APPENDIX A

SOIL LOGS

EarthFax

Sample 0-22"
22-30"
30-48"

SOILS LOG

BORING No.	EF-1		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT	CYPRUS/ AMAX	PROJECT No.	UX412.16
DATE BEGIN	4/5/95	DATE END	4/5/95
DRILLER	CONROD	METHOD	BOX PIT
RIG TYPE	BACKHOE	LOGGER	D.M.M
COORDINATES		ELEVATION	—
DEPTH (Ft.)	4'	FIRST WATER	—
STATIC WATER	—	BACKFILL	
COMMENTS			

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Sample Depth	Graphic Log	Notes
Root Pockets 10"		Massive	Sa loam	10YR 4/1		EF-1-1	0.0–1.0		Coarse frags 2-9" ~ angular (60% fragments) effervescence +2 ~10% clay. mk gran structure, soft, very friable, non plastic
			Silt loam	10YR 4/2		EF-1-2	1.5–2.0		22" coarse frags 2-3" ~30% ang. lav ↑ lev? (s?) effervescence +2
			Coal fines	10YR 3/1		EF-1-3	2.5–3.5		30" -6" v. dk gray (10YR 3/1) clean (alteration from upward (capillary induced) movement of coal acids. effervescence 0

Coarse Frags.

Sand

Silt

Clay

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5

Sample 0-6"
6-24
24-48"

EarthFax

SOILS LOG

BORING No.	EF-2		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT	CYPRUS/AMAX	PROJECT No.	UC412.16
DATE BEGIN	4/1/95	DATE END	4/1/95
DRILLER	CESTNKOA	METHOD	SOILPIT
RIG TYPE	BACKHOE	LOGGER	DMM
COORDINATES		ELEVATION	
DEPTH (ft.)	4.0'	FIRST WATER	
STATIC WATER		BACKFILL	
COMMENTS			

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
Rocky. Roots to 18"		ma. 61	Sy loam fine-med.	7.5Y 4/2			0.0 – 1.0		Debris material w/ coal waste and angular fragments to 18". (shale debris). mature hard friable non plastic coarse frags ~ 40% v. strong (violent) effervescence (+3)
Debris					Dif		1.5 – 2.0		
			Loamy sand	2.5Y 6/3			2.0 – 3.5		(Sedic) Salt (fine-venic from shaley fragments) round-subrounded pebbles ~ 60%. mature, medium, friable non plastic mod-strong (+2) effervescence.
							4.0 – 4.5		
							5.0 – 5.5		
							6.0 – 6.5		
							7.0 – 7.5		
							8.0 – 8.5		

Coarse Frags.

Sand

Silt

Clay

Sample 0-6"
6-12"
Comp est.

SOILS LOG

EarthFax

BORING No.	EF-3
PROJECT NAME	CRANDALL CANYON
OWNER/CLIENT	CYPRUS/AMAX
PROJECT No.	UC412.16
DATE BEGIN	4/5/95
DATE END	4/5/95
DRILLER	COONROD
METHOD	SOIL PIT
RIG TYPE	BACKHOE
LOGGER	MMM
COORDINATES	/
ELEVATION	/
DEPTH (ft.)	4 FT
FIRST WATER	/
STATIC WATER	
BACKFILL	
COMMENTS	Similar to material @ EF-7.

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
Pebbles and to normal	Soft mod friable	wk. f.a. gran.	Siloam	10YR 4/2	G	S/C.	0.0		0-6" fine gr. a/c/si. 15% pebbles. Acid (+?)
Bendable. root penetration						I.	0.5		
							1.0		SSS w/ ↑ cl. & ↑ coarse frags. (40%) med.-fine gr. ss (ss loam) subangular to angular. (dragl spoil)
	Dry, Brittle (Na!?) Hard, friable	wk f.a. blocky	Ss loam				1.5		
							2.0		poorly developed "soil" - massive, weak, non-plastic → wk. plastic w/ cl. plastic. (+?) Shaky frags. evident as are v. minor -2" coal frags.
Root penetration to 36"			Siloam				2.5		
							3.0		(+?)
							3.5		
							4.0		
							4.5		
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

Coarse Frags.

Sand

Silt

Clay

EarthFax

SOILS LOG

BORING No.	EF-4		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT	CYPRUS/AMAX	PROJECT No.	DC412.16
DATE BEGIN	4/5/95	DATE END	4/6/95
DRILLER	CIONEDO	METHOD	SOIL PIT
RIG TYPE	BACKHOE	LOGGER	AMM
COORDINATES		ELEVATION	
DEPTH (Ft.)	4'	FIRST WATER	—
STATIC WATER	—	BACKFILL	—
COMMENTS	TOP SOIL SUBSTITUTE		

Coarse Frags. / Sand / Silt / Clay

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Sample Depth	Graphic Log	
Roots - dead grass roots to 6"	friable, non-plastic, sl. plastic	mod. s-a. bl.	Sl loam	2.5Y 3/2	Gradual	I	0.0, 0.5, 1.0		0-3" fine - v fine gr. ss +3 effervescence; Sandy loam (55% gravel (10%); ~40% subrnd to subang cobbles 1"-2" to 4"; Alluvial layer ≡ 3"-14" in EF-5
Rocks ~10% 24" 40% ~6"	soft, friable non-plastic	W. s-a. grn crumbly	Sl-gravel	2.5Y 4/4	Distinct		1.5, 2.0		14" (≡ -14" in EF-5) w/ ↑ ss +3 effervescence; ~30% coarse frags as above, ↑ 1-2"; w/ ? subrnd alluvium
Root casts normal bioturbation to 20"						"C"	2.5, 3.0, 3.5		+3 effervescence
	sl. plastic	wet	Si loam	10YR 4/3		"T"	4.0, 4.5		↑ clay ~20% +3 effervescence
	friable non-plastic	Massive → crumbly	Sandy gravel	10YR 4/3			5.0, 5.5, 6.0		+2 effervescence
							6.5, 7.0, 7.5, 8.0, 8.5		+2 effervescence

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SOILS LOG

BORING No.	EF-5		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT	CYPROS/RMAX	PROJECT No.	IX 412.16
DATE BEGIN	4/5/95	DATE END	4/6/95
DRILLER	CANYON	METHOD	SOIL PIT
RIG TYPE	BACKHOE	LOGGER	DMM
COORDINATES		ELEVATION	
DEPTH (ft.)	5' → 7.5	FIRST WATER	
STATIC WATER		BACKFILL	4/6/95
COMMENTS			

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Sample Depth	Graphic Log	Description
Dense grass root penetration to 10"	weak (friable)	Wk. f-m. gr. platy	Si Sc (G)		Gradual	Ella / Illu	0.0, 0.5, 1.0		Si Sc (medgr sand); +2 effervescence. <5% - 2" gravel. 2.5Y 4/3. 2.5Y 3/2. Si Sc (G) (med-coarse gr sand) ↓ 20% < 2" gravel. Some rocks to 18". Stained med sub-ang. blocky.
Dark Boulders Stones 60%	wk-friable non-plastic	W-granular	SS-gravel cobble	2.5Y 5/3			1.5, 2.0		14" Ss. 60% coarse frags to 8". med-coarse gr sand w/ stained sub-ang. blocky. +2 effervescence.
Roots to 40"		Mon →	Si Loam				2.5, 3.0		30" Si-Ss organic rich horizon 10YR 3/2. Buried "O" hzn. 35" Cl-Si mottled <2" pebbles. +3 effervescence. 40"
		Massive	Si Cl	2.5Y 5/3			3.5, 4.0		
Rubbles, boulders ~15%			Si Loam	Mottled / Mottled 10YR 5/3 2.5Y 5/3			4.5, 5.0, 5.5, 6.0		
Large Boulders to 2m 70%		Moraine	Si Loam	2.5Y 5/3			6.5, 7.0, 7.5		↑ clay ↑ roots. +2 effervescence.
							8.0, 8.5		

Coarse Frags.

Sand

Silt

Clay

EarthFax

SOILS LOG

BORING No.	EF-6		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT	CYPRUS	PROJECT No.	UC412.16
DATE BEGIN	4/5/95	DATE END	4/6/95
DRILLER	COONROD	METHOD	SOIL PIT
RIG TYPE	BACKHOE	LOGGER	DMM
COORDINATES		ELEVATION	NA
DEPTH (ft.)	5 FT. deepen to	FIRST WATER	NA
STATIC WATER	N/A 8'	BACKFILL	4/6/95
COMMENTS	Soil log w/ Hazing Sim's		

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Samples	Depth	Graphic Log	
Roots v. rocky sub-a → subangular	weak friable slightly plastic	wk. s-a-bl.	Sandy loam	10YR 5/3	Gradual			0.0 – 1.0		· Weak sub angular blocky to granular · effervescence +2 · Rocks up to 14" ~ 20% · Gravelly
Rocky Roots around Boulders	mod?	mod. s-a. bl.	sandy loam	10YR 3/2	Distinct	Buried "A"	2	1.5 – 2.0		· mod sub angular blocky · ~ 25% clay · Roots common in void spaces adjacent to rocks · Rocks, & clay
Gravel < 2" Roots to 36"	wk. friable non plastic	wk granular	CaL & gravel	2.5Y 5/4			3	2.5 – 4.0		· Rocks ~ 10% up to 18" · Gravel ~ 40% fine sand to rounded, up to 2" effervescence +3 · Eluviation
	sl. non-plastic							4.0		· Minor illuvial clay coating @ 11'
Cobbles 20% pebbles < 2" 10%	non-plastic	massive	loamy (Si)SL	2.5Y 5/4				4.5		effervescence +3 Eluviation, & rock fragments, & sand (coarse).
	sl. plastic	Mod Platy	S Loam				4	5.0 – 6.0		illuvial layer fine to med grained sand
Boulders to 18" + Cobbles 20%		massive	SL loam				5	6.5 – 7.5		
								8.0		
								8.5		

Coarse Frags.

Sand (Ss)

Silt (Si)

Clay (C)

EarthFax

SOILS LOG

*Sample as per agreement
* incl sample of hydroacids. soils

BORING No.	EF-7		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT	CYPRUS/AMAX	PROJECT No.	UC412.16
DATE BEGIN	4/5/95	DATE END	4/5/95
DRILLER	CONTRACTOR	METHOD	SOIL PIT
RIG TYPE	BACKHOE	LOGGER	DMM
COORDINATES		ELEVATION	
DEPTH (Ft.)	4'	FIRST WATER	
STATIC WATER		BACKFILL	
COMMENTS CUM	ABSENCE OF WHITE/ACID FORMING MINERALS		

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Sample Interval Depth	Graphic Log	Description
Pebbles	friable non plastic	fr granular	Sa Loam ? Sa Loam	10YR 4/3 ? 10YR 4/3	G?	Sf?	0.0 (1) 0.5 (2) 1.0		0-4" med-gr ss effervescence 1% med gyp w/ 1-5mm angular frags. ↑ frags
cobbles rocks. Pebbles to 26"		wk-mod, s-a. blocky	Sa Loam	10YR 4/2			1.5 (3) 2.0		mixed fill material w/ no distinct layering; 70-30% ss cobbles to 8" ~ feox coating ↑↑S 25% ss rocks to 15" feox mottles (5YR 4/6) +2 effervescence
Dendritic (shrub).							2.5 (4) 3.0 3.5		(vdlc) Hydroacids in grey soils 10-28" (ovox) (7.5YR 3/2) effervescence ~ +0.5-1
	sl. plastic						4.0		
							4.5		
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

Coarse Frags.

Sand

Silt

Clay

EarthFax

SOILS LOG

BORING No.	STOCKPILE B B-3
PROJECT NAME	GRANDALL CANYON
OWNER/CLIENT	
PROJECT No.	
DATE BEGIN	4-6-95
DATE END	4-6-95
DRILLER	TONY MAG
METHOD	AMS HAND AUGER
RIG TYPE	1
LOGGER	T.M.
COORDINATES	
ELEVATION	
DEPTH (ft.)	
FIRST WATER	
STATIC WATER	
BACKFILL	
COMMENTS	

Coarse Frags.

Sand

Silt

Clay

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
							0.0		0-0.5' SAND. f-m GRAINED. MOIST. FRIABLE. ROOTS 10YR 4/3 DARK BROWN.
							0.5		0.5-1.0' A.A. TRACE m-GRAINED SIZE COAL AND S.S. FRAGS TO 1+"
							1.0		
							1.5		1.0-1.5' SILTY SAND. CLAY STRINGERS. ~70% FINE GRAINED SAND. SOME FINE GRAVEL. FRIABLE. MOIST. CLAY IS VERY FIRM. 10YR 5/8 BROWN SILTY SAND IS 10YR 3/3 DARK BROWN.
							2.0		
							2.5		1.5-2.0' AA CLAY IS BECOMING FIRM TO FRIABLE (DRYER)
							3.0		2.0-6.0' SAND. PREDOMINANTLY VERY FINE TO FINE GRAINED. SOME M-C GRAINS. SOME S.S. TO 1". DRY. POWDERY 10YR 5/3 BROWN.
							3.5		
							4.0		T.D. = 6.0'
							4.5		
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

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SOILS LOG

BORING No.	STOCK-PILE A BORING #1
PROJECT NAME	CHANDALL CANYON
OWNER/CLIENT	
PROJECT No.	UC-412
DATE BEGIN	4-5-95
DATE END	4-5-95
DRILLER	TONY MING
METHOD	AMS HAND AUGER
RIG TYPE	—
LOGGER	TONY MING
COORDINATES	
ELEVATION	
DEPTH (ft.)	
FIRST WATER	
STATIC WATER	
BACKFILL	
COMMENTS	

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
							0.0		0-0.5' GRASS W/ SUNFLOWER. SAND, PREDOMINANTLY FINE GRAINED, SOME M-GRAINED. MOIST @ ~3" TRACE VERY FRIABLE INAD (2 mm) AND COAL FRAGMENTS. ROOTS. 10YR 3/2 VERY DARK GRAYISH BROWN. FRIABLE.
							0.5		
							1.0		
							1.5		0.5-1.0' SAND. AS ABOVE. MOIST. TRACE ROOTS. SOME BROKEN SANDSTONE TO 1". SOME WOOD FRAGMENTS. FRIABLE. TRACE COAL.
							2.0		
							2.5		1.0-1.5' AS ABOVE. 10YR 3/3 DARK BROWN.
							2.0		1.5-2.0' AS ABOVE EXCEPT S.S. FRAGMENTS NO LARGER THAN 2-3 mm. NO ROOTS
							3.5		2.0-2.5 AS ABOVE
							4.0		2.5-3.0 SAND. AS ABOVE W/ TRACE SILT. OCCASIONAL SMALL ROUNDED STONE TO 1/2" SS FRAGMENTS TO 1/2". WOOD FRAGS. FRIABLE.
							4.5		3.0-3.5 AS ABOVE. NO WOOD.
							5.0		3.5-4.0' SAND. FINE-MEDIUM GRAINED. OCCASSIONALLY WOOD, S.S., AND COAL FRAGMENTS FRIABLE. VERY MOIST 10YR 4/3 DARK BROWN
							5.5		4.0-4.5 AS ABOVE 10YR 3/2
							6.0		4.5-5.0 AS ABOVE TRACE SILT. NO WOOD.
									5.0-5.5 AS ABOVE LESS SILT.
							6.5		5.5-6.0 AS ABOVE INCREASING COAL.
									6.0-6.5 SAND. F-M GRAINED. OCCASSIONAL VC GRAINED (2mm). S.S. FRAGS TO 1/4". 10YR 3/2 FRIABLE. MOIST.
							7.0		6.5-7.0' AS ABOVE W/ WOOD + COAL FRAGS.
							7.5		7.0-7.5' AS ABOVE. LESS WOOD
							8.0		7.5-8.0' AS ABOVE.
							8.5		

Coarse Frags.

Sand

Silt

Clay

EarthFax

SOILS LOG

BORING No.	STOCKPILE A B-2
PROJECT NAME	CRANDALL CANYON
OWNER/CLIENT	
PROJECT No.	UG-412
DATE BEGIN	4-5-95
DATE END	4-5-95
DRILLER	TONY MAG
METHOD	DMS HAND AUGER
RIG TYPE	—
LOGGER	TONY MAG
COORDINATES	
ELEVATION	
DEPTH (ft.)	
FIRST WATER	
STATIC WATER	
BACKFILL	
COMMENTS	

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	Comments
							0.0		0-0.5' GRASS @ SURFACE
							0.5		SAND. PREDOMINANTLY FINE GRAINED. SOME M-C GRAINS MOIST, FRIABLE. ROOTS. 7.5YR 3/2 DARK BROWN
							1.0		0.5-1.0' SAND AS ABOVE. INCREASING COARSE GRAINS W/SMALL STONES TO 1". ROOTS. 7.5Y 3/2
							1.5		1.0-1.5' AS ABOVE
							2.0		REFUSAL @ 1.5' (BOULDER?)
							2.5		
							3.0		
							3.5		
							4.0		
							4.5		
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

Coarse Frags.

Sand

Silt

Clay

EarthFax

SOILS LOG

BORING No.	STOCKPILE A B-3
PROJECT NAME	CRANDALL CANYON
OWNER/CLIENT	
PROJECT No.	UC-412
DATE BEGIN	4-5-95
DATE END	4-5-95
DRILLER	TONY MAG
METHOD	AMS HAND AUGER
RIG TYPE	—
LOGGER	TONY MAG
COORDINATES	
ELEVATION	
DEPTH (ft.)	
FIRST WATER	
STATIC WATER	
BACKFILL	
COMMENTS	

Coarse Frags.

Sand

Silt

Clay

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
							0.0		0-0.5' SAND. PREDOMINANTLY FINE GRAINED. SOME M-C GRAINS. S.S. FRAGMENTS. TR. SILT MOIST. FRIABLE. 10YR 3/2. VERY DARK GRAYISH BROWN
							0.5		
							1.0		0.5-1.0' AS ABOVE
							1.5		1.0-1.5' SILTY SAND. ~70% FINE GRAINED SAND. SOME SMALL S.S. FRAGS. ROOTS. FRIABLE. MOIST. SOME OF S.S. IS VERY SOFT. 10YR 3/2
							2.0		1.5-2.0' SAND. f-m GRAINED. SOME C-GRAINED SANDSTONE FRAGS + STONES TO 2". 10YR 3/3 DK. BROWN MOIST. FRIABLE.
							2.5		
							3.0		2.0-2.5' SAND. f-m GRAINED. SOME C-GRAINS AND S.S. FRAGS TO ~1/4" MOIST. VERY FRIABLE. 10YR 3/2
							3.5		
							4.0		2.5-3.0' SAND. f-m GRAINED. OCCASIONAL GRAINS TO 2+mm. MOIST. FRIABLE. 10YR 3/2
							4.5		
							5.0		3.0-3.5' AS ABOVE w/ S.S. FRAGS TO 1"
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

EarthFax

SOILS LOG

BORING No.	STOCKPILE A B-4
PROJECT NAME	CRANDALL CANYON
OWNER/CLIENT	
PROJECT No.	UG-412
DATE BEGIN	4-5-95
DATE END	4-5-95
DRILLER	TONY MAG
METHOD	AMS HAND AUGER
RIG TYPE	—
LOGGER	TONY MAG
COORDINATES	
ELEVATION	
DEPTH (ft.)	5'
FIRST WATER	
STATIC WATER	REFUSAL @ 5'
BACKFILL	2.5'
COMMENTS	BRIEF THROUGH STONES @ 4' AND 4.5'

Coarse Frags.

Sand

Silt

Clay

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
							0.0		0-0.5' GRASS @ SURFACE. SAND. FINE GRAINED. SOME M-C GRAINS. STONES TO 1+". ROOTS. MOIST FRIABLE. 7.5YR 4/2 DARK BROWN
							0.5		
							1.0		0.5-1.0' SAND. FINE GRAINED. SOME M-C GRAINED. SMALL STONES ~3mm-1/4". MOIST. SOME ROOTS FRIABLE. 10YR 4/2 DK GRAYISH BROWN
							1.5	SOME	
							2.0		1.0-1.5': AS ABOVE
							2.5		1.5-2.0 AS ABOVE W/TRACE COAL FRAGS
							3.0		2.0-2.5 A.A. SOME LARGER S.S. FRAGS (TO 1") 10YR 3/2 VERY DK GRAYISH BROWN
									2.5-3.0 AA W/TRACE SILT BROWN S.S.
							3.5		3.5-4.0 AA 10YR 3/2 DK. BROWN
							4.0		4.0-4.5' AA. W/TRACE COAL FRAGS
							4.5		4.5-5.0' AA W/MANY S.S. FRAGS.
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

EarthFax

SOILS LOG

BORING No.	STOCKPILE B B-1
PROJECT NAME	GRANDALL CANYON
OWNER/CLIENT	
PROJECT No.	UC-412
DATE BEGIN	4-5-95
DATE END	4-5-95
DRILLER	TONY MAG
METHOD	AMS HAND AUGER
RIG TYPE	—
LOGGER	TONY MAG
COORDINATES	
ELEVATION	
DEPTH (ft.)	
FIRST WATER	
STATIC WATER	
BACKFILL	
COMMENTS	

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	Description
							0.0		0-0.25 GRASS @ SURFACE
							0.5		SAND. FINE GRAINED SOME M-C GRAINED. FRIABLE. ROOTS. MOIST 10YR 3/3 DK BROWN
							1.0		0.25-0.5' SAND. FINE GRAINED. UNIFORM. MOIST VERY FRIABLE. 10YR 5/4 YELLOWISH BROWN
							1.5		0.5-1.0' SAND. FINE GRAINED. SOME M-C GRAINS. AN. S.S. FRAGMENTS. MOIST. ROOTS. FRIABLE. 10YR 3/3 DK. BROWN
							2.0		
							2.5		1.0-1.5' AS ABOVE w/ TR. SILT
							3.0		1.5-2.0' AS ABOVE. S.S. BOULDER @ ~1.8' REFUSAL
							3.5		
							4.0		
							4.5		
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

Coarse Frags.

Sand

Silt

Clay

EarthFax

SOILS LOG

BORING No.	STOCKPILE B B-2
PROJECT NAME	CRANDALL CANYON
OWNER/CLIENT	
PROJECT No.	UC-412
DATE BEGIN	4-5-95
DATE END	4-6-95
DRILLER	TONY MAG
METHOD	AMS HAND AUGER
RIG TYPE	—
LOGGER	TONY MAG
COORDINATES	
ELEVATION	
DEPTH (ft.)	
FIRST WATER	
STATIC WATER	
BACKFILL	
COMMENTS	

Coarse Frags.

Sand

Silt

Clay

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	
							0.0		0-0.5 GRASS @ SURFACE. SAND. FINE GRAINED. SOME M-C GRAINS. SOME SMALL STONE ~1/8". MOIST ROOTS. FRIABLE. 10YR 3/3 DK BROWN
							0.5		
							1.0		0.5-1.0' SAND. F-M GRAINED. SOME COARSE GRAINS AND SMALL STONES. ≥2 MM. ROOTS. MOIST FRIABLE. 10YR 3/3
							1.5		
							2.0		1.0-1.5' A.A. SOME S.S. FRAGS TO 1"
							2.5		1.5-2.0' SAND. SOME SILT. SAND IS PREDOMINANTLY FINE GRAINED. SOME M-C GRAINS. AL-GRAIN COAL FRAGS. LARGER S.S. FRAGS TO 1". ROOTS. MOIST FRIABLE - 10YR 3/3
							3.0		
							3.5		2.0-2.75' SILTY SAND w/ CLAY STRINGERS. ~70% FINE GRAINED SAND. SOME M-C GRAINS. FRIABLE. MOIST CLAY IS PLASTIC. S.S. FRAGS TO 2". ROOTS SAND IS 10YR 3/3. CLAY IS 10YR 5/3 BROWN
							4.0		
							4.5		OCCASSIONAL CLAY STRINGER A.A.
							5.0		2.75-3.25 SAND. SOME SILT. SAND IS PRED. FINE GRAINED SOME M-C GRAINS. S.S. FRAGS TO 1+". ROOTS. MOIST FRIABLE. 10YR 3/3
							5.5		3.25-4.0' A.A. w/ M-GRAINED SIZED COAL FRAGS.
							6.0		4.0-4.5' SAND w/ CLAY LENSES UP TO 2" SAND IS F-M GRAINED. OCCASSIONAL S.S. NODULE TO 1/8". CLAY IS SLIGHTLY PLASTIC. SAND IS FRIABLE. SAND - 10YR 3/3 CLAY 10YR 5/3 BROWN
							6.5		
							7.0		4.5-5.0' SAND. FINE GRAINED. TRACE M-GRAINED. SOME S.S. FRAGS TO 1". MOIST. FRIABLE
							7.5		5.0-6.0' SOFT SANDSTONE AND MUDSTONE. DIFFICULT TO AUGER. SAMPLE IS DRY POWDERY CLAY?, SILT, AND VERY FINE SAND w/ LARGER NODULES OF SOFT MUDSTONE AND SANDSTONE. 10YR 5/3 BROWN
							8.0		
							8.5		6.0-7.5' A.A.

REFUSAL @ 7.5'

EarthFax

SOILS LOG

BORING No.	STOCKPILE B B-4		
PROJECT NAME	CRANDALL CANYON		
OWNER/CLIENT		PROJECT No.	UC-412
DATE BEGIN	4-6-95	DATE END	4-6-95
DRILLER	TONY MAG	METHOD	AMS HAND AUGER
RIG TYPE	—	LOGGER	J.M
COORDINATES		ELEVATION	
DEPTH (Ft.)		FIRST WATER	
STATIC WATER		BACKFILL	
COMMENTS			

Roots Organic Material Rocks	Consistence Wet Moist Dry	Structure	Texture	Color (Munsell)	Boundary Condition	Horizon	Depth	Graphic Log	Comments
							0.0		0-0.5' SILTY CLAY. SOME f-GRAINED SAND. MOIST FIRM. ROOTS. 10YR 5/4 YELLOWISH BROWN.
							0.5		
							1.0		0.5-4.0' SAND. SOME CLAY STRINGERS. SAND IS FINE-GRAINED. SOME SILT. FRAGS ~1/8". SAND IS VERY FRIABLE. CLAY IS PLASTIC 10YR 5/3 BROWN. SAND IS 10YR 4/2 DK BROWN.
							1.5		
							2.0		TD=4.0'
							2.5		
							3.0		
							3.5		
							4.0		
							4.5		
							5.0		
							5.5		
							6.0		
							6.5		
							7.0		
							7.5		
							8.0		
							8.5		

Coarse Frags.

Sand

Silt

Clay

APPENDIX B

LABORATORY ANALYTICAL REPORT

**NOTE UPDATED SELENIUM RESULTS AND
LAB WORK SHEETS FOR NEUTRALIZATION AND MAXIMUM ACID POTENTIAL
INCLUDED FOLLOWING THE INITIAL DATA SHEETS**

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024886

PROJECT: Crandall Canyon: TS-1 0-48"

DATE SAMPLED: 4-06-95

DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.81	EPA 9045
Conductivity, umhos/cm	163	EPA 9050
Phosphorus as P, mg/Kg	9.8	EPA 6010
Potassium as K, mg/Kg	90.4	EPA 6010
Nitrate as NO_3-N, mg/Kg	2.68	EPA 353.1
Calcium as Ca (Water Sol), mg/Kg	317	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	45.1	EPA 6010
Sodium as Na (Water Sol), mg/Kg	6.5	EPA 6010
Sieve: % Rock	13.4	USC
% Sand	70.0	Hydrometer, ASA
% Silt	17.7	Hydrometer, ASA
% Clay	12.2	Hydrometer, ASA
Total Nitrogen as N, mg/Kg	2,300	EPA 351.4
SAR	0.09	Calc.

Approved By: Russell Ruckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024887

PROJECT: Crandall Canyon: TS-2 48-96"

DATE SAMPLED: 4-06-95

DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.80	EPA 9045
Conductivity, umhos/cm	288	EPA 9050
Phosphorus as P, mg/Kg	<2	EPA 6010
Potassium as K, mg/Kg	51.9	EPA 6010
Nitrate as NO_3-N, mg/Kg	15.5	EPA 353.1
Calcium as Ca (Water Sol), mg/Kg	79	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	21.0	EPA 6010
Sodium as Na (Water Sol), mg/Kg	4.8	EPA 6010
Sieve: % Rock	4.50	USC
% Sand	71.3	Hydrometer, ASA
% Silt	17.4	Hydrometer, ASA
% Clay	11.3	Hydrometer, ASA
Total Nitrogen as N, mg/Kg	923	EPA 351.4
SAR	0.12	Calc.

Approved By: Russell Ruckman

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DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024888

PROJECT: Crandall Canyon: TS-3 0-48"

DATE SAMPLED: 4-06-95

DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.84	EPA 9045
Conductivity, umhos/cm	189	EPA 9050
Phosphorus as P, mg/Kg	16.7	EPA 6010
Potassium as K, mg/Kg	84.0	EPA 6010
Nitrate as NO_3-N, mg/Kg	4.04	EPA 353.1
Calcium as Ca (Water Sol), mg/Kg	633	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	86.4	EPA 6010
Sodium as Na (Water Sol), mg/Kg	5.9	EPA 6010
Sieve: % Rock	8.14	USC
% Sand	57.2	Hydrometer, ASA
% Silt	28.3	Hydrometer, ASA
% Clay	14.5	Hydrometer, ASA
Total Nitrogen as N, mg/Kg	752	EPA 351.4
SAR	0.06	Calc.

Approved By: Russell Ruckman

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DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024889

PROJECT: Crandall Canyon: TS-4 48-90"

DATE SAMPLED: 4-06-95

DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.81	EPA 9045
Conductivity, umhos/cm	329	EPA 9050
Phosphorus as P, mg/Kg	<2	EPA 6010
Potassium as K, mg/Kg	31.3	EPA 6010
Nitrate as NO_3-N, mg/Kg	14.0	EPA 353.1
Calcium as Ca (Water Sol), mg/Kg	97.1	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	17.3	EPA 6010
Sodium as Na (Water Sol), mg/Kg	2.8	EPA 6010
Sieve: % Rock	8.73	USC
% Sand	52.9	Hydrometer, ASA
% Silt	31.7	Hydrometer, ASA
% Clay	15.3	Hydrometer, ASA
Total Nitrogen as N, mg/Kg	846	EPA 351.4
SAR	0.07	Calc.

Approved By: Russell Ruckman

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DATE: 5-11-95

TO: EarthFax Engineering
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Midvale, Utah 84047

SAMPLE ID: Lab #U024890
PROJECT: Crandall Canyon: EF-1-1, 0-22"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.03	EPA 9045
Conductivity, umhos/cm	283	EPA 9050
Saturation, %	35.9	ASA
Sieve: % Rock	67.2	USC
% Sand	65.7	Hydrometer, ASA
% Silt	27.3	Hydrometer, ASA
% Clay	7.0	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	110	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	29.4	EPA 6010
Sodium as Na (Water Sol), mg/Kg	56.9	EPA 6010
SAR	1.24	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	926	EPA 351.4
Nitrate as NO_3-N, mg/Kg	3.39	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	3.37	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	468	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	16,900	EPA 9060
Exchangeable Sodium, meq/100gm	11.4	ASA
Available Water Capacity, %	20.7	ASA

Approved By: Russell Ruckman

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SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024891
PROJECT: Crandall Canyon: EF-1-2, 22-30"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.06	EPA 9045
Conductivity, umhos/cm	490	EPA 9050
Saturation, %	32.6	ASA
Sieve: % Rock	28.1	USC
% Sand	62.0	Hydrometer, ASA
% Silt	27.3	Hydrometer, ASA
% Clay	10.7	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	126	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	31.3	EPA 6010
Sodium as Na (Water Sol), mg/Kg	85.6	EPA 6010
SAR	1.77	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	765	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.90	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.53	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	938	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	11,700	EPA 9060
Exchangeable Sodium, meq/100gm	15.4	ASA
Available Water Capacity, %	23.5	ASA

Approved By: Russell Ruckman

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DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024892
PROJECT: Crandall Canyon: EF-1-3, 30-48"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.13	EPA 9045
Conductivity, umhos/cm	346	EPA 9050
Saturation, %	36.2	ASA
Sieve: % Rock	57.0	USC
% Sand	83.9	Hydrometer, ASA
% Silt	13.0	Hydrometer, ASA
% Clay	3.1	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	236	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	38.4	EPA 6010
Sodium as Na (Water Sol), mg/Kg	97.4	EPA 6010
SAR	1.55	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	5,730	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.48	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	8.43	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	467	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	242,000	EPA 9060
Exchangeable Sodium, meq/100gm	8.47	ASA
Available Water Capacity, %	25.5	ASA

Approved By: Russell Ruckman

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SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024893
PROJECT: Crandall Canyon: EF-2-1, 0-6"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.74	EPA 9045
Conductivity, umhos/cm	189	EPA 9050
Saturation, %	33.1	ASA
Sieve: % Rock	46.9	USC
% Sand	68.0	Hydrometer, ASA
% Silt	25.1	Hydrometer, ASA
% Clay	7.0	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	271	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	48.1	EPA 6010
Sodium as Na (Water Sol), mg/Kg	2.2	EPA 6010
SAR	0.03	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	1,120	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.68	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	3.72	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	468	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	57,500	EPA 9060
Exchangeable Sodium, meq/100gm	9.17	ASA
Available Water Capacity, %	25.9	ASA

Approved By: Russell Buckman

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SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024894
PROJECT: Crandall Canyon: EF-2-2, 6-24"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.08	EPA 9045
Conductivity, umhos/cm	316	EPA 9050
Saturation, %	33.0	ASA
Sieve: % Rock	69.9	USC
% Sand	83.5	Hydrometer, ASA
% Silt	14.4	Hydrometer, ASA
% Clay	2.1	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	112	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	13.9	EPA 6010
Sodium as Na (Water Sol), mg/Kg	8.2	EPA 6010
SAR	0.19	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	422	EPA 351.4
Nitrate as NO_3-N, mg/Kg	3.44	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	3.34	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	931	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	10,200	EPA 9060
Exchangeable Sodium, meq/100gm	13.3	ASA
Available Water Capacity, %	27.3	ASA

Approved By: Russell Rackman

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SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024895
PROJECT: Crandall Canyon: EF-2-3, 24-48"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.08	EPA 9045
Conductivity, umhos/cm	276	EPA 9050
Saturation, %	31.2	ASA
Sieve: % Rock	72.7	USC
% Sand	81.4	Hydrometer, ASA
% Silt	14.2	Hydrometer, ASA
% Clay	4.4	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	168	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	19.9	EPA 6010
Sodium as Na (Water Sol), mg/Kg	15.6	EPA 6010
SAR	0.30	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	480	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.53	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	3.19	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	933	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	6,720	EPA 9060
Exchangeable Sodium, meq/100gm	10.4	ASA
Available Water Capacity, %	24.7	ASA

Approved By: Russell Ruckman

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801 262 7378 FAX
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SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024896
PROJECT: Crandall Canyon: EF-3-1, 0-6"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.90	EPA 9045
Conductivity, umhos/cm	150	EPA 9050
Saturation, %	31.1	ASA
Sieve: % Rock	23.7	USC
% Sand	61.0	Hydrometer, ASA
% Silt	25.1	Hydrometer, ASA
% Clay	13.9	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	410	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	39.3	EPA 6010
Sodium as Na (Water Sol), mg/Kg	19.8	EPA 6010
SAR	0.25	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	960	EPA 351.4
Nitrate as NO_3-N, mg/Kg	6.39	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.56	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	933	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	12,000	EPA 9060
Exchangeable Sodium, meq/100gm	15.5	ASA
Available Water Capacity, %	23.4	ASA

Approved By: Russell Ruckman

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SALT LAKE CITY UTAH 84107 6905

CHEMTECH ANALYTICAL LABORATORIE

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024897
PROJECT: Crandall Canyon: EF-3-2, 6-12"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.99	EPA 9045
Conductivity, umhos/cm	161	EPA 9050
Saturation, %	30.5	ASA
Sieve: % Rock	41.2	USC
% Sand	67.4	Hydrometer, ASA
% Silt	22.8	Hydrometer, ASA
% Clay	9.8	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	64.7	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	14.2	EPA 6010
Sodium as Na (Water Sol), mg/Kg	20.4	EPA 6010
SAR	0.60	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	673	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.82	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.78	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	94	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	10,540	EPA 9060
Exchangeable Sodium, meq/100gm	15.8	ASA
Available Water Capacity, %	23.7	ASA

Approved By: Russell Rackman

801 262 7299 PHONE
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6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024898
PROJECT: Crandall Canyon: EF-3-3, 18-48"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.02	EPA 9045
Conductivity, umhos/cm	191	EPA 9050
Saturation, %	34.1	ASA
Sieve: % Rock	36.1	USC
% Sand	65.6	Hydrometer, ASA
% Silt	24.0	Hydrometer, ASA
% Clay	10.4	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	444	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	45.9	EPA 6010
Sodium as Na (Water Sol), mg/Kg	33.4	EPA 6010
SAR	0.40	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	943	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.73	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.84	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	932	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	16,100	EPA 9060
Exchangeable Sodium, meq/100gm	12.1	ASA
Available Water Capacity, %	25.1	ASA

Approved By: Russell Ruckman

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SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024899
PROJECT: Crandall Canyon: EF-4-1, 0-6"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.92	EPA 9045
Conductivity, umhos/cm	161	EPA 9050
Saturation, %	30.6	ASA
Sieve: % Rock	41.6	USC
% Sand	65.1	Hydrometer, ASA
% Silt	24.3	Hydrometer, ASA
% Clay	10.6	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	114	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	22.2	EPA 6010
Sodium as Na (Water Sol), mg/Kg	1.5	EPA 6010
SAR	0.03	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	549	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.55	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.25	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	934	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	4,540	EPA 9060
Exchangeable Sodium, meq/100gm	12.2	ASA
Available Water Capacity, %	22.4	ASA

Approved By: Russell Ruckman

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SAMPLE ID: Lab #U024900
PROJECT: Crandall Canyon: EF-4-2, 6-14"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.07	EPA 9045
Conductivity, umhos/cm	158	EPA 9050
Saturation, %	28.1	ASA
Sieve: % Rock	37.0	USC
% Sand	64.3	Hydrometer, ASA
% Silt	25.1	Hydrometer, ASA
% Clay	10.6	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	343	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	50.2	EPA 6010
Sodium as Na (Water Sol), mg/Kg	4.7	EPA 6010
SAR	0.06	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	432	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.64	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.16	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	938	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,020	EPA 9060
Exchangeable Sodium, meq/100gm	13.0	ASA
Available Water Capacity, %	22.4	ASA

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SAMPLE ID: Lab #U024901
PROJECT: Crandall Canyon: EF-4-3, 14-48"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.10	EPA 9045
Conductivity, umhos/cm	127	EPA 9050
Saturation, %	30.1	ASA
Sieve: % Rock	36.0	USC
% Sand	68.4	Hydrometer, ASA
% Silt	23.5	Hydrometer, ASA
% Clay	8.1	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	321	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	55.1	EPA 6010
Sodium as Na (Water Sol), mg/Kg	4.6	EPA 6010
SAR	0.06	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	421	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.54	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.53	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	943	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	3,420	EPA 9060
Exchangeable Sodium, meq/100gm	12.3	ASA
Available Water Capacity, %	24.8	ASA

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SAMPLE ID: Lab #U024902
PROJECT: Crandall Canyon: EF-4-4, 60-72"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.18	EPA 9045
Conductivity, umhos/cm	181	EPA 9050
Saturation, %	24.9	ASA
Sieve: % Rock	34.7	USC
% Sand	67.8	Hydrometer, ASA
% Silt	22.1	Hydrometer, ASA
% Clay	10.0	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	106	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	31.6	EPA 6010
Sodium as Na (Water Sol), mg/Kg	7.8	EPA 6010
SAR	0.17	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	393	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.89	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.47	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	942	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	3,680	EPA 9060
Exchangeable Sodium, meq/100gm	13.9	ASA
Available Water Capacity, %	22.8	ASA

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SAMPLE ID: Lab #U024903
PROJECT: Crandall Canyon: EF-4-5, 84-96"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.17	EPA 9045
Conductivity, umhos/cm	151	EPA 9050
Saturation, %	30.3	ASA
Sieve: % Rock	32.9	USC
% Sand	71.1	Hydrometer, ASA
% Silt	21.1	Hydrometer, ASA
% Clay	7.8	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	93.1	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	30.3	EPA 6010
Sodium as Na (Water Sol), mg/Kg	6.0	EPA 6010
SAR	0.14	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	470	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.54	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.25	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	941	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	3,130	EPA 9060
Exchangeable Sodium, meq/100gm	11.8	ASA
Available Water Capacity, %	21.6	ASA

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SAMPLE ID: Lab #U024904
PROJECT: Crandall Canyon: EF-5-1, 0-14"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.03	EPA 9045
Conductivity, umhos/cm	131	EPA 9050
Saturation, %	29.5	ASA
Sieve: % Rock	33.8	USC
% Sand	59.3	Hydrometer, ASA
% Silt	28.8	Hydrometer, ASA
% Clay	11.9	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	65.1	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	12.2	EPA 6010
Sodium as Na (Water Sol), mg/Kg	0.8	EPA 6010
SAR	0.02	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	516	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.24	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.31	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	928	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,700	EPA 9060
Exchangeable Sodium, meq/100gm	12.7	ASA
Available Water Capacity, %	24.1	ASA

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SAMPLE ID: Lab #U024905
PROJECT: Crandall Canyon: EF-5-2, 14-30"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.95	EPA 9045
Conductivity, umhos/cm	101	EPA 9050
Saturation, %	28.3	ASA
Sieve: % Rock	66.7	USC
% Sand	62.0	Hydrometer, ASA
% Silt	27.8	Hydrometer, ASA
% Clay	10.1	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	62.3	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	11.1	EPA 6010
Sodium as Na (Water Sol), mg/Kg	1.3	EPA 6010
SAR	0.04	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	510	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.57	EPA 353.1
Boron as B (Water Sol), mg/Kg	<I	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	2.34	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	945	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	2,530	EPA 9060
Exchangeable Sodium, meq/100gm	14.5	ASA
Available Water Capacity, %	20.9	ASA

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SAMPLE ID: Lab #U024906
PROJECT: Crandall Canyon: EF-5-3, 30-35"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.91	EPA 9045 ↓
Conductivity, umhos/cm	180	EPA 9050 ↑
Saturation, %	34.5	ASA ↑
Sieve: % Rock	0.48	USC ↓↓
% Sand	58.8	Hydrometer, ASA
% Silt	29.7	Hydrometer, ASA
% Clay	11.4	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	114	EPA 6010 ↑
Magnesium as Mg (Water Sol), mg/Kg	28.6	EPA 6010 ↑
Sodium as Na (Water Sol), mg/Kg	3.7	EPA 6010 ↑
SAR	0.08	Calc. ↑
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	788	EPA 351.4 ↑
Nitrate as NO_3-N, mg/Kg	2.34	EPA 353.1 ↑
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.0	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	932	EPA 600/2-78-054 ~
Total Organic Carbon, mg/Kg	17,800	EPA 9060 ↑↑
Exchangeable Sodium, meq/100gm	15.3	ASA ↑
Available Water Capacity, %	27.9	ASA ↑

Approved By: Russell Ruckman

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SAMPLE ID: Lab #U024907
PROJECT: Crandall Canyon: EF-5-4, 54-66"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.09	EPA 9045
Conductivity, umhos/cm	129	EPA 9050
Saturation, %	30.3	ASA
Sieve: % Rock	32.7	USC
% Sand	57.9	Hydrometer, ASA
% Silt	31.8	Hydrometer, ASA
% Clay	10.3	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	90.4	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	21.1	EPA 6010
Sodium as Na (Water Sol), mg/Kg	1.9	EPA 6010
SAR	0.05	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	447	EPA 351.4
Nitrate as NO_3-N, mg/Kg	3.47	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.66	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	944	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,150	EPA 9060
Exchangeable Sodium, meq/100gm	10.1	ASA
Available Water Capacity, %	22.5	ASA

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DATE: 5-11-95

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SAMPLE ID: Lab #U024908
PROJECT: Crandall Canyon: EF-5-5, 78-90"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.15	EPA 9045
Conductivity, umhos/cm	153	EPA 9050
Saturation, %	28.5	ASA
Sieve: % Rock	53.0	USC
% Sand	64.2	Hydrometer, ASA
% Silt	22.3	Hydrometer, ASA
% Clay	13.5	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	99.2	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	25.9	EPA 6010
Sodium as Na (Water Sol), mg/Kg	1.9	EPA 6010
SAR	0.04	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	486	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.42	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.22	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	938	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	4,490	EPA 9060
Exchangeable Sodium, meq/100gm	16.3	ASA
Available Water Capacity, %	22.6	ASA

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SAMPLE ID: Lab #U024909
PROJECT: Crandall Canyon: EF-6-1, 0-16"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.02	EPA 9045
Conductivity, umhos/cm	147	EPA 9050
Saturation, %	27.9	ASA
Sieve: % Rock	18.4	USC
% Sand	58.1	Hydrometer, ASA
% Silt	26.3	Hydrometer, ASA
% Clay	15.6	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	91.2	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	16.9	EPA 6010
Sodium as Na (Water Sol), mg/Kg	0.8	EPA 6010
SAR	0.02	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	499	EPA 351.4
Nitrate as NO_3-N, mg/Kg	3.34	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.47	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	937	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	3,310	EPA 9060
Exchangeable Sodium, meq/100gm	16.0	ASA
Available Water Capacity, %	23.7	ASA

Approved By: Russell Buckman

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SAMPLE ID: Lab #U024910
PROJECT: Crandall Canyon: EF-6-2, 16-30"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	7.90	EPA 9045
Conductivity, umhos/cm	165	EPA 9050
Saturation, %	32.8	ASA
Sieve: % Rock	34.3	USC
% Sand	54.7	Hydrometer, ASA
% Silt	29.1	Hydrometer, ASA
% Clay	16.3	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	300	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	70.3	EPA 6010
Sodium as Na (Water Sol), mg/Kg	6.7	EPA 6010
SAR	0.09	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	641	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.05	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	0.81	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	938	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	7,300	EPA 9060
Exchangeable Sodium, meq/100gm	18.6	ASA
Available Water Capacity, %	25.6	ASA

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SAMPLE ID: Lab #U024911
PROJECT: Crandall Canyon: EF-6-3, 30-48"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.00	EPA 9045
Conductivity, umhos/cm	128	EPA 9050
Saturation, %	23.2	ASA
ieve: % Rock	62.3	USC
% Sand	78.5	Hydrometer, ASA
% Silt	17.4	Hydrometer, ASA
% Clay	4.1	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	68.0	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	12.4	EPA 6010
Sodium as Na (Water Sol), mg/Kg	3.2	EPA 6010
SAR	0.09	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	383	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.57	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.37	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	946	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	1,340	EPA 9060
Exchangeable Sodium, meq/100gm	11.1	ASA
Available Water Capacity, %	18.5	ASA

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SAMPLE ID: Lab #U024912
PROJECT: Crandall Canyon: EF-6-4, 60-72"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.06	EPA 9045
Conductivity, umhos/cm	177	EPA 9050
Saturation, %	25.9	ASA
Sieve: % Rock	22.1	USC
% Sand	47.7	Hydrometer, ASA
% Silt	37.3	Hydrometer, ASA
% Clay	14.9	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	201	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	45.2	EPA 6010
Sodium as Na (Water Sol), mg/Kg	7.1	EPA 6010
SAR	0.12	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	443	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.83	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	0.84	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	948	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	3,130	EPA 9060
Exchangeable Sodium, meq/100gm	18.1	ASA
Available Water Capacity, %	20.0	ASA

Approved By: Russell Ruckman

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SAMPLE ID: Lab #U024913
PROJECT: Crandall Canyon: EF-6-5, 84-96"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.13	EPA 9045
Conductivity, umhos/cm	175	EPA 9050
Saturation, %	26.7	ASA
Sieve: % Rock	18.1	USC
% Sand	60.5	Hydrometer, ASA
% Silt	31.7	Hydrometer, ASA
% Clay	7.8	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	80.7	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	22.0	EPA 6010
Sodium as Na (Water Sol), mg/Kg	4.8	EPA 6010
SAR	0.12	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	359	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.45	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.41	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	941	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	1,740	EPA 9060
Exchangeable Sodium, meq/100gm	8.61	ASA
Available Water Capacity, %	19.8	ASA

Approved By: Russell Ruckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024914
PROJECT: Crandall Canyon: EF-7-1, 0-6"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.05	EPA 9045
Conductivity, umhos/cm	156	EPA 9050
Saturation, %	33.5	ASA
Sieve: % Rock	37.5	USC
% Sand	61.0	Hydrometer, ASA
% Silt	26.5	Hydrometer, ASA
% Clay	12.5	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	61.9	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	10.2	EPA 6010
Sodium as Na (Water Sol), mg/Kg	1.7	EPA 6010
SAR	0.05	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	462	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.56	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.50	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	937	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,440	EPA 9060
Exchangeable Sodium, meq/100gm	13.0	ASA
Available Water Capacity, %	26.6	ASA

Approved By: Russell Ruckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024915
PROJECT: Crandall Canyon: EF-7-2, 6-12"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.08	EPA 9045
Conductivity, umhos/cm	191	EPA 9050
Saturation, %	34.0	ASA
Sieve: % Rock	35.1	USC
% Sand	66.3	Hydrometer, ASA
% Silt	23.8	Hydrometer, ASA
% Clay	9.9	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	77.4	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	9.3	EPA 6010
Sodium as Na (Water Sol), mg/Kg	11.8	EPA 6010
SAR	0.34	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	389	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.64	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	2.16	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	946	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,530	EPA 9060
Exchangeable Sodium, meq/100gm	13.8	ASA
Available Water Capacity, %	29.0	ASA

Approved By: Russell Buckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024916
PROJECT: Crandall Canyon: EF-7-3, 18-24"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.06	EPA 9045
Conductivity, umhos/cm	304	EPA 9050
Saturation, %	33.4	ASA
Sieve: % Rock	31.3	USC
% Sand	59.0	Hydrometer, ASA
% Silt	29.0	Hydrometer, ASA
% Clay	12.0	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	74.2	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	11.4	EPA 6010
Sodium as Na (Water Sol), mg/Kg	9.5	EPA 6010
SAR	0.27	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	750	EPA 351.4
Nitrate as NO_3-N, mg/Kg	2.06	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.72	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	948	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	6,790	EPA 9060
Exchangeable Sodium, meq/100gm	13.2	ASA
Available Water Capacity, %	26.7	ASA

Approved By: Russell Ruckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024917
PROJECT: Crandall Canyon: EF-7-4, 30-36"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.01	EPA 9045
Conductivity, umhos/cm	280	EPA 9050
Saturation, %	31.0	ASA
Sieve: % Rock	17.6	USC
% Sand	63.4	Hydrometer, ASA
% Silt	23.6	Hydrometer, ASA
% Clay	13.0	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	111	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	14.8	EPA 6010
Sodium as Na (Water Sol), mg/Kg	8.9	EPA 6010
SAR	0.21	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	464	EPA 351.4
Nitrate as NO_3-N, mg/Kg	1.52	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.44	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	946	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,920	EPA 9060
Exchangeable Sodium, meq/100gm	16.9	ASA
Available Water Capacity, %	25.5	ASA

Approved By: Russell Ruckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

DATE: 5-11-95

TO: EarthFax Engineering
7324 So. 1300 E. STE 100
Midvale, Utah 84047

SAMPLE ID: Lab #U024918
PROJECT: Crandall Canyon: EF-7-5, 42-48"
DATE SAMPLED: 4-06-95
DATE SUBMITTED: 4-07-95

CERTIFICATE OF ANALYSIS

PARAMETER	DETECTED	METHOD
pH Units	8.11	EPA 9045
Conductivity, umhos/cm	316	EPA 9050
Saturation, %	34.0	ASA
Sieve: % Rock	6.50	USC
% Sand	57.6	Hydrometer, ASA
% Silt	26.5	Hydrometer, ASA
% Clay	15.9	Hydrometer, ASA
Calcium as Ca (Water Sol), mg/Kg	138	EPA 6010
Magnesium as Mg (Water Sol), mg/Kg	19.8	EPA 6010
Sodium as Na (Water Sol), mg/Kg	13.3	EPA 6010
SAR	0.28	Calc.
Selenium as Se (Water Sol), mg/Kg	<.5	EPA 6010
Total Nitrogen as N, mg/Kg	594	EPA 351.4
Nitrate as NO_3-N, mg/Kg	3.25	EPA 353.1
Boron as B (Water Sol), mg/Kg	<1	EPA 6010
Maximum Acid Potential, tons $CaCO_3$/1000 tons soil	1.94	EPA 600/2-78-054
Neutralization Potential, tons $CaCO_3$/1000 tons soil	946	EPA 600/2-78-054
Total Organic Carbon, mg/Kg	5,510	EPA 9060
Exchangeable Sodium, meq/100gm	22.2	ASA
Available Water Capacity, %	27.9	ASA

Approved By: Russell Ruckman

801 262 7299 PHONE
801 262 7378 FAX
6100 SOUTH STRATLER
SALT LAKE CITY UTAH 84107 6905

August 9, 1995

Earthfax Engineering
7324 S. 1300 E. STE 100
Midvale, Utah 84047

PROJECT: Crandall Canyon
DATE SAMPLED: 04-06-95
DATE SUBMITTED: 04-07-95

CERTIFICATE OF ANALYSIS

Lab #:	Parameter	Detected	Notes
U024890	Selenium (Water Sol), mg/Kg	<.1	(J)
U024891	Selenium (Water Sol), mg/Kg	<.1	(J)
U024892	Selenium (Water Sol), mg/Kg	0.11	(J)
U024893	Selenium (Water Sol), mg/Kg	<.1	(J)
U024894	Selenium (Water Sol), mg/Kg	<.1	(J)
U024895	Selenium (Water Sol), mg/Kg	<.1	(J)
U024896	Selenium (Water Sol), mg/Kg	<.1	(J)
U024897	Selenium (Water Sol), mg/Kg	<.1	(J)
U024898	Selenium (Water Sol), mg/Kg	<.1	(J)
U024899	Selenium (Water Sol), mg/Kg	<.1	(J)
U024900	Selenium (Water Sol), mg/Kg	<.1	(J)
U024901	Selenium (Water Sol), mg/Kg	<.1	(J)
U024902	Selenium (Water Sol), mg/Kg	<.1	(J)
U024903	Selenium (Water Sol), mg/Kg	<.1	(J)
U024904	Selenium (Water Sol), mg/Kg	<.1	(J)
U024905	Selenium (Water Sol), mg/Kg	<.1	(J)
U024906	Selenium (Water Sol), mg/Kg	<.1	(J)
U024907	Selenium (Water Sol), mg/Kg	<.1	(J)
U024908	Selenium (Water Sol), mg/Kg	<.1	(J)
U024909	Selenium (Water Sol), mg/Kg	<.1	(J)
U024910	Selenium (Water Sol), mg/Kg	<.1	(J)
U024911	Selenium (Water Sol), mg/Kg	<.1	(J)
U024912	Selenium (Water Sol), mg/Kg	<.1	(J)
U024913	Selenium (Water Sol), mg/Kg	<.1	(J)
U024914	Selenium (Water Sol), mg/Kg	<.1	(J)
U024915	Selenium (Water Sol), mg/Kg	<.1	(J)
U024916	Selenium (Water Sol), mg/Kg	<.1	(J)
U024917	Selenium (Water Sol), mg/Kg	<.1	(J)

NOTES: J = Estimated value, below normal quantification limit

Approved By: Joel Wagstaff

NEUTRALIZATION POTENTIAL OF SOILS				
EPA-600 / 2-78-054				
Date:	5/2and5/3/95			
Analyst:	RCG			
0.2633	g KHP		40	ml HCl
2.7	ml NaOH		40.8	ml NaOH
0.4776	N of NaOH		0.4872	N of HCl
	CONSTANT			
	0.04399343			
SAMPLE ID	**SAMPLE WEIGHT**	**ml HCL V1**	**ml TITRANT pH OF 7**	**TONS CaCO3 PER 1000 TON**
24886	2.0083	40	45.65	~~466.78~~
24887	2.005	40	37.8	~~465.73~~
24888	2.0027	80	71.45	~~934.76~~
24889	2.0006	80	67.95	~~937.62~~
24890	2	40	36.25	467.73
24891	2.0015	80	66.8	937.81
24892	2.0015	40	36.85	467.06
24893	2.0032	40	33.95	468.21
24894	2.0064	80	74.5	931.41
24895	2.0043	80	74.25	932.52
24895 DUP	2.0015	80	75.1	933.37
5/3/95				
24896	2.0034	80	73.5	933.34
24897	20.0063	80	72.9	93.50
24898	2.0078	80	70.8	932.73
24899	2.0091	80	67.45	933.92
24900	2.003	80	65.9	937.59
24901	2.0029	80	56	942.93
24902	2.0025	80	57.35	942.40
24903	2.0091	80	54	941.09
24904	2.0074	80	78.9	928.59
24905	2.0007	80	52.7	945.74
24905 DUP	2.0021	80	53.35	944.73
24906	2.0023	80	77.45	931.74
24907	2.0021	80	54.9	943.90
24908	2.0096	80	59.5	937.92
24909	2.0043	80	65.05	937.44
24910	2.0044	80	62.9	938.54
24911	2.0022	80	51.8	945.51
24912	2.0036	80	46.15	947.87
24913	2.0064	80	56.7	940.91
24914	2.0014	80	68.55	936.92

NEUTRALIZATION POTENTIAL OF SOILS				
EPA-600 / 2-78-054				
Date:	5/2and5/3/95			
Analyst:	RCG			
0.2633	g KHP		40	ml HCl
2.7	ml NaOH		40.8	ml NaOH
0.4776	N of NaOH		0.4872	N of HCl
	CONSTANT			
	0.02921891			
SAMPLE ID	SAMPLE WEIGHT	ml HCL V1	ml TITRANT pH OF 7	TONS CaCO3 PER 1000 TON
24915	2.0088	80	68.75	945.68
24915 DUP	2.0004	80	69.25	949.47
24916	2.0024	80	69.6	948.40
24917	2.0028	80	76.15	945.88
24918	2.0062	80	70.1	946.42

ChemTech, Inc. QC Summary Form 5/8/95

MATRIX SPIKES/DUPLICATES
Inorganics Tests

	DATE	SAMPLE ID	M	ANALYST	Sample	SpkLvl	MS	MSD	%MS	%MSD	RPD	LIMITS	FLAG
Neutralization Pot	05/02/95	24895	W	RCG	933.	0.	933.	932.	100.0	100.0	0.0	Duplicate 20.0	
Neutralization Pot	05/02/95	24905	W	RCG	946.	0.	946.	945.	100.0	99.9	0.1	Duplicate 20.0	
Neutralization Pot	05/02/95	24915	W	RCG	946.	0.	946.	949.	100.0	100.4	0.4	Duplicate 20.0	

FLAGS	Description
1	Single Spike
C	Matrix Effects
D	Diluted Out
L	Low Level
M	Sample > 4x SpkLvl
N	ND - NO RPD
R	To Be Rerun
X	Outlier

M	Description
B	Fortified Blank
C	Calibration Solution
G	Sludge
O	Oil
S	Soil
T	TCLP
W	Water

MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference

$$RPD = \frac{|MS - MSD| * 200}{(MS + MSD)} \qquad \% MS = \frac{MS * 100}{(Sample + SpkLvl)}$$

Q:\QCDB\QC__5RD8.MDB

NEUTRALIZATION POTENTIAL OF SOILS

Analyst: RCG Lot#:
Date: 05/02/95 & 05/03/95
Time:

EPA-600/2-78-054
March 1978

SAMPLE ID	SAMPLE WEIGHT	HCL ml V_1	HCL N_1	titrant NaOH N_2	ml titrant to pH 7 V_2	tons CaCO3 eqv. per 1000 ton material
KHP	0.2033g	—	—	0.5N	2.70	
0.5N HCl	40ml	—	—		40.80	I
24886	2.0083	40	0.5N		45.65	I
24887	2.0050	40			37.80	I
24888	2.0027	80			71.45	II
24889	2.0006	80			67.95	II
24890	2.0000	40			30.25	I
24891	2.0015	80			66.80	II
24892	2.0015	40			36.85	I
24893	2.0032	40			33.95	I
24894	2.0064	80			74.50	II
24895	2.0043	80			74.25	II
24895D	2.0015	80			75.10	II
x3 0.5N HCl	40ml	—	—		40.50	I
24896	2.0034	80	0.5N		73.50	II
24897	2.0063				72.90	II
24898	2.0078				70.80	II
24899	2.0091				67.45	II
24900	2.0030				65.90	II
24901	2.0029				56.00	II
24902	2.0025				57.35	II
24903	2.0091				54.00	II
24904	2.0094				78.90	II
24905	2.0007				52.70	II
24905D	2.0021				53.35	II

Calculations:

1. Constant (c) = (ml acid in blank) / (ml base in blank)
2. ml acid consumed = (ml acid added) - (ml base added x C)
3. Tons $CaCO_3$ eqv per 1000 tons of material = (ml of acid consumed) x (25.0) x (N of acid)
4. $N_2 = (N_1V_1) / V_2$
5. $N_1 + (N_2V_2) / V_1$

$$N \text{ of NaOH} = \frac{g\ KHP \times 1000}{ml\ NaOH \times 204.2}$$

Titrate to ph 8.7, when standardizing NaOH w/ KHP

NEUTRALIZATION POTENTIAL OF SOILS

Analyst: RCM
Date: 05/02 & 05/03/95
Time:
Lot#:

EPA-600/2-78-054
March 1978

SAMPLE ID	SAMPLE WEIGHT	HCL ml V_1	HCL N_1	titrant NaOH N_2	ml titrant to pH 7 V_2	tons CaCO3 eqv. per 1000 ton material
24906	2.0023	80	0.5N	0.5N	77.45	11
24907	2.0021				84.90	11
24908	2.0016				69.50	11
24909	2.0043				65.05	11
24910	2.0044				62.90	11
24911	2.0022				51.80	11
24912	2.0036				46.15	1
24913	2.0004				56.70	11
24914	2.0014				68.55	11
24915	2.0088				68.75	11
24915D	2.0004				69.25	11
24916	2.0024				69.60	11
24917	2.0028				76.15	111
24918	2.0062				70.10	

Calculations:

1. Constant (c) = (ml acid in blank) / (ml base in blank)
2. ml acid consumed = (ml acid added) - (ml base added x C)
3. Tons $CaCO_3$ eqv per 1000 tons of material = (ml of acid consumed) x (25.0) x (N of acid)
4. $N_2 = (N_1V_1) / V_2$
5. $N_1 + (N_2V_2) / V_1$

$$N \text{ of NaOH} = \frac{g\ KHP \times 1000}{ml\ NaOH \times 204.2}$$

Titrate to ph 8.7, when standardizing NaOH w/ KHP

WestChem Environmental Lab, Inc.
1250 Lamoille Highway, Suite #3•Elko, Nevada 89801•Phone: (702) 738-0111•Fax: (702) 753-7255

CLIENT: Chemtech
6100 S Stratler
Murray, UT 84107

Date Received: 4/26/95
Date Reported: 5/ 1/95
Cert. Number: 4055

ATTENTION: Mr. Joel Workman

Lab Number Sample Description Matrix Date Sampled	95-A000767 24886 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.035	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000768 24887 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.028	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000769 24888 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.036	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000770 24889 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.035	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000771 24890 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.108	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000772 24891 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.049	%		6010	4/27/95	JHR

Certificate of Analysis Number 4055 (Continued)

Lab Number Sample Description Matrix Date Sampled	95-A000773 24892 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.270	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000774 24893 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.119	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000775 24894 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.107	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000776 24895 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.102	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000777 24896 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.050	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000778 24897 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.057	%		6010	4/27/95	JHR

Certificate of Analysis Number 4055 (Continued)

Lab Number Sample Description Matrix Date Sampled	95-A000779 24898 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.059	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000780 24899 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.040	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000781 24900 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.057	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000782 24901 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.049	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000783 24902 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.047	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000784 24903 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.040	%		6010	4/27/95	JHR

Certificate of Analysis Number 4055 (Continued)

Lab Number Sample Description Matrix Date Sampled	95-A000785 24904 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.042	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000786 24905 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.075	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000787 24906 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.032	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000788 24907 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.053	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000789 24908 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.039	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000790 24909 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.047	%		6010	4/27/95	JHR

Certificate of Analysis Number 4055 (Continued)

Lab Number Sample Description Matrix Date Sampled	95-A000791 24910 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.026	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000792 24911 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.044	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000793 24913 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.045	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000794 24914 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.048	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000795 24915 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.069	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000796 24916 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.055	%		6010	4/27/95	JHR

Certificate of Analysis Number 4055 (Continued)

Lab Number Sample Description Matrix Date Sampled	95-A000797 24917 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.046	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000798 24918 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.062	%		6010	4/27/95	JHR

Lab Number Sample Description Matrix Date Sampled	95-A000845 24912 Solid Waste	Units	MCL	Method	Test Date	Analyst Initials
Sulfur, Total	0.027	%		6010	4/27/95	JHR

Reviewed and Approved By:

Jack H. Ruckman

Jack H. Ruckman, Ph.D.
Laboratory Director

4/27/95

$i := 1 ..33$

Maximum Acid Potential

$ID_i :=$ $\quad percent_i := pot_i := percent_i \cdot 31.24$

ID_i	$percent_i$	pot_i
24886	.035	1.09
24887	.028	0.87
24888	.036	1.12
24889	.035	1.09
24890	.108	3.37
24891	.049	1.53
24892	.270	8.43
24893	.119	3.72
24894	.107	3.34
24895	.102	3.19
24896	.050	1.56
24897	.057	1.78
24898	.059	1.84
24899	.040	1.25
24900	.037	1.16
24901	.049	1.53
24902	.047	1.47
24903	.040	1.25
24904	.042	1.31
24905	.075	2.34
24906	.032	1
24907	.053	1.66
24908	.039	1.22
24909	.047	1.47
24910	.026	0.81
24911	.044	1.37
24912	.027	0.84
24913	.045	1.41
24914	.048	1.5
24915	.069	2.16
24916	.055	1.72
24917	.046	1.44
24918	.062	1.94

EARTHFAX ENGINEERING, INC.
7324 South Union Park Avenue
Suite 100
Midvale, Utah 84047

CHAIN-OF-CUSTODY FORM

Sampling Company: EARTHFAX	Sampling Personnel: AM/DM
Project Name: CRANDALL CANYON	Project Number: UC-412-16
Analytical Laboratory: CHEMTECH	Date of Shipment/Delivery: 4-7-95
Method of Shipment/Delivery: HAND	Airbill Number: NA

Field Sample No.	Date Sampled	Time Sampled	Sample Type	No. of Containers	Remarks
TS-1 0-48"	4-6-95		SOIL	1	ANALYZE FOR PARAMETERS LISTED ON ATTACHED TABLE 2
TS-2 48-96"					
TS-3 0-48"					
TS-4 48-90"					
EF-1-1 0-22"					ANALYZE FOR PARAMETERS LISTED ON ATTACHED TABLE 6
EF-1-2 22-30"					
EF-1-3 30-48"					
EF-2-1 0-6"					

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	4-7-95	11:55	[signature]	4-7	11:55
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

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CHAIN-OF-CUSTODY FORM

Sampling Company: EARTHFAX	Sampling Personnel: AM/DM
Project Name: CRANDALL CANYON	Project Number: UC-412-16
Analytical Laboratory: CHEMTECH	Date of Shipment/Delivery: 4-7-95
Method of Shipment/Delivery: HAND	Airbill Number: NA

Field Sample No.	Date Sampled	Time Sampled	Sample Type	No. of Containers	Remarks
EF-2-2 6-24"	4-6-95		SOIL	17	ANALYZE FOR PARAMETERS LISTED ON ATTACHED TABLE 6
EF-2-3 24-48"					
EF-3-1 0-6"					
EF-3-2 6-12"					
EF-3-3 18-48"					
EF-4-1 0-6"					
EF-4-2 6-14"					
EF-4-3 14-48"					

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Cathy Mayhew	4-7-95	11:55	Laurie Shelley	4-7	1155
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

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Suite 100
Midvale, Utah 84047

CHAIN-OF-CUSTODY FORM

Sampling Company:	EARTHFAX	Sampling Personnel:	AM/DM
Project Name:	CRANDALL CANYON	Project Number:	UC-412-16
Analytical Laboratory:	CHEMTECH	Date of Shipment/Delivery:	4-7-95
Method of Shipment/Delivery:	HAND	Airbill Number:	NA

Field Sample No.	Date Sampled	Time Sampled	Sample Type	No. of Containers	Remarks
EF-4-4 60-72"	4-6-95		SOIL	1	ANALYZE FOR PARAMETERS LISTED ON TABLE 6 (ATTACHED)
EF-4-5 84-96"					
EF-5-1 0-14"					
EF-5-2 14-30"					
EF-5-3 30-35"					
EF-5-4 54-66"					
EF-5-5 78-90"					
EF-6-1 0-16"					

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
[signature]	4-7-95	11:55			
Relinquished by: [signature]	Date: 4-7	Time: 11:55	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

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Midvale, Utah 84047

CHAIN-OF-CUSTODY FORM

Sampling Company: EARTHFAX	Sampling Personnel: AM/DM
Project Name: CRANDALL CANYON	Project Number: UC-412-16
Analytical Laboratory: CHEMTECH	Date of Shipment/Delivery: 4-7-95
Method of Shipment/Delivery: HAND	Airbill Number: NA

Field Sample No.	Date Sampled	Time Sampled	Sample Type	No. of Containers	Remarks
EF-6-2 16-30"	4-6-95		SOIL	1	ANALYZE FOR PARAMETERS LISTED ON ATTACHED TABLE 6
EF-6-3 30-48"					
EF-6-4 60-72"					
EF-6-5 84-96"					
EF-7-1 0-6"					
EF-7-2 6-12"					
EF-7-3 18-24"					
EF-7-4 30-36"					

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Anthony Mayfonthi	4-7-95	11:55	Laurie Shelley	4-7	1155
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

EARTHFAX ENGINEERING, INC.
7324 South Union Park Avenue
Suite 100
Midvale, Utah 84047

5 of 5

CHAIN-OF-CUSTODY FORM

Sampling Company: EARTHFAX	Sampling Personnel: AM/DM
Project Name: CRANDALL CANYON	Project Number: UC-412-16
Analytical Laboratory: CHEMTECH	Date of Shipment/Delivery: 4-7-95
Method of Shipment/Delivery: HAND	Airbill Number: NA

Field Sample No.	Date Sampled	Time Sampled	Sample Type	No. of Containers	Remarks
EF-7-5 42-48"	4-6-95		SOIL	1	ANALYZE FOR PARAMETERS LISTED ON ATTACHED TABLE 6.
EF-7-H	4-6-95	12:00	SOIL	2	BTEX / TPH

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Anthony Meyhoulin	4-7-95	11:55	Laurie Shelley	4-7	1155
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

APPENDIX C

PHOTOGRAPHS

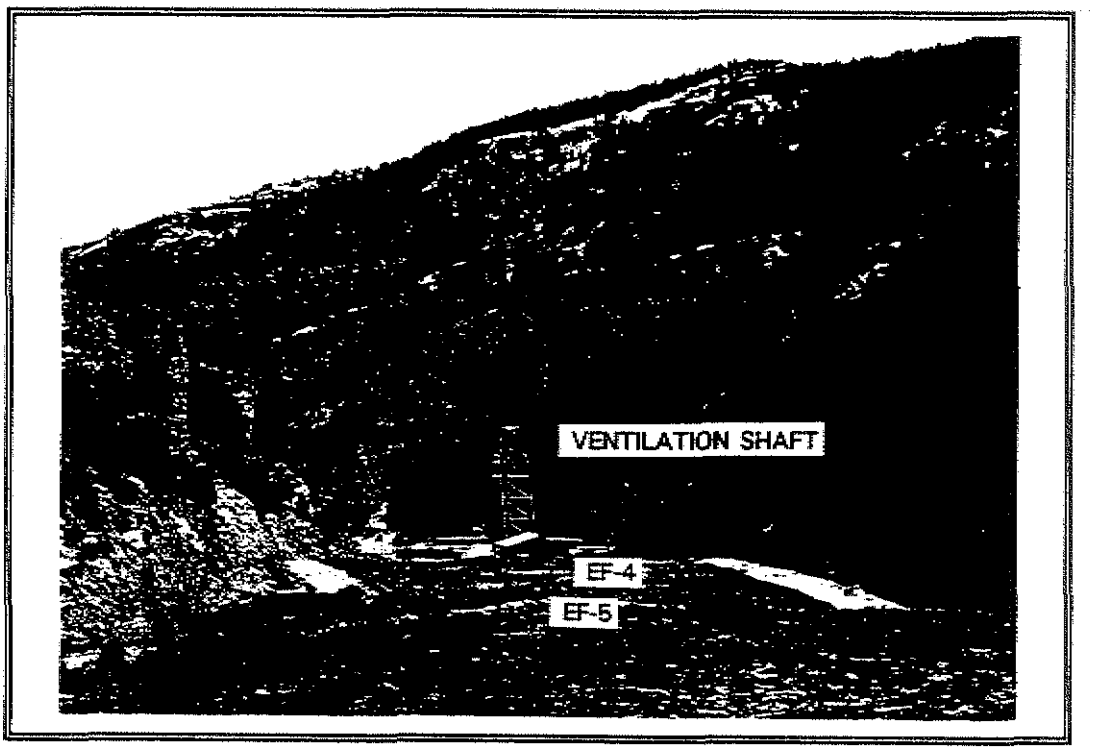

PLATE 1. VIEW (EAST) DOWN CANYON FROM UPPER MADE LAND PAD. SOIL PIT EF-6 IS JUST OUT OF VIEW BEHIND THE PHOTOGRAPHER.

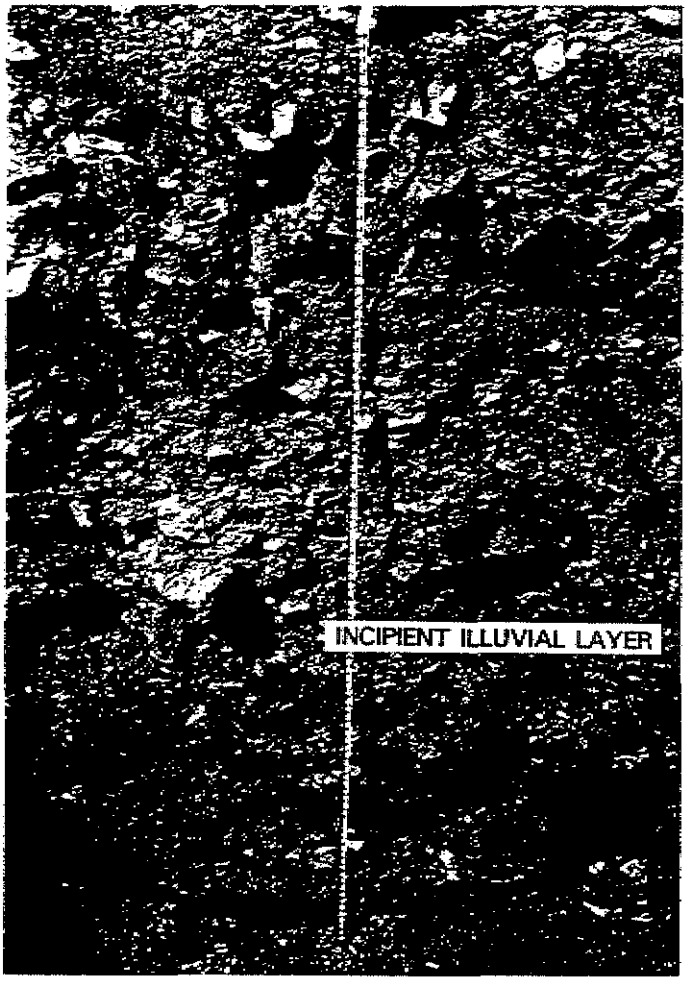

PLATE 2. TYPICAL SOIL PROFILE (EF-4) SHOWING INCIPIENT ILLUVIAL LAYER, AND ABUNDANT, ANGULAR COARSE FRAGMENTS

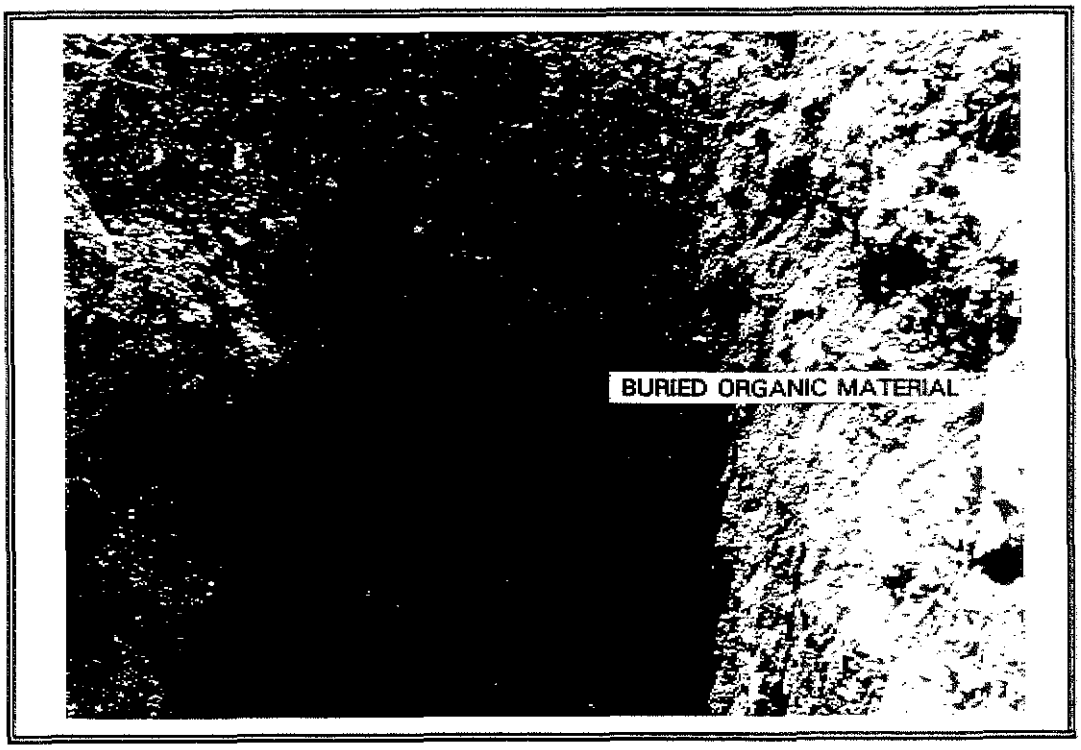

PLATE 3. BURIED ORAGANIC MATERIAL IN EF-5.

PLATE 4. VIEW (WEST) UP CANYON FROM LOWER MADE LAND PAD. SOIL PIT EF-1 IS TO THE RIGHT OF THE FIELD OF VIEW.

PLATE 5. VEGETATION NEAR EF-2. TYPICAL OF LOWER MADE LAND AREA

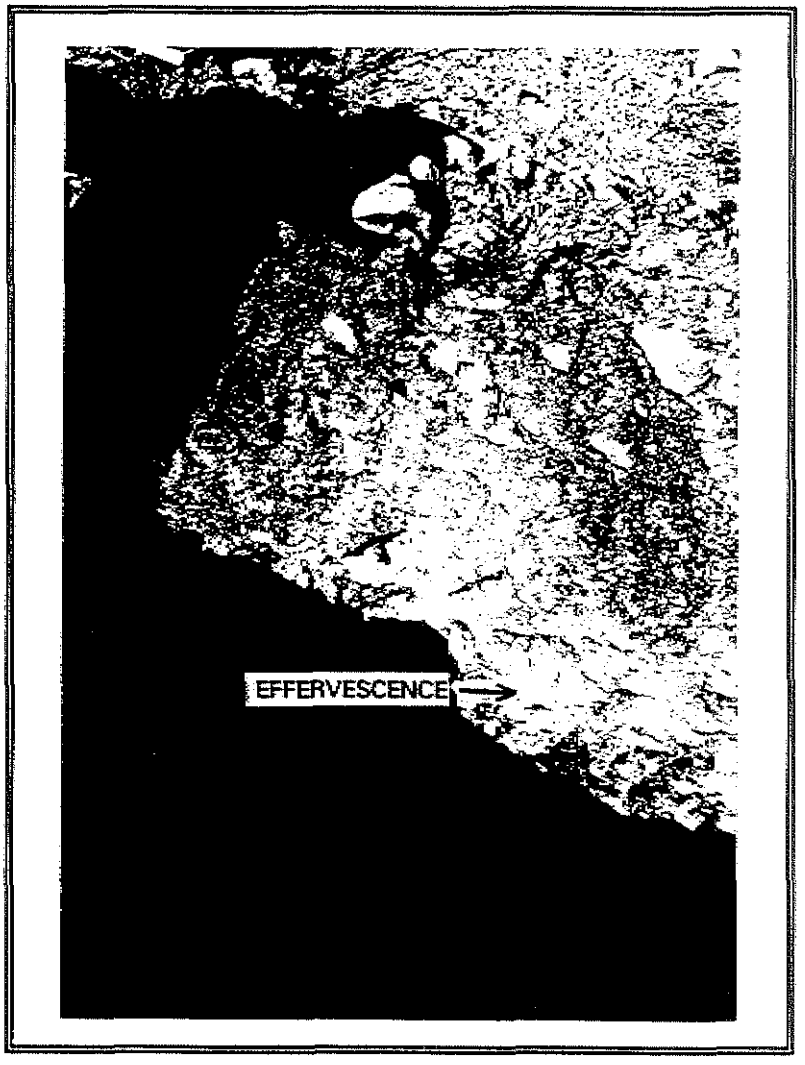

PLATE 6. SOIL PIT EF-2 SHOWING MINOR SALT EFFERVESCENCE JUST ABOVE SHADOW LINE.

APPENDIX D

SOIL AMENDMENT RECOMMENDATIONS

UTAH STATE UNIVERSITY LOGAN, UTAH 84322-4830

USU Analytical Laboratories
Soil Testing Lab Plant Analysis Lab
Feed Analysis Lab Irrigation Water Analysis Lab

Telephone (801) 797-2217
Fax (801) 797-2117

24 May 1995

David McMillan
Earthfax Engineering, Inc.
7324 So. Union Park Avenue
Suite 100
Midvale, Utah 84047

Dear David:

The 4 topsoils have good pH, EC, and SAR (including Ca, Mg, Na). You should have no problem growing your species once you add fertilizers (although the sandy loam soil won't hold water well). Recommendations for N, P, K are as follows (I forgot to ask you if you might irrigate so I gave both):

NON-IRRIGATED:

	TS-1	TS-2	TS-3	TS-4
N, lbs/A	40-70	40-50	40-70	40-50
P_2O_5, lbs/A	0-30	50-70	0	50-70
K_2O, lbs/A	80-120	140-180	80-120	180-220

IRRIGATED:

	TS-1	TS-2	TS-3	TS-4
N, lbs/A	90-110	90-110	90-110	90-110
P_2O_5, lbs/A	40-60	150-170	0	150-170
K_2O, lbs/A	80-120	140-180	80-120	180-220

We do not differentiate between irrigated and non-irrigated for K. I bet you can cut the potassium recommendation in have on the non-irrigated and be okay.

Of course, the recommendations assume that the lab followed the procedures used at Utah State University. If not, they may not be valid recommendations.

I hope this helps. If you have any other questions, etc., please contact the lab. I can get back to you between 4 and 5 pm today. After that, I will be out until Tuesday.

Sincerely,

Janice Kotuby-Amacher
Lab Director

SPECIES LIST #1

SPECIES	# pls/acre
Agropyron smithii Western wheatgrass	3.0
Agropyron spicatum Bluebunch wheatgrass	1.0
Amelanchier utahensis Utah Serviceberry	1.0
Artemisia ludoviciana Louisiana sagebrush	0.1
Artemisia tridentata vaseyana Mountain big sagebrush	0.2
Aster glaucodes Blueleaf Aster	0.5
Atriplex canescens Fourwing saltbush	1.5
Ceratoides lanata Winterfat	1.5
Cercocarpus ledifolius Curl-leaf mountain mahogany	1.0
Chrysothamnus nauseosus albicaulis Whitestem rubber rabbitbrush	0.5
Elymus cinereus Basin wildrye	2.0
*Elymus salina** Salina wildrye	2.0
Linum lewisii False flax	1.0
Melilotus officinalis Yellow sweetclover	0.5
Oryzopsis hymenoides Indian Ricegrass	2.0
Penstemon palmeri Palmer Penstemon	0.2
Petalostemum purpureum Purple prairie clover	0.5
Poa ampla Bluegrass	0.2
Rhus trilobata Skunkbrush	1.5
Sporobolus cryptandrus Sand dropseed	0.1
Total Seed	17.3

* When unavailable, this species will be replaced by *Agropyron dasystachyum* (Thickspike wheatgrass)

APPENDIX 3.7T

REVEGETATION REFERENCE AREAS

REGISTERED PROFESSIONAL ENGINEER
No. 7102
RICHARD B. WHITE
9/15/95
STATE OF UTAH