESCRIPTION FORM MO6, LAKEWOOD, CO USD

Series or Comp Name: **C** Date: **9-18-09** State: **UT** County: **Juicer** SSA: **subco** Unit: **Settling Pond** **5-1-09**

MU Sym: Pedon Type: **Erosion cut** Lab #: Photo #: Land Use: **Mine Reclaim**

Surface Frag %: GR: **6** CR: — ST: — BD: — CN: — FL: — Permeability: **mod** Drainage: **Well** Elevation: **7290**

Major Landform: **Canyon** Local Landform: **Canyon sideslope** Moisture Regime: **Ustic** Percent Slope: **72** Aspect: **88°**

Up Shape: **Linear** Across Shape: **convex** Geomorph: **sideslope** Hillslope: **Lower 1/3**

Erosion: Knd: **Gully 1** Deg: **mod** Runoff: **Rapid** Classification: **Reclaimed minedump**

Location: Sec. **12 T. 22S R. 4E** Latitude: " N UTM: Zone: **12** mE: **463826** mN: **4706930** Longitude: " W

Parent Material/Bedrock: **Topsoil over Mine waste** Diagnostic: — Descriptor(s): **R Leng**

Moisture depth(s): Control Section Ave: Clay %: Rock Frag %: Precipitation: **16-20"** Temperature @ 50 cm:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Crested wheatgrass	
	Chenop grass	

NOTES:

Site
This description is representative of the steep westerly coal & rock slopes that have been reclaimed with a "topsoil" cover.

Pedon
Depth's are measured vertically topsoil depth perpendicular to slope is about 18" and varies by location.

Depth inch	Horizon	Matrix Color		Texture Lab	Structure	Rupture Resist				Mottles			Ped Surface Features			Eller			
		Dry	Moist			Dry	Mst	Stk	Pis	% Sz	Con	Col	Shp	Loc	Knd		% Con	Dst	Loc
0-6	A1	10YR 5/2	10YR 3/2	SCL	1m sbk 2fgr	sh	ufr	ss	sp	—	—	—	—	—	—	—	—	—	ST
6-13	A2	10YR 5/2	10YR 4/2	SCL	2m sbk	h	fr	ss	sp	—	—	—	—	—	—	—	—	—	ST
13-20	A3	10YR 5/2	10YR 3/2	CL	2m sbk	h	fr	ss	sp	—	—	—	—	—	—	—	—	—	ST
20-22	R	2.5Y 5/2	2.5Y 4/2	CNX	1f sbk	h	fr	ss	sp	—	—	—	—	—	—	—	—	—	SL
22-42	R	2.5Y 4/2	2.5Y 3/2	GN	m	h	fr	ss	sp	—	—	—	—	—	—	—	—	—	BE
42-54	3C1	2.5Y 6/2	2.5Y 5/2	CL	2f sbk	vh	fr	ss	sp	—	—	—	—	—	—	—	—	—	ST
54-72	3C2	2.5Y 6/2	2.5Y 5/2	CL	2f sbk	h	fr	ss	sp	—	—	—	—	—	—	—	—	—	ST

waste coal track

Roots	Qty	Sz	Loc	Pores	Shp	Qty	Sz	Concentrations				Rock Frag		Wet	pH	Clay %	CCE	Bnd	Notes (e.g., Diagnostic)
								Knd	%	shp	Sz	Loc	Col						
8vf	1	T	4	vf	—	—	—	—	—	—	—	GR5	Ang	5.11	8.0	25	—	95	Topsoil
6vf	2	T	4	vf	—	—	—	—	—	—	—	GR5	↓	5.12	7.8	26	—	95	Topsoil
4vf	3	T	3	vf	—	—	—	—	—	—	—	GR5	↓	dry	7.9	31	—	95	Topsoil
4vf	1	T	IR	2	vf	—	—	—	—	—	—	CN 95	—	dry	8.0	25	—	65	sandstone & shale channels
—	—	—	—	—	—	—	—	—	—	—	—	CN 15	—	dry	7.9	24	—	95	Topsoil
—	—	T	1	vf	—	—	—	—	—	—	—	GR30	Ang	dry	8.2	29	—	95	Topsoil
—	—	T	1	vf	—	—	—	—	—	—	—	GR50	Angular	dry	8.2	29	—	95	sandstone

Pedon * 50% coal
 ** 85% coal
 *** 1-2% coal

Series or Comp Name: **A** Date: **9-18-09** State: **UT** County: **Sevier** SSA: **SUF60** Unit: **Site Long** MORA: **5-2-09**

MU Sym: **Cutbank** Lab #: **Photo #:** Land Use: **Woodland**

Surface Frag %: GR: **8** CR: **2** ST: **15** BD: **-** CN: **-** FL: **-** Permeability: **mod** Drainage: **Rapid** Elevation: **7278**

Major Landform: **Canyon** Local Landform: **Stream Terrace** Moisture Regime: **10-1590** Aspect: **75°**

Up Shape: **concave** Across Shape: **Linear** Geomorphic: **Hillslope:**

Erosion: Kind: **Streambank** Deg: **Runoff:** Classification: **Ustic Haploceptis**

Location: Sec. **12 T. 22 S. R. 4 E** Latitude: **" N** UTM: Zone: **12** mE: **463853** mN: **4306866**

Parent Material/Bedrock: **Colluvium** Diagnostic: **cambic calcic** Describer(s): **R Long**

Moisture depth(s): **10-40 inches** Control Section Ave: Clay %: **15% (lab)** Rock Frag %: **27%** Precipitation: **Temperature @ 5cm:**

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Gamble oak	
	Rocky Mtn Juniper	
	Pinyon Pine	
	Rabbit brush	

NOTES:

Site
This pedon is representative of oak brush soils - native
About 30 feet west of stream
NO coal contamination observed

Depth (cm)	Horizon	Matrix Color		Texture Lab	Structure	Rupture Resist				Mottles			Ped Surface Features			Effer			
		Dry	Moist			Dry	Mst	Stk	Pis	% Sz	Con	Col	Shp	Loc	Knd %		Con	Dst	Loc
0-2	Oi	leaves & needles																	
2-5	A1	2.5Y 5/2	2.5Y 3/2	SCL	1f sbk	sh	vfr	ss	po										V5
5-10	A2	2.5Y 6/3	2.5Y 4/2	GR SL	1m sbk	h	vfr	so	po										5L
10-18	Bw1	2.5Y 5/3	2.5Y 4/3	GR SL	2m sbk	h	fr	so	po										5L
18-28	Bw2	2.5Y 7/3	2.5Y 5/3	GR SL	2.5m sbk	vh	fr	so	po										5T
28-40	Bw3	2.5Y 6/2	2.5Y 4/2	GR SCL	2m sbk	h	fr	ss	sp										5T
40-51	Bk1	2.5Y 6/3	2.5Y 5/3	LS	1m sbk	sh	vfr	so	po										5T
51-65	Bk2	2.5Y 6/3	2.5Y 5/3	SL	1m sbk	sh	vfr	so	po										5T
65		2.5Y 7/3	2.5Y 5/3	30%															

Roots Qty Sz Loc	Pores Shp Qty Sz	Concentrations Knd % shp Sz Loc Col	Rock Frag Knd % Rnd Sz	Wet	pH	Clay %	CCE	Bnd	Notes (e.g., Diagnostic)
3vf T	I 4vf		GR5 SA	3M	7.9	20		CS	
2f			BD15						
3vf 1m	T 2vf		GR5	s.M	7.8	12		gs	
2f 1c T			BD15						
8vf 2m	T 2vf		GR5	dry	7.8	15		cu	
4f 3c T			BD15						
8vf 3m	T 2vf		GR15	dry	8.2	15		CS	
3f 2c T			BD15						
3vf 1m T	T 1vf	CAL2 0-1mm BRF	GR20	dry	8.4	21		gs	
1f 1c			BD10						
3vf 1m T	T 2vf	CAL2 0-1mm BRF	GR15	dry	8.4	8		cu	
2f 1c			BD10						
2vf 1m T	T 1vf	CAL1 0-1mm BRF	GR5	dry	8.4	10			
1f 1c			BD5						

Series or Comp Name: **E** Date: **9-18-09** State: **UT** County: **Sevier** SSA: **SUFCO** Unit: **pond settling** 5-3-09
 MU Sym: Pedon Type: **Backhoe Pit** Lab #: Photo #: Land Use: **semi-reclaimed**
 Surface Frag %: GR: **5** CB: **5** ST: **10** BD: **5** CN: FL: Permeability: **mod Rapid** Drainage: **well** Elevation: **7287**
 Major Landform: **Canyon** Local Landform: **stream terrace** Moisture Regime: Percent Slope: **6** Aspect: **98°**
 Up Shape: **Linear** Across Shape: **Linear** Geomorphic: **TR** Hillslope: **Toeslope**
 Erosion: Knd: **Sheet** Deg: **2** Runoff: **mod slow** Classification: **Waste coal area**
 Location: Sec. **12** T. **22S** R. **4E** Latitude: Longitude: UTM: Zone: **12** mE: **46340** mN: **4306792**
 Parent Material/Bedrock: **Coal waste over alluvium** Diagnostic: Describer(s): **R Long**
 Moisture depth(s): Control Section Ave: Clay %: Rock Frag %: Precipitation: **16-20"** Temperature @ 50 cm:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Crested wheat	
	Rabbit brush	
	Rocky Mtn Juniper (1)	

NOTES:

Disturbed location on terrace.

Depth inch	Horizon	Matrix Color		Texture LAB	Structure	Rupture Resist				Mottles			Pod Surface Features			Eller
		Dry	Moist			Dry	Mst	Stk	Pls	% Sz	Con	Col	Shp	Loc	Knd %	
0-8"		10YR 3/2	10YR 2/1	CL SL	1fmsbk	h	fr	mix of coal + soil + rock			soil + rock					
8-19"		10YR 4/1	10YR 2/1	GR LS	2c5BK	vh	fr	compacted coal/soil mix			soil mix					
19-30"				Sa	5G	l	lo	coal slacks								
30-34"	IIA	10YR 5/2	10YR 3/2	SL	2msbk	h	fv	so	po				SL			
39-45"	IIBw	10YR 6/3	10YR 5/3	SL	2msbk	h	fr	so	po				SL			
45-60"	IIBk	10YR 7/3	10YR 6/3	GR LS	1msbk	sh	vf	so	po				VS			
60-73"	IIC	10YR 7/3	10YR 5/3	LS	m	sh	vf	so	po				ST			
73-82"	IIIA	10YR 6/2	10YR 4/2	L	2msbk	sh	vf	ss	sp				ST			
82-94"	IIIC	10YR 6/3	10YR 5/3	Sa	m	sh	vf	so	po				SL			

Roots	Pores		Concentrations				Rock Frag		Wet	pH	Clay %	CCE	Bnd	Notes (e.g., Diagnostic)
	Qty	Sz	Shp	Qty	Sz	Knd %	shp	Sz						
10vf	T	T4	vf				GR 10		7.7	13		CS		
35	T	T4	vf				CB 10ST 5		7.8	8		CS		
6vf	T	T4	vf				GR 20					CS		
15	T	T4	vf				CB 5					CS		
5vf	T	IT10	vf				CB 5			2		CS		
vf	T	T3	f	CAM	f	pf	GR 5		7.8	12		CS		
2vf	T	T3	vf				GR 2		8.0	17		CS		
		T3	vf	CAC	20-1mm	BRF	GR 15		8.2	6		CS	discontinuous gravel bands 1-4" thick	
		IT6	vf						8.4	10		CS		
		T3	vf						8.4	23		CS		
		IT6	vf						8.2	5		CS		

Angular sandstone TOT

5-4-09

USDA NRCS PEDON DESCRIPTION FORM MO6, LAKEWOOD, CO
Draft 5/97

Series or Comp Name: **D** Date: **9-18-09** State: **UT** County: **Sevier** SSA: **SUFLO** Unit: **Ford** Muns: **5-4-09**
 MU Sym: Pedon Type: **Alcifer** Lab #: Photo #: Land Use: **Willow**
 Surface Frag %: GR: CB: **ST** BD: CN: FL: Permeability: Ksat: **med Rapid** Drainage: **Poorly** Elevation: **7270**
 Major Landform: **Canyon** Local Landform: **Valley Bottom** Moisture Regime: **Ustic** Percent Slope: **2** Aspect: **164°**
 Up Shape: **Linear** Across Shape: **Concave** Geomorphic: Hillslope:
 Erosion: Kind: **None - Deposition** Deg: Runoff: Classification: **Fluvaquentic Haplusterts**
 Location: Sec. T. R. Latitude: **36° 13' N** UTM: Zone: **13** Easting: **463861** Northing: **4306781**
 Parent Material/Bedrock: **Alluvium** Diagnostic: **Cambic 6-12"** Descriptor(s): **R Long**
 Moisture depth(s): Control Section Ave: Clay %: **10-40" (5% Lab)** Rock Frag %: **3%** Precipitation: Temperature @ 50 cm: **0**

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Willow	
	Bluegrass	

NOTES:

Sample size limited by size of larger bucket

Water level 10"

Horizons/layers broken by depth; too difficult to make distinctions in the field

Depth (Lch)	Horizon	Matrix Color		Texture (L/S)	Structure	Rupture Resist				Mottles			Ped Surface Features			Effer				
		Dry	Moist			Dry	Mst	Sbk	Pls	% Sz	Con	Col	Shp	Loc	Kind		%	Con	Dst	Loc
0-6"	A	10YR 6/3	10YR 5/3	SL	1 fm sbk SG	5h	vfr	50	po	4fP	7.5YR 5/6									SL
6-12	Bws	10YR 6/2	10YR 3/1	SL	2 m sbk	h	vfr	50	po											ST
12-24	C	10YR 6/1	10YR 4/1	L	m	vh	fr	55	po	8 m D	10YR 6/6									ST
24-36	2A	2.5Y 7/2	10YR 8/2	80% SL	2 m sbk	h	fr	50	po	20% horizontal sand grains										ST
36-48	2B	2.5Y 6/2	2.5Y 5/2	SL	2 m sbk	vh	fr	50	po											SL
48-54	2C	2.5Y 6/1	2.5Y 3/2	SL	m	vh	fr	50	po											ST

Lab

Roots Qty Sz Loc	Pores Shp Qty Sz	Concentrations Kind % shp Sz Loc Col	Rock Frag Kind % Rnd Sz	Wet	pH	Clay %	CCE	Bnd	Notes (e.g., Diagnostic)
* 1 6vf 3f 2m T				WS	8.0	10			* 20% 10YR 3/1 moist
* 2 6vf 3f 4m T				WS	8.2	13			*
3 4vf 2f 1c T				WS	8.2	20			
4 4vf 2f 2m 1c T				WS	8.3	11			10% fine coal
5 2vf			GR 20 fine SR sand	WS	8.3	12			7% fine coal
6 1vf				WS	8.4	13			4% fine coal

* 1-3% coal fines stopped by large gravels at 54"

5-5-09

USDA **USDA-NRCS** **PEDON DESCRIPTION FORM** **MO6, LAKEWOOD, CO** **USD**
Draft 5/97

Series or Comp Name: **B** Date: **10-1-09** State: **UT** County: **Sevier** SSA: **SUFCO** Unit: MLRA:

MU Sym: Pedon Type: **cutbank** Lab #: Photo #: Land Use: **Woodland**

Surface Frag %: GR: **10** CB: **2** ST: **3** BD: **—** CN: **—** FL: **—** Permeability: **mod** Drainage: **well** Elevation: **7280**

Major Landform: **Plateau** Local Landform: **Canyon sideslope** Moisture Regime: **Ustic** Percent Slope: **15-18** Aspect: **250°**

Up Shape: **concave** Across Shape: **linear** Geomorphic: Hillslope: **Foot slope**

Erosion: Kind: **gully** Deg: Runoff: **Med slow** Classification: **Fluentic Haplocrypts**

Location: Sec. T. R. Latitude: "N Longitude: "W UTM: Zone: **12** mE: **463867** mN: **4306800**

Parent Material/Bedrock: **Alluvium** Diagnostic: **Cambic 5-12"** Descriptor(s): **R Long**

Moisture depth(s): **10-40"** Control Section Ave: Clay %: **Lab 17.6%** Rock Frag %: **12%** Precipitation: Temperature @ 50 cm:

VEGETATION:

SYMBOL	COMMON NAME	% GD COVER
	Gambel oak	
	Rocky Mtn Maple	
	Rocky Mtn Juniper	

NOTES:

15-20' above willows bottom

① 5-10% of horizon has thin discontinuous bands (1-3" thick) with 35-40% fine gravel concentrations

similar to 5-2-09, but more fluentic layers

Depth inches	Horizon	Matrix Color		Texture Lab	Structure	Rupture Resist				Mottles			Ped Surface Features			Effer					
		Dry	Moist			Dry	Mst	Sik	Pls	% Sz	Con	Col	Slp	Loc	Kind		%	Con	Dst	Loc	Col
0-1	O _i			leaves & needles																	
1-5	A	10YR 4/2	10YR 3/2	SL	1f sbk 2mgr	sh	fr	50	PO												ST
5-12	B _{uo}	10YR 6/3	10YR 4/2	GFA SL	2fm sbk	sh	fr	50	PO												VE
12-18	2A	2.5Y 5/3	2.5Y 4/3	SL	2m smk	sh	fr	50	PO												ST
18-30	2BK	2.5Y 6/3	2.5Y 4/3	CN SL	2m sbk	sh	fr	50	PO												ST
30-43	3ABK	10YR 6/2	10YR 4/3	SCL	2m sbk	sh	fr	55	PO												ST
43-47	4A	10YR 4/1	10YR 3/1	SCL	2m sbk	sh	fr	55	PO												VE
47-63	5BK	10YR 6/3	10YR 5/3	SNV SL	M/SG	h	fr	50	PO												ST
63-68	6ABK	10YR 6/2	10YR 5/3	SL	2m sbk	sh	fr	50	PO												ST

10 68-76.6 DU x 2.5Y 6/3 2.5Y 4/3 2m sbk h fr

Roots	Pores	Concentrations	Rock Frag	Wet	pH	Clay %	CCE	Bnd	Notes (e.g., Diagnostic)
Qty Sz Loc	Shp Qty Sz	Kind % shp Sz Loc Col	Kind % Rnd Sz						
—	—	—	—	—	—	—	—	—	—
4VF T 2F 2mc	T 7VF T 3F	—	Sand 10 SA GR V fine	5.15				CS	
4VF T 2F 2mc	T 5VF T 2F	—	Sand 15 SA GR fine	dry				AS	
3VF T 2F 2mc	T 6VF T 2F	—	Sand 55 A CN	dry				CS	
3VF T 2F 2mc	T 6VF T 2F	CAC 3VF BRF	Sand 20 SA CN	dry				CS	①
3VF T 2F 2mc	T 4VF T 2F	CAC 2VF BRF CAM 2 VF VPF	Sand 5 SA CN	dry				AS	
5VF T 2F 2mc	T 3VF	—	Sand 1 SA CN	dry				AS	
5VF T 2F 2mc	T 6VF	CAC 7 1-2mm AP	Sand 45 SA CN 2 BD	dry				CW	
9 3VF 2F 1mc	T 2VF	CAC 10-1mm BRF 2 CAM VPF	Sand 8 SA CN 2 BD	dry				CW	
10 2VF 1mc	T 2VF	CAC 10-1mm BRF 4 CAM VPF	Sand 5 SA CN 2 BD	dry				CW	

Appendix B

Laboratory Analysis Data



Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
 Salina, UT 84654

Report ID: S0909486001

Project: Sufco Sed. Pond
 Date Received: 9/23/2009

Date Reported: 10/2/2009
 Work Order: S0909486

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	PE			PE		
							Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	Sulfur meq/L	SAR
S0909486-001	S-2-09	2-5	7.4	51.8	1.18	7.6	4.90	4.24	1.67	2.12	0.99	
S0909486-002	S-2-09	5-10	7.5	30.8	0.69	3.9	3.14	2.15	1.26	0.95	0.58	
S0909486-003	S-2-09	10-18	7.7	31.8	0.81	4.2	3.81	1.93	1.34	1.09	0.64	
S0909486-004	S-2-09	18-28	7.8	31.1	0.71	2.6	2.41	1.75	0.95	1.54	1.07	
S0909486-005	S-2-09	28-40	8.0	38.0	0.74	4.7	1.94	2.06	1.06	2.60	1.84	
S0909486-006	S-2-09	40-51	8.0	24.7	0.46	1.7	1.45	1.01	0.75	0.87	0.79	
S0909486-007	S-2-09	51-65	7.8	27.0	0.52	2.1	2.30	1.28	0.81	0.80	0.60	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
 Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
 Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
 Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801
(307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909486001

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Date Reported: 10/2/2009

Work Order: S0909486

Lab ID	Sample ID	Depths Inches	Sand %	Silt %	Clay %	Texture	Very Fine		Nitrogen		Available	
							Sand %	CO3 %	Nitrate ppm	Phosphorus ppm	Potassium meq/100g	
S0909486-001	S-2-09	2-5	54.0	26.0	20.0	Sandy Clay Loam	14.2	20.7	0.6	30.4	0.10	
S0909486-002	S-2-09	5-10	72.0	16.0	12.0	Sandy Loam	6.5	21.6	0.1	11.2	0.05	
S0909486-003	S-2-09	10-18	64.0	21.0	15.0	Sandy Loam	9.7	21.9	0.9	17.8	0.06	
S0909486-004	S-2-09	18-28	56.0	29.0	15.0	Sandy Loam	11.7	31.3	<0.1	5.6	0.04	
S0909486-005	S-2-09	28-40	52.0	27.0	21.0	Sandy Clay Loam	<0.1	25.2	<0.1	6.4	0.07	
S0909486-006	S-2-09	40-51	82.0	10.0	8.0	Loamy Sand	38.7	21.0	<0.1	3.6	0.03	
S0909486-007	S-2-09	51-65	70.0	20.0	10.0	Sandy Loam	5.1	24.6	<0.1	3.8	0.03	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
 Salina, UT 84654

Report ID: S0909486001

Project: Sufco Sed. Pond
 Date Received: 9/23/2009

Date Reported: 10/2/2009
 Work Order: S0909486

Lab ID	Sample ID	Depths Inches	Total Carbon		TOC %	Neutral. Potential	
			%	%		1/1000t	1/1000t
S0909486-001	S-2-09	2-5	9.4	6.9	207		
S0909486-002	S-2-09	5-10	4.2	1.6	216		
S0909486-003	S-2-09	10-18	5.5	2.9	219		
S0909486-004	S-2-09	18-28	5.7	1.9	313		
S0909486-005	S-2-09	28-40	5.1	2.1	252		
S0909486-006	S-2-09	40-51	3.0	0.5	210		
S0909486-007	S-2-09	51-65	4.3	1.4	246		

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
 Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
 Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009
Work Order: S0909487

Project: Sufco Sed. Pond
Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	SAR	
												PE
S0909487-001	S-1-09	0-6	7.8	45.9	0.64	3.2	4.90	1.08	0.25	0.62	0.36	
S0909487-002	S-1-09	6-13	7.5	49.8	0.97	1.7	7.86	1.91	0.17	0.85	0.38	
S0909487-003	S-1-09	13-20	7.3	49.1	1.90	2.0	18.0	4.19	0.17	1.54	0.46	
S0909487-004	S-1-09	20-32	6.9	37.4	3.92	8.0	34.5	33.1	0.29	1.15	0.20	
S0909487-005	S-1-09	32-42	7.0	43.5	3.59	9.5	32.4	30.3	0.12	0.91	0.16	
S0909487-006	S-1-09	42-54	7.4	40.0	2.31	4.6	15.9	17.1	0.22	2.03	0.50	
S0909487-007	S-1-09	54-72	7.6	36.1	2.07	3.4	16.2	12.6	0.38	1.49	0.39	
S0909487-008	S-3-09	0-8	7.3	56.9	0.80	9.5	5.83	2.44	0.41	0.58	0.28	
S0909487-009	S-3-09	8-19	7.3	58.4	0.45	7.9	2.82	1.52	0.08	0.24	0.16	
S0909487-022	S-3-09	19-30	6.5	86.0	0.43	3.8	2.29	1.61	0.20	0.43	0.31	
S0909487-010	S-3-09	30-39	7.2	35.1	0.61	3.2	4.01	1.74	0.13	0.40	0.24	
S0909487-011	S-3-09	39-45	7.5	34.8	0.51	2.6	3.41	1.36	0.13	0.24	0.15	
S0909487-012	S-3-09	45-60	8.0	24.4	0.36	0.8	1.71	0.93	0.12	0.42	0.36	
S0909487-013	S-3-09	60-73	8.1	26.5	0.31	1.4	2.28	0.91	0.20	0.16	0.13	
S0909487-014	S-3-09	73-82	7.7	53.3	0.53	4.4	3.42	1.17	0.19	0.17	0.11	
S0909487-015	S-3-09	82-94	8.3	21.4	0.25	0.4	2.60	1.33	0.45	0.17	0.12	
S0909487-016	S-4-09	0-6	7.4	34.5	1.36	4.1	5.53	5.25	0.25	4.67	2.01	
S0909487-017	S-4-09	6-12	7.2	51.0	0.84	6.7	4.06	2.35	0.24	2.36	1.32	
S0909487-018	S-4-09	12-24	7.2	60.6	0.76	5.3	3.81	2.53	0.19	1.63	0.92	
S0909487-019	S-4-09	24-36	7.1	37.5	0.80	6.5	4.02	2.56	0.18	1.71	0.95	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

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Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801
(307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Sand		Silt %	Clay %	Texture	Very Fine		CO3 %
			%	%				Sand %	Sand %	
S0909487-001	S-1-09	0-6	50.0	25.0	25.0	25.0	Sandy Clay Loam	21.9	9.3	9.3
S0909487-002	S-1-09	6-13	48.0	26.0	26.0	26.0	Sandy Clay Loam	21.6	7.6	7.6
S0909487-003	S-1-09	13-20	40.0	29.0	29.0	31.0	Clay Loam	15.2	9.3	9.3
S0909487-004	S-1-09	20-32	42.0	33.0	33.0	25.0	Loam	9.0	25.6	25.6
S0909487-005	S-1-09	32-42	52.0	24.0	24.0	24.0	Sandy Clay Loam	6.3	19.1	19.1
S0909487-006	S-1-09	42-54	32.0	39.0	39.0	29.0	Clay Loam	4.4	29.8	29.8
S0909487-007	S-1-09	54-72	34.0	37.0	37.0	29.0	Clay Loam	5.8	32.9	32.9
S0909487-008	S-3-09	0-8	69.0	18.0	18.0	13.0	Sandy Loam	11.8	12.0	12.0
S0909487-009	S-3-09	8-19	81.0	11.0	11.0	8.0	Loamy Sand	7.3	10.1	10.1
S0909487-022	S-3-09	19-30	98.0	<0.1	<0.1	2.0	Sand	5.9	1.3	1.3
S0909487-010	S-3-09	30-39	72.0	16.0	16.0	12.0	Sandy Loam	14.0	12.5	12.5
S0909487-011	S-3-09	39-45	66.0	17.0	17.0	17.0	Sandy Loam	13.7	16.7	16.7
S0909487-012	S-3-09	45-60	87.0	7.0	7.0	6.0	Loamy Sand	0.6	11.5	11.5
S0909487-013	S-3-09	60-73	80.0	10.0	10.0	10.0	Loamy Sand	10.7	21.6	21.6
S0909487-014	S-3-09	73-82	44.0	33.0	33.0	23.0	Loam	13.5	21.8	21.8
S0909487-015	S-3-09	82-94	92.0	3.0	3.0	5.0	Sand	4.4	11.1	11.1
S0909487-016	S-4-09	0-6	78.0	12.0	12.0	10.0	Sandy Loam	11.5	15.9	15.9
S0909487-017	S-4-09	6-12	64.0	23.0	23.0	13.0	Sandy Loam	16.2	19.2	19.2
S0909487-018	S-4-09	12-24	39.0	41.0	41.0	20.0	Loam	19.6	21.4	21.4
S0909487-019	S-4-09	24-36	74.0	15.0	15.0	11.0	Sandy Loam	13.4	17.0	17.0

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009
Work Order: S0909487

Project: Sufoo Sed. Pond
Date Received: 9/23/2009

397 South 800 West
Salina, UT 84654

Lab ID	Sample ID	Depths Inches	Selenium ppm	Boron ppm	Nitrogen		Available		Total	
					Nitrate ppm	Phosphorus ppm	Potassium meq/100g	Carbon %	TOC %	
S0909487-001	S-1-09	0-6	<0.02	1.36	4.8	4.2	0.08	5.0	4.0	
S0909487-002	S-1-09	6-13	<0.02	0.94	32.3	26.4	0.05	3.6	2.7	
S0909487-003	S-1-09	13-20	<0.02	0.90	64.0	16.6	0.05	4.5	3.5	
S0909487-004	S-1-09	20-32	0.21	4.49	61.8	4.3	0.03	19.9	16.9	
S0909487-005	S-1-09	32-42	0.07	5.50	44.3	3.7	0.02	29.9	27.7	
S0909487-006	S-1-09	42-54	0.04	2.27	20.2	3.3	0.02	9.1	5.6	
S0909487-007	S-1-09	54-72	0.02	1.32	12.7	6.3	0.03	6.2	2.5	
S0909487-008	S-3-09	0-8	<0.02	2.44	18.0	17.7	0.07	35.8	34.6	
S0909487-009	S-3-09	8-19	<0.02	4.39	0.3	3.1	0.01	49.4	48.4	
S0909487-022	S-3-09	19-30	<0.02	5.14	5.6	3.7	<0.01	67.8	67.7	
S0909487-010	S-3-09	30-39	<0.02	2.58	10.1	54.1	0.02	2.5	1.1	
S0909487-011	S-3-09	39-45	<0.02	1.79	7.0	40.4	0.01	3.0	0.9	
S0909487-012	S-3-09	45-60	<0.02	0.44	<0.1	18.0	<0.01	1.4	0.3	
S0909487-013	S-3-09	60-73	<0.02	0.81	1.0	27.8	<0.01	2.3	<0.1	
S0909487-014	S-3-09	73-82	<0.02	2.11	6.7	16.6	0.03	4.1	1.5	
S0909487-015	S-3-09	82-94	<0.02	0.44	<0.1	7.3	<0.01	1.0	<0.1	
S0909487-016	S-4-09	0-6	<0.02	1.20	<0.1	8.0	0.01	9.6	8.1	
S0909487-017	S-4-09	6-12	<0.02	2.22	<0.1	12.6	0.02	10.6	8.2	
S0909487-018	S-4-09	12-24	<0.02	1.82	1.1	11.2	0.02	11.1	8.6	
S0909487-019	S-4-09	24-36	<0.02	1.54	1.5	5.6	0.01	26.1	24.1	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
1673 Terra Avenue, Sheridan, Wyoming 82801
(307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009
Work Order: S0909487

Project: Sufco Sed. Pond
Date Received: 9/23/2009

397 South 800 West
Salina, UT 84654

Lab ID	Sample ID	Depths Inches	Total		T.S.		Neutral.		T.S.	
			Sulfur %	ABP t/1000t	AB t/1000t	ABP t/1000t	Potential t/1000t	ABP t/1000t		
S0909487-001	S-1-09	0-6	0.04	1.17	1.17	87.0	85.9	85.9		
S0909487-002	S-1-09	6-13	0.02	0.71	0.71	74.0	73.3	73.3		
S0909487-003	S-1-09	13-20	0.04	1.18	1.18	84.1	82.9	82.9		
S0909487-004	S-1-09	20-32	0.20	6.20	6.20	248	242	242		
S0909487-005	S-1-09	32-42	0.28	8.69	8.69	188	180	180		
S0909487-006	S-1-09	42-54	0.05	1.61	1.61	297	296	296		
S0909487-007	S-1-09	54-72	0.01	0.37	0.37	309	308	308		
S0909487-008	S-3-09	0-8	0.18	5.58	5.58	100	94.6	94.6		
S0909487-009	S-3-09	8-19	0.25	7.73	7.73	85.7	78.0	78.0		
S0909487-022	S-3-09	19-30	0.31	9.63	9.63	13.8	4.16	4.16		
S0909487-010	S-3-09	30-39	<0.01	<0.01	<0.01	115	115	115		
S0909487-011	S-3-09	39-45	0.02	0.51	0.51	174	174	174		
S0909487-012	S-3-09	45-60	<0.01	<0.01	<0.01	92.6	92.6	92.6		
S0909487-013	S-3-09	60-73	<0.01	<0.01	<0.01	187	187	187		
S0909487-014	S-3-09	73-82	0.02	0.62	0.62	218	217	217		
S0909487-015	S-3-09	82-94	<0.01	<0.01	<0.01	86.9	86.9	86.9		
S0909487-016	S-4-09	0-6	0.05	1.70	1.70	130	128	128		
S0909487-017	S-4-09	6-12	0.07	2.17	2.17	208	205	205		
S0909487-018	S-4-09	12-24	0.20	6.13	6.13	202	196	196		
S0909487-019	S-4-09	24-36	0.23	7.17	7.17	170	163	163		

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acic Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: *Karen A Secor*

Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
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Soil Analysis Report

Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	PE			SAR	
							Calcium meq/L	Magnesium meq/L	Potassium meq/L		
S0909487-020	S-4-09	36-48	7.1	44.5	0.85	5.1	4.72	3.20	0.21	1.46	0.73
S0909487-021	S-4-09	48-54	7.1	45.6	0.90	5.5	5.34	3.34	0.23	1.57	0.75

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acic Ammonium Oxalate

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Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009
Work Order: S0909487

Project: Sufco Sed. Pond
Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Sand			Silt %	Clay %	Texture	Very Fine		CO3 %
			%	Sand	%				Sand	%	
S0909487-020	S-4-09	36-48	70.0	18.0	12.0	12.0	Sandy Loam	15.8	12.3		
S0909487-021	S-4-09	48-54	65.0	22.0	13.0	13.0	Sandy Loam	13.8	14.4		

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate
Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0909487002
(Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Selenium ppm	Boron ppm	Nitrogen		Available		Total	
					Nitrate ppm	Phosphorus ppm	Potassium meq/100g	Carbon %	Carbon %	TOC %
S0909487-020	S-4-09	36-48	<0.02	1.70	<0.1	7.0	0.02	29.8	28.5	
S0909487-021	S-4-09	48-54	<0.02	1.34	0.3	7.2	0.01	19.7	18.2	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
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 (307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
 Salina, UT 84654

Report ID: S0909487002
 (Replaces S0909487001)

Date Reported: 10/2/2009

Work Order: S0909487

Project: Sufco Sed. Pond

Date Received: 9/23/2009

Lab ID	Sample ID	Depths Inches	Total		T.S.		Neutral.		T.S.	
			Sulfur %	Sulfur AB	AB t/1000t	ABP t/1000t	Potential t/1000t	ABP t/1000t		
S0909487-020	S-4-09	36-48	0.45	14.0	113	99.1				
S0909487-021	S-4-09	48-54	0.27	8.32	125	116				

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acic Ammonium Oxalate
 Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
 Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
 Karen Secor, Soil Lab Supervisor



Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0910070001

Project: Sufco Sed Pond

Date Received: 10/6/2009

Date Reported: 10/13/2009

Work Order: S0910070

Lab ID	Sample ID	Depths Inches	pH s.u.	Saturation %	Electrical Conductivity dS/m	Organic Matter %	Calcium meq/L	Magnesium meq/L	Potassium meq/L	Sodium meq/L	SAR
S0910070-001	S-5-09	1-5	7.3	73.2	0.85	13.0	4.96	1.80	1.08	0.91	0.49
S0910070-002	S-5-09	5-12	7.6	33.8	0.76	4.2	2.97	1.18	0.58	2.47	1.71
S0910070-003	S-5-09	12-18	7.6	37.5	0.70	4.7	3.61	1.49	0.75	0.73	0.46
S0910070-004	S-5-09	18-30	7.6	39.9	0.78	3.6	3.34	1.69	0.46	1.96	1.24
S0910070-005	S-5-09	30-43	7.6	42.7	0.70	5.1	3.21	1.55	0.27	1.40	0.91
S0910070-006	S-5-09	43-47	7.5	38.5	1.65	4.8	9.74	3.45	0.38	1.82	0.71
S0910070-007	S-5-09	47-63	7.6	28.8	1.78	1.6	10.2	4.39	0.33	2.58	0.95
S0910070-008	S-5-09	63-68	7.5	32.6	2.77	1.9	17.6	6.91	0.64	3.79	1.08
S0910070-009	S-5-09	68-76	7.6	36.1	3.18	1.8	18.5	10.6	0.91	6.02	1.58

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acid Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



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1673 Terra Avenue, Sheridan, Wyoming 82801
(307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
Salina, UT 84654

Report ID: S0910070001

Project: Sufco Sed Pond

Date Received: 10/6/2009

Date Reported: 10/13/2009

Work Order: S0910070

Lab ID	Sample ID	Depths Inches	Sand %	Silt %	Clay %	Texture	Very Fine		Nitrogen		Available	
							Sand %	CO3 %	Nitrate ppm	Phosphorus ppm	Potassium meq/100g	
S0910070-001	S-5-09	1-5	57.0	26.0	17.0	Sandy Loam	20.4	23.0	0.3	13.2	0.87	
S0910070-002	S-5-09	5-12	63.0	22.0	15.0	Sandy Loam	7.2	30.3	0.3	6.88	0.37	
S0910070-003	S-5-09	12-18	69.0	19.0	12.0	Sandy Loam	12.9	24.6	5.9	7.14	0.44	
S0910070-004	S-5-09	18-30	60.0	22.0	18.0	Sandy Loam	11.1	26.8	4.6	6.53	0.37	
S0910070-005	S-5-09	30-43	53.0	26.0	21.0	Sandy Clay Loam	5.1	27.9	<0.1	6.31	0.32	
S0910070-006	S-5-09	43-47	63.0	17.0	20.0	Sandy Clay Loam	2.3	24.5	0.5	6.26	0.24	
S0910070-007	S-5-09	47-63	73.0	12.0	15.0	Sandy Loam	6.4	33.3	0.5	4.04	0.13	
S0910070-008	S-5-09	63-68	57.0	24.0	19.0	Sandy Loam	4.7	25.9	0.9	4.00	0.29	
S0910070-009	S-5-09	68-76	57.0	23.0	20.0	Sandy Clay Loam	4.9	27.4	0.9	4.08	0.33	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acic Ammonium Oxalate

Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential

Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor

Karen Secor, Soil Lab Supervisor



Inter-Mountain Laboratories, Inc.
 1673 Terra Avenue, Sheridan, Wyoming 82801
 (307) 672-8945

Soil Analysis Report
Canyon Fuel Company, LLC.

397 South 800 West
 Salina, UT 84654

Report ID: S0910070001

Project: Sufco Sed Pond

Date Received: 10/6/2009

Date Reported: 10/13/2009

Work Order: S0910070

Lab ID	Sample ID	Depths Inches	Total		Neutral	
			Carbon %	TOC %	Carbon %	Potential t/1000t
S0910070-001	S-5-09	1-5	13.7	11.0	230	
S0910070-002	S-5-09	5-12	5.8	2.1	303	
S0910070-003	S-5-09	12-18	4.7	1.7	246	
S0910070-004	S-5-09	18-30	5.2	1.9	268	
S0910070-005	S-5-09	30-43	5.8	2.4	279	
S0910070-006	S-5-09	43-47	5.5	2.6	245	
S0910070-007	S-5-09	47-63	4.0	<0.1	333	
S0910070-008	S-5-09	63-68	4.0	0.9	259	
S0910070-009	S-5-09	68-76	4.0	0.7	274	

These results apply only to the samples tested.

Abbreviations for extractants: PE= Saturated Paste Extract, H2OSol= water soluble, AB-DTPA= Ammonium Bicarbonate-DTPA, AAO= Acic Ammonium Oxalate
 Abbreviations used in acid base accounting: T.S.= Total Sulfur, AB= Acid Base, ABP= Acid Base Potential, PyrS= Pyritic Sulfur, Pyr+Org= Pyritic Sulfur + Organic Sulfur, Neutral. Pot.= Neutralization Potential
 Miscellaneous Abbreviations: SAR= Sodium Adsorption Ratio, CEC= Cation Exchange Capacity, ESP= Exchangeable Sodium Percentage

Reviewed by: Karen A Secor
 Karen Secor, Soil Lab Supervisor

Appendix C

Soil Profile and Area Photographs



Photo 1. Looking up 72 percent slope at coal waste dump that was reclaimed by spreading topsoil. Soil profile S-1-09 is in the center of the photo. The topsoil cover is 20 inches thick at this location. Severe gullying has occurred in the reclaimed area.



Photo 2. Soil profile S-1-09. The coal waste has been covered with 20 inches of topsoil at this location. Vegetation is crested wheatgrass.



Photo 3. Soil profile S-2-09 in alluvium on a stream terrace. Vegetation is dominated by Gamble oak with scattered Rocky mountain juniper, pinyon pine, and rabbitbrush.



Photo 4. Area surrounding soil profile S-3-09. This soil profile is in map unit 4. A reclaimed slope (map unit 2) is vegetated with crested wheatgrass in the near background. Gamble oak in map unit 1 is in the middle background on the lower footslope and stream terrace. The SUFCO mine surface facilities are in the far background.



Photo 5. Soil profile S-3-09 is covered with 30 inches of coal waste and soil mixed with coal waste. Soil profile has a buried surface at 73 inches (dark grayish brown, moist).



Photo 6. Soil profile S-4-09 is located in the alluvial canyon bottom. Mine discharge water from is flowing in the center of this photo.

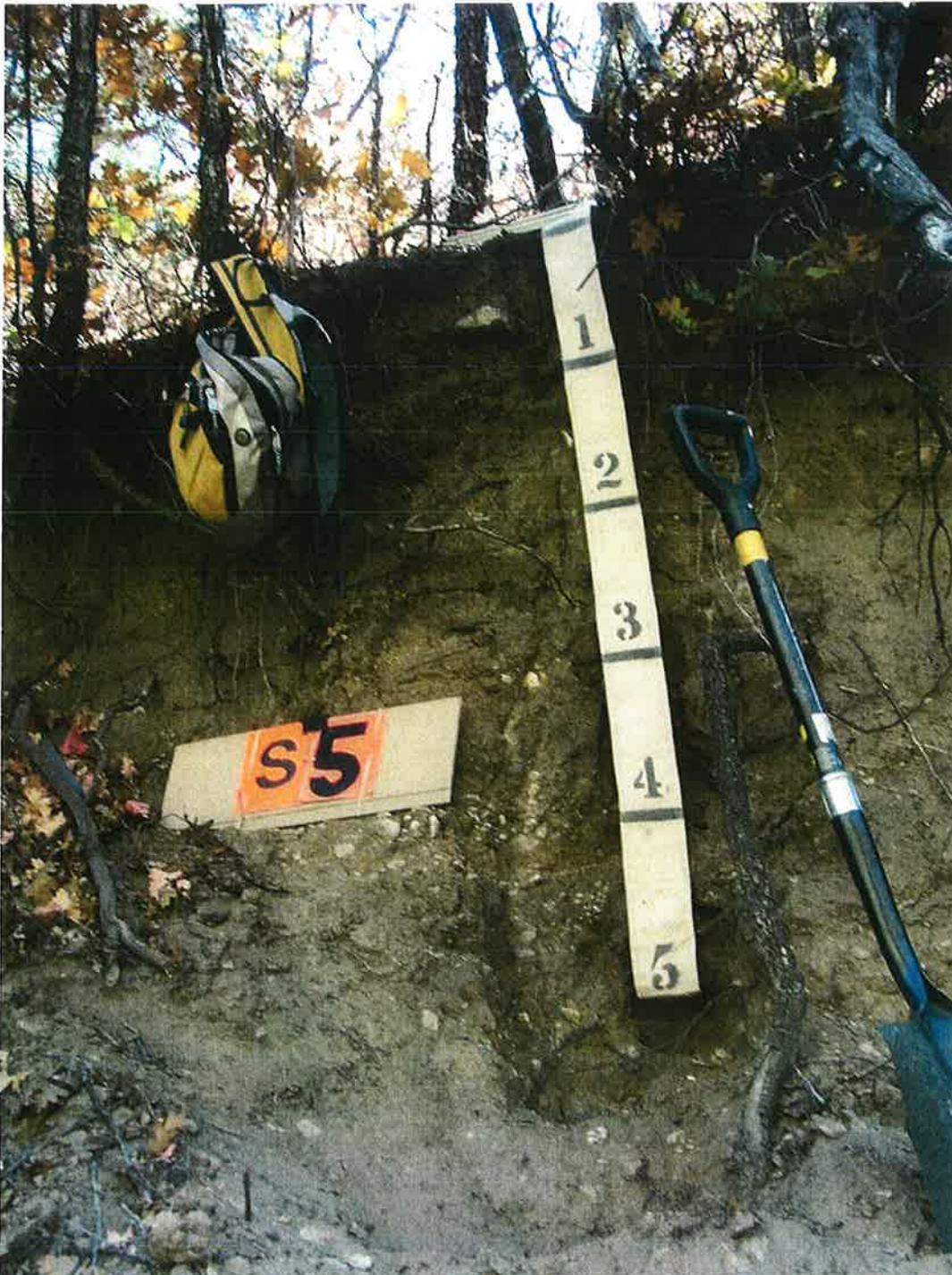


Photo 7. Soil profile S-5-09 in alluvium on east side stream terrace. There are 5 periods of deposition in this soil profile, below the present surface.



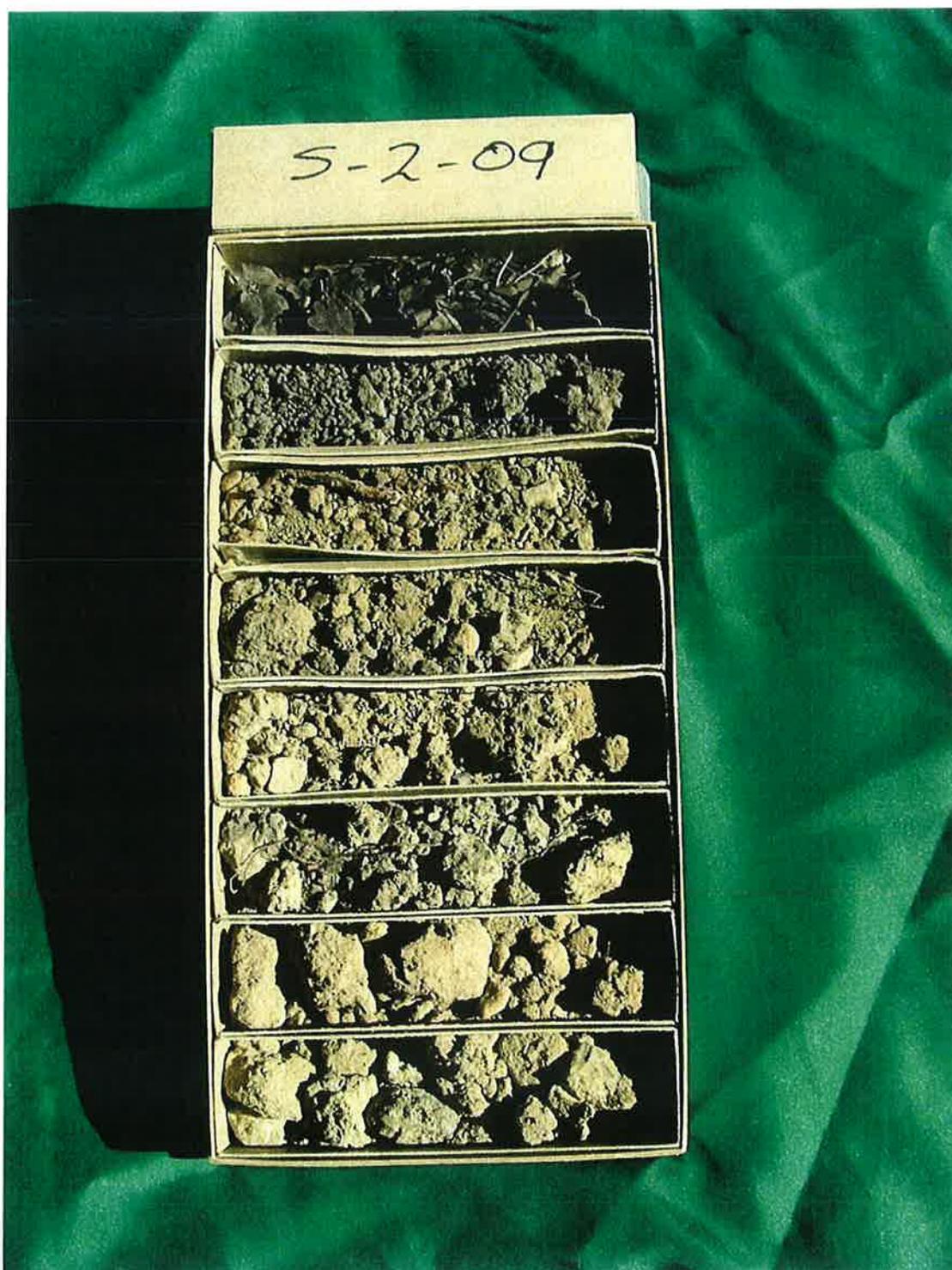
Photo 8. Looking south down canyon at SUFCO settling pond soil survey area. Soil profile S-3-09 is near the backhoe. Soil profile S-4-09 is in the willows east of the backhoe. Soil profile S-5-09 is at the base of the oak brush on the east stream terrace, across from the backhoe.

Appendix D

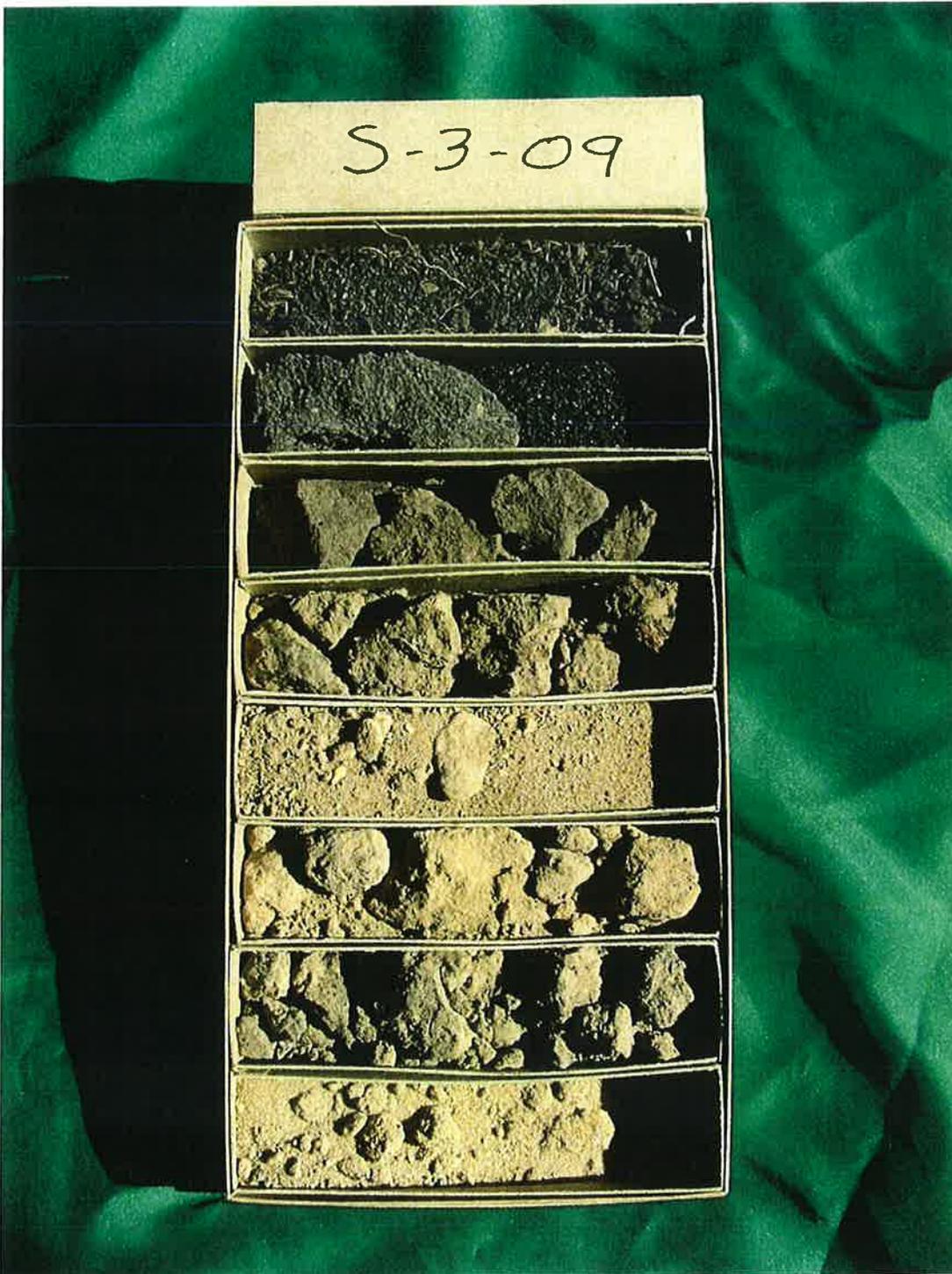
Micromonolith Box Photographs



Box Photo 1. Soil profile S-1-09. Reclaimed coal mine spoil.



Box Photo 2. Soil profile S-2-09. Ustic Haplocryepts, coarse-loamy, mixed, superactive.



Box Photo 3. Soil profile S-3-09, coal waste over native soil profile. Horizons 2 (8 to 19 inches) and 3 (19 to 30 inches) share the same tray with horizon 2 on the left.



Box Photo 4. Soil profile S-4-09. Fluvaquentic Haplustepts, coarse-loamy, mixed, frigid.



Box Photo 5. Soil Profile S-5-09. Fluventic Haplocryepts, coarse-loamy, mixed.

CHAPTER 7
HYDROLOGY

Overflow Pond, Primary Sedimentation Pond and Concrete Sediment Trap. The calculations contained in Appendix 7-14 were based on the assumption that the primary sedimentation pond will fully contain the runoff from the main facility disturbed areas. The concrete sediment trap will pass the water to the sedimentation pond, but will not provide significant runoff storage. The concrete sediment trap is used primarily for the removal of sediment.

Several drainage areas, identified on Plate 7-6, contribute runoff to the overflow pond. The disturbed drainage area contributing directly to the overflow pond are DIS-1 through DIS-6. The undisturbed drainage area contributing to the overflow pond is CBW-1.

The curve numbers used to determine the design runoff volume were based on information presented in Appendix 7-11 and Appendix 7-23. The curve number assumed for the disturbed watershed DIS-1 through DIS-4 is 80 and for DIS-5 and DIS-6 is 100, see Appendix 7-11 and 7-23. The curve number for undisturbed watersheds CBW-1 is 72, see Appendix 7-11. Refer to Table 7-6 for a list of all disturbed and undisturbed subwatershed areas and curve numbers within the facilities area. Based on the curve numbers presented above, the storm runoff volume from the 10-year, 24-hour storm event to the overflow pond is 57,898 cubic feet (1.33 acre-feet). The maintenance runoff rate of 0.046 cfs adds 3,975 cubic feet (0.0913 acre-feet) to this volume during a 24-hour period, resulting in a combined required runoff storage volume of 61,873 cubic feet (1.42 acre-feet) without sediment storage. The calculations, presented in Appendix 7-23, are based on hydrologic design methods described in Appendix 7-10. As presented above, the maximum sediment storage volume is 24,211 cubic feet. In order to fully contain the runoff from the 10-year, 24-hour storm event and the maximum sediment storage, the primary spillway elevation for the overflow pond is 7252.5 (2.14 acre-feet), from the stage-capacity table contained in Table 7-8A. The required minimum elevation for the primary spillway with a volume of 24,211 cubic feet is 7,252.26, for ease of construction the primary spillway elevation will be 7,252.50 feet. **The actual overflow pond is 3.15 acre-feet.**

Several drainage areas, identified on Plate 7-6, contribute runoff to the primary sedimentation pond. The disturbed drainage areas contributing to the pond are DIS-1, DIS-2, DIS-3, DIS-4, and DIS-5. The undisturbed drainage area contributing to the pond is CBW-1. The undisturbed drainage CBW-1 is discharged to the pond because it was determined that construction of a diversion ditch along the