

**Appendix A3.
Interim Cover**

**Standard Proctor Test Results Summary
Lift Approval Summary
Lift Approval Package
Buyoff Surveys**

Appendix A3. Interim Cover Standard Proctor Test Results Summary

Proctor ID #	Date Sampled	Date Approved	Maximum Dry Density (lb/ft³)	Optimum Moisture Content (%)	Soils Description
Interim Cover #1 (2014)	7/24/2014	8/4/2014	116.0	14.5	Tan Sandy Silt

Appendix A3. Interim Cover Lift Approval Summary

August 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd ³)	Cumulative Quantity Approved (yd ³)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
8/4/14	UIV04140731-00	0	3851	3,851	N/A	0.8	IC-1(2014)	2	0	93.8
8/4/14	UIW01140730-00	1	5417	9,268	N/A	0.8	IC-3(2011)	3	0	94.3
8/5/14	UIV08140804-00	1	3999	13,267	N/A	0.8	IC-1(2014)	2	1	90.4
8/5/14	UIW01140805-00	0	2031	15,298	N/A	0.3	IC-1(2014)	3	0	95.3
8/11/14	UIV04140805-00	0	963	16,261	N/A	0.3	IC-1(2014)	2	0	91.6
8/12/14	UIV08140811-00	1	1000	17,261	N/A	0.2	IC-1(2014)	2	0	93.2
						Average CAES Screen Passing Pixels (%)=	N/A			
						Total Quantity Approved (yd ³) =	17,261			
						Total # of Nuclear Density Guage Tests =	14			
						Total # of Moisture Tests =	3			
						Quantity per Moisture Test (yd ³) =	5,754			
						Total Average Thickness (ft.)=	0.5			

Appendix A3. Interim Cover Lift Approval Package

LIFT APPROVAL FORM

PROJECT: <u>Moab UMTRA</u>		OTHER: <u> </u>																																																																	
NW CORNER		DATE: <u>8/11/2014</u>																																																																	
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="4"><i>P</i> 1 6795338 N. 2123469 E.</td> </tr> <tr> <td>EW:</td> <td>456</td> <td>X</td> <td>0.635 = 290</td> </tr> <tr> <td>NS:</td> <td>469</td> <td>X</td> <td>0.539 = 253</td> </tr> <tr> <td colspan="4"><i>P</i> 2 6795202 N. 2123308 E.</td> </tr> <tr> <td>EW:</td> <td>456</td> <td>X</td> <td>0.283 = 129</td> </tr> <tr> <td>NS:</td> <td>469</td> <td>X</td> <td>0.830 = 389</td> </tr> <tr> <td colspan="4"><i>P</i> 3</td> </tr> <tr> <td>EW:</td> <td>X</td> <td></td> <td>=</td> </tr> <tr> <td>NS:</td> <td>X</td> <td></td> <td>=</td> </tr> <tr> <td colspan="4"><i>P</i> 4 N</td> </tr> <tr> <td>EW:</td> <td>X</td> <td></td> <td>=</td> </tr> <tr> <td>NS:</td> <td>X</td> <td></td> <td>= A-</td> </tr> <tr> <td colspan="4"><i>P</i> 5</td> </tr> <tr> <td>EW:</td> <td>X</td> <td></td> <td>=</td> </tr> <tr> <td>NS:</td> <td>X</td> <td></td> <td>=</td> </tr> <tr> <td colspan="2">Page 2 attached:</td> <td>Y</td> <td>N</td> </tr> </table>		<i>P</i> 1 6795338 N. 2123469 E.				EW:	456	X	0.635 = 290	NS:	469	X	0.539 = 253	<i>P</i> 2 6795202 N. 2123308 E.				EW:	456	X	0.283 = 129	NS:	469	X	0.830 = 389	<i>P</i> 3				EW:	X		=	NS:	X		=	<i>P</i> 4 N				EW:	X		=	NS:	X		= A-	<i>P</i> 5				EW:	X		=	NS:	X		=	Page 2 attached:		Y	N
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IDENTIFY LOTS ABOVE																																																																			
LIFT ID: <u>UIV08140811-00</u>		NW CORNER: <u>6795591 N. 2123179 E.</u>																																																																	
Uncompacted Thickness:	<u>0.2</u>	Compacted Thickness:	<u>N/A</u>																																																																
NW CORNER of debris placement:		EW Dimension	<u>N/A</u>																																																																
Lift Area (ft ²):		Lift Volume (yd ³):	<u>1,000</u>																																																																
Comments: QC verified that the underlying lift was scarified prior to placement of this lift area. QC verified that the interim cover material soils was free of organics and was common fill w/satisfactory results. QC performed moisture/ density tests on 08/11/2014 w/satisfactory results. QC also performed a moisture correlation that was satisfactory. This is the final lift of Interim Cover for this area.																																																																			
Attached Forms: Grid Slope <u>X</u> Compaction Macro <u>N/A</u> Print Screen <u>N/A</u> Moisture/ Density <u>X</u>																																																																			
KEYING IN NOTES: N E S <u>W</u> <u>Satisfactory</u>		MOISTURE/ DENSITY TESTS ID # (S): <u>1, 2</u>																																																																	
LIFT APPROVED BY: <u>Mitch Hogan</u> <i>[Signature]</i>		DATE: <u>8/12/2014</u> TIME: <u>1637</u>																																																																	
QA/QC APPROVAL <i>[Signature]</i>		DATE: <u>09/15/2014</u>																																																																	

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Appendix A3. Interim Cover Lift Approval Package (continued)

FIELD DENSITY TEST

PROJECT: <u>Moab UMTRA Project</u> OTHER _____																			
LIFT IDENTIFICATION: <u>UIV08140811-00</u> DATE: <u>8/11/2014</u>																			
TEST ID NUMBER(S): _____ # <u>1</u>																			
TEST LOCATION: <u>P1</u> TEST METHOD: <u>N/A</u> D1556 <u>x</u> D6938																			
<p style="text-align: center;">ASTM D6938 (DENSITY DETERMINATION)</p> <p>Make/Model Troxler 3430 Gauge Serial # 28098 Last Calibration Date: <u>2/14/14</u> Daily Standard Counts: <i>Off-Cell Standard</i></p> <p>Density <u>2283</u> Moisture <u>667</u> <i>Method A (Direct Transmission)</i> Depth Setting <u>6" (inches)</u> Count Time <u>1 (minutes)</u></p> <p>Moisture Count <u>221</u> Density Count <u>2051</u></p> <p>Wet Density (ρ_m) <u>124.5 (lbs/ft³)</u> Dry Density <u>105.1 (lbs/ft³)</u></p> <p>Moisture Density <u>19.4 (lbs/ft³)</u> Moisture Fraction <u>18.5 (%)</u></p> <p style="text-align: center;">MOISTURE DETERMINATION ASTM D4643</p> <p>Container ID <u>D-6</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Mass of container & wet specimen (M_{cms})</td> <td style="text-align: center;"><u>525.1</u></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of container & dry specimen ($M_{c ds}$)</td> <td style="text-align: center;"><u>479.5</u></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$</td> <td style="text-align: center;"><u>45.6</u></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of container (M_c)</td> <td style="text-align: center;"><u>214.3</u></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$</td> <td style="text-align: center;"><u>265.2</u></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Moisture content (w) $w = (M_w / M_s) \times 100$</td> <td style="text-align: center;"><u>17.2</u></td> <td style="text-align: right;">%</td> </tr> </table> <p>Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$) $\rho_d = (100 \times 124.5) / (100 + 17.2) = 106.2 \text{ lbs/ft}^3$ <i>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)</i></p> <p>Percent Compaction = $\rho_d / \gamma_d \text{max} \times 100$ $106.2 / 116.0 \times 100 = 91.6 \%$</p> <p>Comments: Microwave oven power setting on HIGH. Initial time setting of 3 minutes and subsequent incremental drying periods of 1 minute until a change of 0.1 % or less of the initial wet mass of the soil.</p>	Mass of container & wet specimen (M_{cms})	<u>525.1</u>	g	Mass of container & dry specimen ($M_{c ds}$)	<u>479.5</u>	g	Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$	<u>45.6</u>	g	Mass of container (M_c)	<u>214.3</u>	g	Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$	<u>265.2</u>	g	Moisture content (w) $w = (M_w / M_s) \times 100$	<u>17.2</u>	%	<p style="text-align: center;">ASTM D1556 (DENSITY DETERMINATION)</p> <p>Testing Apparatus _____ Calibrated Vol. (lbs/ft³) _____ Bulk Density of sand (ρ_1) _____ g/cm³ _____ lbs/ft³ Mass of Sand to Fill Cone & Plate (M_2) _____ g</p> <p>Mass of bottle & cone before filling _____ g cone, plate & hole _____ g Mass of bottle & cone after filling _____ g cone, plate & hole _____ g Mass of sand to fill cone, plate, & hole (M_1) _____ g Mass of sand to fill hole _____ g Mass of wet soil in container _____ g Mass of container _____ g Mass of wet soil (M_3) _____ g</p> <p>Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm³ Dry Mass of soil $M_4 = 100 M_3 / (w + 100)$ _____ g Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft³ Dry Density $\rho_d = M_4 / V$ _____ g/cm³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft³</p> <p>Soil Description: <u>Tan Sandy Silt</u> Proctor ID: <u>Interim Cover # 1 (2014)</u> Standard Proctor (ASTM D698)</p> <p>Maximum Dry Density ($\gamma_d \text{max}$) <u>116.0 (lbs/ft³)</u> Optimum Moisture (w_{opt}) <u>14.5 (%)</u> Required Moisture: <u>11.5 %</u> to <u>17.5 %</u> Required Percent Compaction: <u>90.0 (%)</u></p> <p>TEST RESULTS: <input checked="" type="checkbox"/> Pass Date: <u>8/11/14</u> <input type="checkbox"/> Failed Moisture <input type="checkbox"/> Failed Compaction Time: <u>1525</u></p> <p>By: <u>Beachem Bosh</u> (print) (signature)</p>
Mass of container & wet specimen (M_{cms})	<u>525.1</u>	g																	
Mass of container & dry specimen ($M_{c ds}$)	<u>479.5</u>	g																	
Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$	<u>45.6</u>	g																	
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Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$	<u>265.2</u>	g																	
Moisture content (w) $w = (M_w / M_s) \times 100$	<u>17.2</u>	%																	
<u>09.15.2014</u> QA/QC APPROVAL DATE																			

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Appendix A3. Interim Cover Lift Approval Package (continued)

FIELD DENSITY TEST

PROJECT: <u>Moab UMTRA Project</u>		OTHER _____	
LIFT IDENTIFICATION: <u>UIV08140811-00</u>		DATE: <u>8/11/2014</u>	
TEST ID NUMBER(S): _____		# <u>1</u>	
TEST LOCATION: <u>Area PZ</u>		TEST METHOD: _____ D1556 <input checked="" type="checkbox"/> D6938	

ASTM D6938 (DENSITY DETERMINATION)		ASTM D1556 (DENSITY DETERMINATION)	
Make/Model <u>Troxler 3430</u>	Gauge Serial # <u>28098</u>	Testing Apparatus _____	Calibrated Vol. (lbs/ft ³) _____
Last Calibration Date: <u>2/14/14</u>		Bulk Density of sand (ρ_1) _____ g/cm ³	_____ lbs/ft ³
Daily Standard Counts: <u>Off-Cell Standard</u>		Mass of Sand to Fill Cone & Plate (M_2) _____ g	
Density <u>2283</u>	Moisture <u>667</u>	Mass of bottle & cone before filling	_____ g
<i>Method A (Direct Transmission)</i>		cone, plate & hole	_____ g
Depth Setting <u>6"</u> (inches)	Count Time <u>1</u> (minutes)	Mass of bottle & cone after filling	_____ g
		cone, plate & hole	_____ g
Moisture Count <u>160</u>	Density Count <u>2112</u>	Mass of sand to fill cone,	_____ g
		plate, & hole (M_1)	_____ g
Wet Density (ρ_m) <u>123.5</u> (lbs/ft ³)	Dry Density <u>110.0</u> (lbs/ft ³)	Mass of sand to fill hole	_____ g
		Mass of wet soil in container	_____ g
Moisture Density <u>13.5</u> (lbs/ft ³)	Moisture Fraction <u>12.3</u> (%)	Mass of container	_____ g

MOISTURE DETERMINATION	
_____ ASTM D2216 @ 110° C or _____ ASTM D4643	
Container ID _____	
Mass of container & wet specimen (M_{cms})	_____ g
Mass of container & dry specimen (M_{cbs})	_____ g
Mass of water (M_w)	_____ g
$M_w = M_{cms} - M_{cbs}$	
Mass of container (M_c)	_____ g
Mass of dry specimen (M_s)	_____ g
$M_s = M_{cbs} - M_c$	
Moisture content (w)	_____ %
$w = (M_w / M_s) \times 100$	0.0

Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$)	
$\rho_d = (100 \times \text{N/A}) / (100 + \text{N/A}) = \mathbf{110.0}$ lbs/ft ³	
<small>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)</small>	
Percent Compaction = $\rho_d / \gamma_{d,max} \times 100$	
$\mathbf{110.0} / \mathbf{116.0} \times \mathbf{100} = \mathbf{94.8}$ %	

Soil Description: _____	Tan Sandy Silt
Proctor ID: _____	Interim Cover # 1 (2014)
Standard Proctor (ASTM D698)	
Maximum Dry Density ($\gamma_{d,max}$) _____ (lbs/ft ³)	116.0
Optimum Moisture (w_{opt}) _____ (%)	14.5
Required Moisture: <u>11.5</u> % to <u>17.5</u> %	
Required Percent Compaction: _____ (%)	90.0

Comments:	TEST RESULTS:
	<input checked="" type="checkbox"/> Pass Date: <u>8/11/14</u>
	<input type="checkbox"/> Failed Moisture
	<input type="checkbox"/> Failed Compaction Time: <u>1525</u>
	By: <u>Beachem Bosh</u> (signature)
	(print)

<u>[Signature]</u>	<u>09.15.2014</u>
QA/QC APPROVAL	DATE

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Appendix A3. Interim Cover Buyoff Surveys

Environmental Management - Grand Junction Office



Interim Cover Buyoff Form

Client: Department of Energy
Project: Moab UMTRA Project
Date: 08-12-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

Lift Area	Lift Area
UIV08	

Approver Name/Title	Signature	Sign Date
Mitch Hogan/ QA/QC Representative		8-12-2014
Kirk Briscoe/ CJ Operations Manager		8-12-2014
Comments		
See attached for lift area		

Appendix A3. Interim Cover Buyoff Surveys (continued)

Top Of Waste Buyoff Survey						
Lift Area Buyoff ID:			UIV08		Date: 8/12/2014	
Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in Inches
8856	6795124	2123241	4989.9	4989.9	0.0	0.0
8855	6795174	2123235	4991.2	4991.2	0.0	0.2
8893	6795180	2123285	4991.4	4991.3	0.0	0.1
8931	6795187	2123334	4991.5	4991.5	0.0	0.2
9006	6795249	2123427	4993.2	4993.2	0.1	0.6
8968	6795242	2123378	4993.0	4993.0	0.1	0.7
8930	6795236	2123328	4992.8	4992.8	0.0	0.2
8892	6795230	2123279	4992.6	4992.6	0.0	0.1
8854	6795224	2123229	4992.5	4992.4	0.1	1.0
8853	6795273	2123223	4993.7	4993.7	0.0	0.0
8891	6795280	2123272	4993.9	4993.8	0.0	0.1
8929	6795286	2123322	4994.1	4994.0	0.0	0.6
8967	6795292	2123372	4994.2	4994.2	0.0	0.1
9005	6795298	2123421	4994.4	4994.4	0.0	0.3
9043	6795304	2123471	4994.6	4994.6	0.0	0.3
9042	6795354	2123465	4995.9	4995.8	0.0	0.2
9004	6795348	2123415	4995.7	4995.7	0.1	0.9
8966	6795342	2123365	4995.6	4995.5	0.1	1.1
8928	6795335	2123316	4995.4	4995.3	0.1	0.9
8890	6795329	2123266	4995.1	4995.1	0.0	0.1
8852	6795323	2123217	4995.0	4994.9	0.1	0.6
8851	6795372	2123210	4996.2	4996.2	0.0	0.5
8889	6795379	2123260	4996.4	4996.3	0.1	0.6
8927	6795385	2123309	4996.5	4996.5	0.0	0.0
8965	6795391	2123359	4996.7	4996.7	0.0	0.1
9003	6795397	2123409	4997.0	4996.9	0.1	1.2
9041	6795404	2123458	4997.2	4997.1	0.1	1.0
9040	6795453	2123452	4998.3	4998.3	0.0	0.1
9002	6795447	2123402	4998.3	4998.2	0.1	1.7
8964	6795441	2123353	4998.0	4998.0	0.0	0.1
8926	6795435	2123303	4997.8	4997.8	0.0	0.5
8888	6795428	2123254	4997.7	4997.6	0.1	1.0
8850	6795422	2123204	4997.4	4997.4	0.0	0.1
8849	6795472	2123198	4998.7	4998.7	0.0	0.0
8887	6795478	2123247	4998.9	4998.8	0.1	0.8
8925	6795484	2123297	4999.1	4999.0	0.1	0.9
8963	6795490	2123347	4999.2	4999.2	0.0	0.3
9001	6795497	2123396	4999.4	4999.4	0.0	0.0
9039	6795503	2123446	4999.6	4999.6	0.0	0.6
9077	6795509	2123495	4999.8	4999.8	0.0	0.4
9000	6795546	2123390	5000.7	5000.7	0.0	0.1
8962	6795540	2123340	5000.5	5000.5	0.0	0.0
8924	6795534	2123291	5000.3	5000.3	0.0	0.5
8886	6795528	2123241	5000.1	5000.1	0.0	0.1
8848	6795521	2123192	4999.9	4999.9	0.0	0.2

Comments: QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.

Approval Date: 8/12/2014 Total Square Feet: 117,400 ft²

North West Corner: 6795531 N. 2123152 E.

QC Signature: Mitch Hogan/ *[Signature]* Reviewed By: Beachem Bosh/ *[Signature]*

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Appendix A3. Interim Cover Buyoff Surveys (continued)



Interim Cover Buyoff Form

Client: Department of Energy
Project: Moab UMTRA Project
Date: 8-12-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

Lift Area	Lift Area
UIW01	

Approver Name/Title	Signature	Sign Date
Beachem Bosh / QA/QC Rep.		8-12-14
Kirk Briscoe CJ Operations Manager		8-12-14
Comments		
See attached for lift area		

Appendix A3. Interim Cover Buyoff Surveys (continued)

Top Of Waste Buyoff Survey						
Lift Area Buyoff ID:			UIW01		Date: 8/12/2014	
Point #	Northing	Easting	Surveyed Elevation	Design Elevation	Difference in feet	Difference in Inches
8913	6796057	2123225	4989.82	4989.74	0.1	0.9
8951	6796063	2123275	4990.04	4989.93	0.1	1.3
8989	6796069	2123324	4990.17	4990.11	0.1	0.7
9027	6796075	2123374	4990.37	4990.30	0.1	0.8
9065	6796082	2123424	4990.58	4990.49	0.1	1.1
9103	6796088	2123473	4990.77	4990.67	0.1	1.2
9104	6796061	2123476	4991.28	4991.21	0.1	0.9
9141	6796067	2123526	4991.44	4991.38	0.1	0.7
9178	6796068	2123533	4991.41	4991.36	0.0	0.6
9182	6796074	2123582	4991.32	4991.22	0.1	1.2
9203	6796079	2123632	4991.12	4991.07	0.0	0.6
9204	6796085	2123682	4991.03	4990.93	0.1	1.2
9225	6796090	2123731	4990.88	4990.79	0.1	1.1
9226	6796096	2123781	4990.69	4990.65	0.0	0.6
9229	6796046	2123787	4991.72	4991.65	0.1	0.9
9224	6796041	2123737	4991.87	4991.79	0.1	0.9
9205	6796035	2123687	4992.04	4991.93	0.1	1.3
9202	6796030	2123637	4992.14	4992.08	0.1	0.7
9183	6796024	2123588	4992.26	4992.22	0.0	0.5
9179	6796018	2123538	4992.41	4992.36	0.0	0.6
9142	6796018	2123532	4992.45	4992.38	0.1	0.8
9105	6796011	2123483	4992.28	4992.21	0.1	0.8
9067	6796005	2123433	4992.12	4992.03	0.1	1.1
9066	6796055	2123427	4991.11	4991.03	0.1	0.9
9028	6796049	2123377	4990.94	4990.84	0.1	1.2
9029	6795999	2123383	4991.90	4991.84	0.1	0.7
8991	6795993	2123334	4991.70	4991.65	0.1	0.6
8990	6796042	2123328	4990.71	4990.65	0.1	0.7
8952	6796036	2123278	4990.51	4990.47	0.0	0.5
8953	6795987	2123284	4991.59	4991.47	0.1	1.5
8915	6795980	2123235	4991.40	4991.28	0.1	1.4
8914	6796030	2123228	4990.37	4990.28	0.1	1.1
8877	6795974	2123185	4991.12	4991.09	0.0	0.3
8878	6795924	2123191	4992.13	4992.09	0.0	0.5
8916	6795931	2123241	4992.36	4992.28	0.1	1.0
8954	6795937	2123290	4992.53	4992.47	0.1	0.7
8992	6795943	2123340	4992.74	4992.65	0.1	1.0
9030	6795949	2123390	4992.91	4992.84	0.1	0.8
9068	6795956	2123439	4993.11	4993.03	0.1	1.0
9106	6795962	2123489	4993.28	4993.21	0.1	0.8
9143	6795968	2123539	4993.43	4993.38	0.1	0.6
9180	6795969	2123544	4993.48	4993.37	0.1	1.3
9184	6795974	2123593	4993.28	4993.22	0.1	0.6
9201	6795980	2123643	4993.12	4993.08	0.0	0.5
9206	6795986	2123693	4993.00	4992.94	0.1	0.8
9223	6795991	2123743	4992.91	4992.79	0.1	1.4
9230	6795997	2123792	4992.73	4992.65	0.1	1.0
9231	6795947	2123798	4993.69	4993.65	0.0	0.4
9222	6795941	2123748	4993.89	4993.80	0.1	1.1
9207	6795936	2123698	4994.00	4993.94	0.1	0.8
9200	6795930	2123649	4994.15	4994.08	0.1	0.8
9185	6795925	2123599	4994.31	4994.23	0.1	1.0
9181	6795919	2123549	4994.49	4994.37	0.1	1.4
9144	6795918	2123545	4994.47	4994.38	0.1	1.1
9107	6795912	2123495	4994.29	4994.21	0.1	1.0
9069	6795906	2123446	4994.07	4994.03	0.0	0.5
9031	6795900	2123396	4993.93	4993.84	0.1	1.1
8993	6795894	2123346	4993.69	4993.65	0.0	0.5
8955	6795887	2123297	4993.51	4993.47	0.0	0.5
8917	6795881	2123247	4993.37	4993.28	0.1	1.1
8879	6795875	2123197	4993.15	4993.09	0.1	0.7
8880	6795825	2123204	4994.15	4994.09	0.1	0.7
8918	6795831	2123253	4994.35	4994.28	0.1	0.9
8956	6795838	2123303	4994.57	4994.47	0.1	1.2

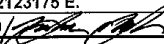
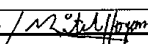
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Appendix A3. Interim Cover Buyoff Surveys (continued)

8994	6795844	2123353	4994.72	4994.65	0.1	0.8
9032	6795850	2123402	4994.92	4994.84	0.1	1.0
9070	6795856	2123452	4995.05	4995.03	0.0	0.3
9108	6795863	2123501	4995.29	4995.21	0.1	1.0
9145	6795869	2123551	4995.45	4995.38	0.1	0.8
9186	6795875	2123605	4995.28	4995.23	0.0	0.6
9199	6795880	2123654	4995.11	4995.09	0.0	0.3
9208	6795886	2123704	4995.02	4994.94	0.1	0.9
9221	6795892	2123754	4994.86	4994.80	0.1	0.8
9220	6795842	2123759	4995.88	4995.80	0.1	0.9
9209	6795836	2123709	4996.01	4995.95	0.1	0.7
9198	6795831	2123660	4996.14	4996.09	0.0	0.6
9187	6795825	2123610	4996.32	4996.23	0.1	1.1
9140	6795819	2123557	4996.46	4996.38	0.1	0.9
9109	6795813	2123508	4996.26	4996.21	0.0	0.6
9071	6795807	2123458	4996.07	4996.03	0.0	0.5
9033	6795801	2123408	4995.87	4995.84	0.0	0.3
8995	6795794	2123359	4995.75	4995.65	0.1	1.2
8957	6795786	2123309	4995.53	4995.47	0.1	0.7
8919	6795782	2123260	4995.30	4995.28	0.0	0.3
8881	6795776	2123210	4995.16	4995.09	0.1	0.8
8843	6795769	2123160	4994.98	4994.91	0.1	0.9
8844	6795720	2123167	4995.96	4995.91	0.1	0.6
8882	6795726	2123216	4996.15	4996.09	0.1	0.7
8920	6795732	2123266	4996.37	4996.28	0.1	1.1
8958	6795736	2123315	4996.57	4996.47	0.1	1.2
8996	6795745	2123365	4996.71	4996.65	0.1	0.7
9034	6795751	2123415	4996.86	4996.84	0.0	0.3
9072	6795757	2123464	4997.07	4997.03	0.0	0.5
9110	6795763	2123514	4997.30	4997.21	0.1	1.1
9147	6795770	2123563	4997.48	4997.39	0.1	1.1
9188	6795776	2123616	4997.35	4997.23	0.1	1.4
9197	6795781	2123665	4997.22	4997.09	0.1	1.5
9210	6795787	2123715	4997.01	4996.95	0.1	0.8
9219	6795792	2123765	4996.84	4996.80	0.0	0.5
9218	6795743	2123770	4997.87	4997.81	0.1	0.7
9217	6795693	2123776	4998.91	4998.81	0.1	1.2
9213	6795638	2123732	5000.03	4999.95	0.1	0.9
9212	6795687	2123726	4999.01	4998.95	0.1	0.7
9211	6795737	2123721	4998.01	4997.95	0.1	0.7
9196	6795731	2123671	4998.19	4998.09	0.1	1.2
9195	6795682	2123677	4999.15	4999.10	0.1	0.7
9194	6795632	2123682	5000.19	5000.09	0.1	1.1
9191	6795626	2123633	5000.29	5000.24	0.0	0.5
9190	6795676	2123627	4999.31	4999.24	0.1	0.8
9189	6795726	2123621	4998.31	4998.24	0.1	0.8
9148	6795720	2123570	4998.49	4998.39	0.1	1.3
9149	6795670	2123576	4999.50	4999.39	0.1	1.4
9150	6795621	2123582	5000.41	5000.39	0.0	0.2
9151	6795571	2123588	5001.48	5001.38	0.1	1.1
9115	6795515	2123545	5000.05	4999.96	0.1	1.0
9114	6795565	2123539	5001.28	5001.21	0.1	0.9
9113	6795615	2123533	5000.27	5000.21	0.1	0.7
9112	6795664	2123526	4999.27	4999.21	0.1	0.7
9111	6795714	2123520	4998.26	4998.21	0.0	0.5
9073	6795708	2123470	4998.10	4998.03	0.1	0.8
9074	6795658	2123477	4999.11	4999.03	0.1	0.9
9075	6795608	2123483	5000.13	5000.03	0.1	1.2
9076	6795559	2123489	5001.08	5001.02	0.1	0.8
9038	6795552	2123440	5000.92	5000.84	0.1	0.9
9037	6795602	2123433	4999.90	4999.84	0.1	0.8
9036	6795652	2123427	4998.94	4998.84	0.1	1.1
9035	6795701	2123421	4997.94	4997.84	0.1	1.2
8997	6795695	2123371	4997.75	4997.65	0.1	1.2
8998	6795645	2123378	4998.69	4998.65	0.0	0.4
8999	6795596	2123384	4999.73	4999.65	0.1	1.0
8961	6795590	2123334	4999.53	4999.47	0.1	0.7
8960	6795639	2123328	4998.57	4998.47	0.1	1.2
8959	6795689	2123322	4997.51	4997.47	0.0	0.5
8921	6795683	2123272	4997.31	4997.28	0.0	0.4

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Appendix A3. Interim Cover Buyoff Surveys (continued)

8922	6795633	2123278	4998.32	4998.28	0.0	0.5
8923	6795583	2123284	4999.33	4999.28	0.0	0.6
8885	6795577	2123235	4999.15	4999.09	0.1	0.7
8884	6795627	2123229	4998.12	4998.09	0.0	0.3
8883	6795676	2123223	4997.12	4997.09	0.0	0.3
8845	6795670	2123173	4996.98	4996.91	0.1	0.8
8846	6795621	2123179	4997.96	4997.91	0.0	0.5
8847	6795571	2123185	4998.96	4998.91	0.0	0.6
Comments:	QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness. This area also includes UIV04					
Approval Date: 8/12/2014			Total Square Feet: 348,427 ft ²			
North West Corner: 6796053 N. 2123175 E.						
QC Signature: Beachem Bosh 			Reviewed By: Mitch Hogan / 			

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**Appendix A4.
Radon Barrier**

**Standard Proctor Test Results Summary
Lift Approval Summary
Lift Approval Package
Buyoff Surveys**

Appendix A4. Radon Barrier Standard Proctor Test Results Summary

Proctor ID #	Date Sampled	Date Approved	Maximum Dry Density (lb/ft ³)	Optimum Moisture Content (%)	Soils Description
Radon Barrier # 1 (2014)	7/29/2014	8/4/2014	111.0	17.5	Brown Sandy Silt
Radon Barrier # 2 (2014)	8/19/2014	8/29/2014	110.5	14.5	Lt Brown Clay
Radon Barrier # 3 (2014)	8/19/2014	8/29/2014	113.5	14.5	Brown Clay
Radon Barrier # 4 (2014)	9/2/2004	9/12/2014	115.0	15.5	Brown Clay
Radon Barrier # 5 (2014)	9/8/2012	9/12/2014	114.5	15.5	Grey Clay
Radon Barrier # 6 (2014)	9/17/2014	9/22/2014	114.0	14.5	Brown Clay
Radon Barrier # 7 (2014)	9/17/2014	9/22/2014	113.5	14.5	Grey Clay
Radon Barrier # 8 (2014)	9/19/2014	9/26/2014	117.0	14.0	Lt Grey Clay
Radon Barrier # 9 (2014)	9/19/2014	9/26/2014	118.0	14.0	Dk Grey Clay

Appendix A4. Radon Barrier Lift Approval Summary

September 2014											
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd ³)	Cumulative Quantity Approved (yd ³)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)	Notes
9/2/2014	URL10140827-00	0	3432	3,432	N/A	0.8	RB#1 & 2(2014)	2	0	102.4	
9/3/2014	URL01140827-00	0	4741	8,173	N/A	0.8	RB#1 & 3(2014)	2	0	101.1	
9/5/2014	URL10140902-00	0	3432	11,605	N/A	0.8	RB#1(2014)	2	0	100.0	
9/9/2014	URL10140905-00	1	3861	15,466	N/A	0.9	RB#1(2014)	2	0	101.3	
9/10/2014	URL01140904-00	0	5333	20,799	N/A	0.9	RB#1(2014)	3	0	100.2	
9/10/2014	URL10140910-00	0	1716	22,515	N/A	0.4	RB#3(2014)	2	0	102.7	
9/12/2014	URR01140911-00	2	4234	26,749	N/A	0.8	RB#3(2014)	2	0	100.8	
9/13/2014	URQ10140911-00	0	3174	29,923	N/A	0.7	RB#3(2014)	2	0	101.5	
9/18/2014	URR01140916-00	2	4763	34,686	N/A	0.9	RB#4(2014)	2	1	99.9	
9/19/2014	URQ10140916-00	2	4081	38,767	N/A	0.9	RB#3(2014)	2	0	103.0	
9/23/2014	URQ10140923-00	2	3174	41,941	N/A	0.7	RB#4(2014)	2	0	95.4	
9/23/2014	URR01140923-00	2	3175	45,116	N/A	0.6	RB#4(2014)	2	0	97.1	
9/24/2014	URR01140924-00	2	3705	48,821	N/A	0.7	RB#5(2014)	2	0	98.8	
9/24/2014	URQ10140924-00	2	3174	51,995	N/A	0.7	RB#5(2014)	2	0	98.1	
9/26/2014	URR01140925-00	2	3705	55,700	N/A	0.7	RB#4(2014)	2	0	101.1	
9/26/2014	URQ10140925-00	2	2720	58,420	N/A	0.6	RB#7(2014)	3	1	100.0	
		Average CAES Screen Passing Pixels (%)=		N/A							
		Total Quantity Approved (yd³) =		58,420							
		Total # of Nuclear Density Gauge Tests =		34							
		Total # of Moisture Tests =		19							
		Quantity per Moisture Test (yd³) =		3,075							
		Total Average Thickness (ft.)=		0.7							

Appendix A4. Radon Barrier Lift Approval Package

RADON BARRIER LIFT APPROVAL FORM

PROJECT:	Moab UMTRA Project	OTHER:	
NW CORNER	DATE:	9/11/2014	

P 1	6795029 N. 2123040 E.		
EW:	235	X	0.414 = 97
NS:	475	X	0.972 = 462
P 2	6795273 N. 2123124 E.		
EW:	235	X	0.772 = 181
NS:	475	X	0.459 = 218
P 3	/		
EW:	X		=
NS:	X		=
P 4	N		
EW:	X		=
NS:	X		=
P 5	A		
EW:	X		=
NS:	X		=
Page 2 attached:	Y		N

IDENTIFY LOTS ABOVE

LIFT ID: URQ10140911-00 NW CORNER: 6795491 N. 2122943 E.

THICKNESS: UNC: 0.7' COM: N/A ELEV: N/A Scarification Insp: MH Date: 9/10/14 Time: 1600

Material Inspection by: MH Partical Size: ≤4"; ≥4"; Nesting: Y: N: Processed Mancos Shale Material: Y: N:

Comments: This lift area is 122,408 ft². On 9/10/2014 QC observed Operations start placement. On 9/11/2014 QC observed Operation continue to place along with process and moisture condition material. On 9/12/2014 Operations continued to placed, process and moisture condition. On 9/13/2014 QC observed Operations process and moisture condition material. QC performed a final material inspection for the whole lift with satisfactory results. Operations compacted the lift area and QC performed moisture/ density tests with satisfactory results. Lift volume is 3174 yd³.

KEYING IN NOTES: N E S W Satisfactory DENSITY TESTS ID # (S): 1, 2

LIFT APPROVED BY: Mitch Hogan / [Signature] DATE: 9/13/2014 TIME: 1245

[Signature] / [Signature] 09/16/2014
 QA/QC APPROVAL DATE

Density Testing
 DOE-EM/GJRAC1783
 Rev. 0

QC-F-001
 File index No. 43.8.2
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Appendix A4. Radon Barrier Lift Approval Package (continued)


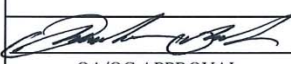
FIELD DENSITY TEST

PROJECT: Moab UMTRA Project OTHER _____																			
LIFT IDENTIFICATION: URQ10140911-00 DATE: 9/13/2014																			
TEST ID NUMBER(S): # 1																			
TEST LOCATION: P2 TEST METHOD: D1556 <input type="checkbox"/> D6938 <input checked="" type="checkbox"/>																			
ASTM D6938 (DENSITY DETERMINATION) Make/Model <u>Troxler 3430</u> Gauge Serial # <u>28098</u> Last Calibration Date: <u>2/14/14</u> Daily Standard Counts: <i>Off-Cell Standard</i> Density <u>2286</u> Moisture <u>672</u> <i>Method A (Direct Transmission)</i> Depth Setting <u>8</u> (inches) Count Time <u>1</u> (minutes) Moisture Count <u>180</u> Density Count <u>1136</u> Wet Density (ρ_m) <u>130.6</u> (lbs/ft ³) Dry Density <u>114.6</u> (lbs/ft ³) Moisture Density <u>16.1</u> (lbs/ft ³) Moisture Fraction <u>14.0</u> (%)	ASTM D1556 (DENSITY DETERMINATION) Testing Apparatus _____ Calibrated Vol. (lbs/ft ³) _____ Bulk Density of sand (ρ_1) _____ g/cm ³ _____ lbs/ft ³ Mass of Sand to Fill Cone & Plate (M_2) _____ g Mass of bottle & cone before filling _____ g cone, plate & hole Mass of bottle & cone after filling _____ g cone, plate & hole Mass of sand to fill cone, plate, & hole (M_1) _____ g Mass of sand to fill hole _____ g Mass of wet soil in container _____ g Mass of container _____ g Mass of wet soil (M_3) _____ g Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm ³ Dry Mass of soil $M_4 = 100 M_3 / (w + 100)$ _____ g Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft ³ Dry Density $\rho_d = M_4 / V$ _____ g/cm ³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft ³																		
MOISTURE DETERMINATION _____ ASTM D2216 @ 110° C or _____ ASTM D4643 Container ID _____ <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Mass of container & wet specimen (M_{cms})</td> <td style="width: 20%; border: 1px solid black;">g</td> </tr> <tr> <td>Mass of container & dry specimen ($M_{c ds}$)</td> <td style="border: 1px solid black;">g</td> </tr> <tr> <td>Mass of water (M_w)</td> <td style="border: 1px solid black;">g</td> </tr> <tr> <td>$M_w = M_{cms} - M_{c ds}$</td> <td style="border: 1px solid black;">g</td> </tr> <tr> <td>Mass of container (M_c)</td> <td style="border: 1px solid black;">g</td> </tr> <tr> <td>Mass of dry specimen (M_s)</td> <td style="border: 1px solid black;">g</td> </tr> <tr> <td>$M_s = M_{c ds} - M_c$</td> <td style="border: 1px solid black;">g</td> </tr> <tr> <td>Moisture content (w)</td> <td style="background-color: yellow; border: 1px solid black; text-align: center;">0.0 %</td> </tr> <tr> <td>$w = (M_w / M_s) \times 100$</td> <td style="border: 1px solid black;">%</td> </tr> </table>		Mass of container & wet specimen (M_{cms})	g	Mass of container & dry specimen ($M_{c ds}$)	g	Mass of water (M_w)	g	$M_w = M_{cms} - M_{c ds}$	g	Mass of container (M_c)	g	Mass of dry specimen (M_s)	g	$M_s = M_{c ds} - M_c$	g	Moisture content (w)	0.0 %	$w = (M_w / M_s) \times 100$	%
Mass of container & wet specimen (M_{cms})	g																		
Mass of container & dry specimen ($M_{c ds}$)	g																		
Mass of water (M_w)	g																		
$M_w = M_{cms} - M_{c ds}$	g																		
Mass of container (M_c)	g																		
Mass of dry specimen (M_s)	g																		
$M_s = M_{c ds} - M_c$	g																		
Moisture content (w)	0.0 %																		
$w = (M_w / M_s) \times 100$	%																		
Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$) $\rho_d = (100 \times \text{N/A}) / (100 + \text{N/A}) = \mathbf{114.6}$ lbs/ft ³ <small>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)</small> Percent Compaction = $\rho_d / \gamma_{dmax} \times 100$ $114.6 / 113.5 \times 100 = \mathbf{101.0}$ %																			
Comments:	Soil Description: <u>Brown Clay</u> Proctor ID: <u>Radon Barrier # 3 (2014)</u> Standard Proctor (ASTM D698) Maximum Dry Density (γ_{dmax}) <u>113.5</u> (lbs/ft ³) Optimum Moisture (w_{opt}) <u>14.5</u> (%) <i>11.5</i> Required Moisture: <u>14.5</u> to <u>17.5</u> % Required Percent Compaction: <u>95.0</u> (%)																		
TEST RESULTS: <input checked="" type="checkbox"/> Pass Date: <u>9/13/14</u> <input type="checkbox"/> Failed Moisture <input type="checkbox"/> Failed Compaction Time: <u>1130</u> By: <u>Beachem Bosh</u> <small>(print) (signature)</small>																			
<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> QA/QC APPROVAL </div> <div style="text-align: center;"> <u>09-17-2014</u> DATE </div> </div>																			

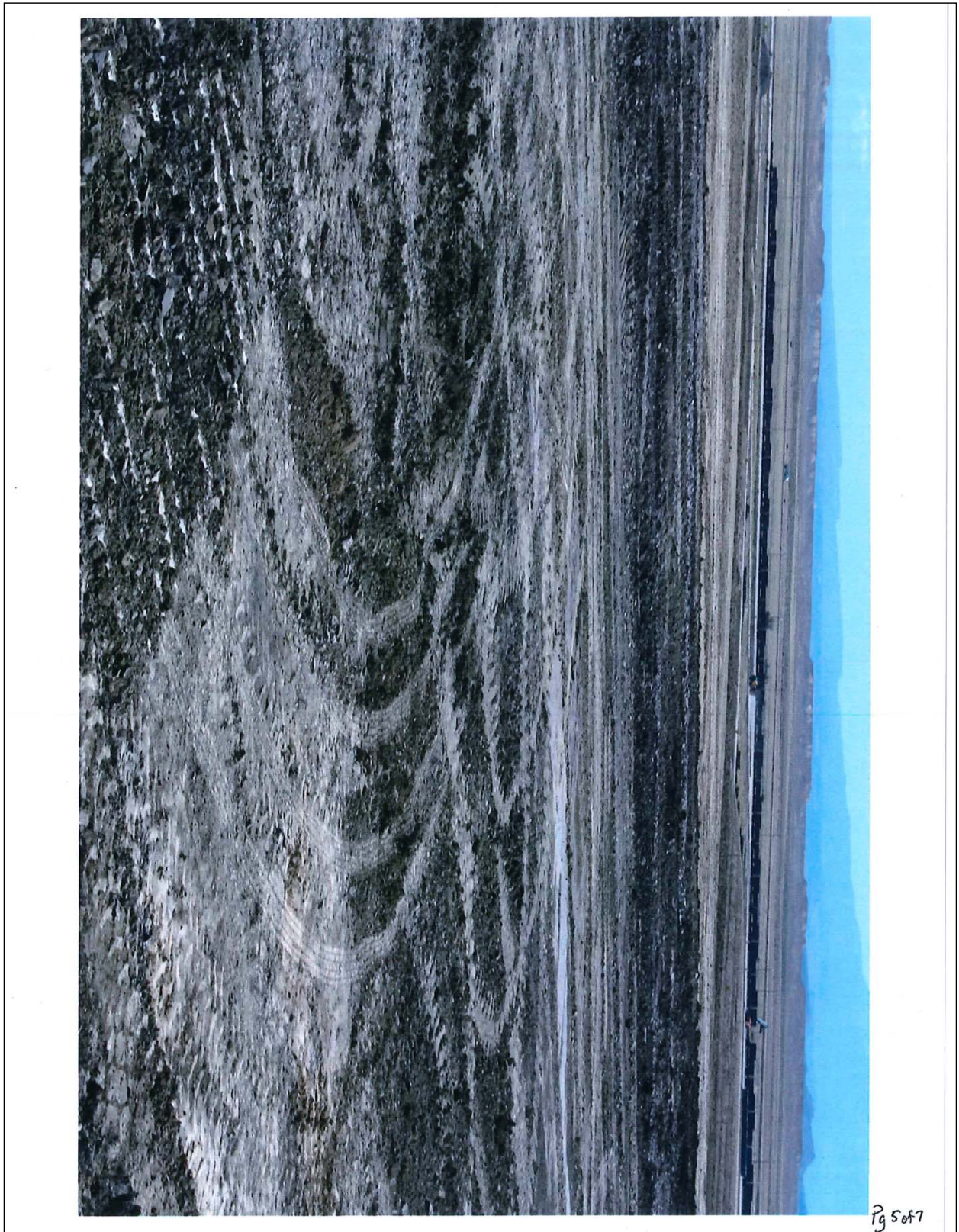
Density Testing
DOE-EM/GJRAC1783
Rev. 0

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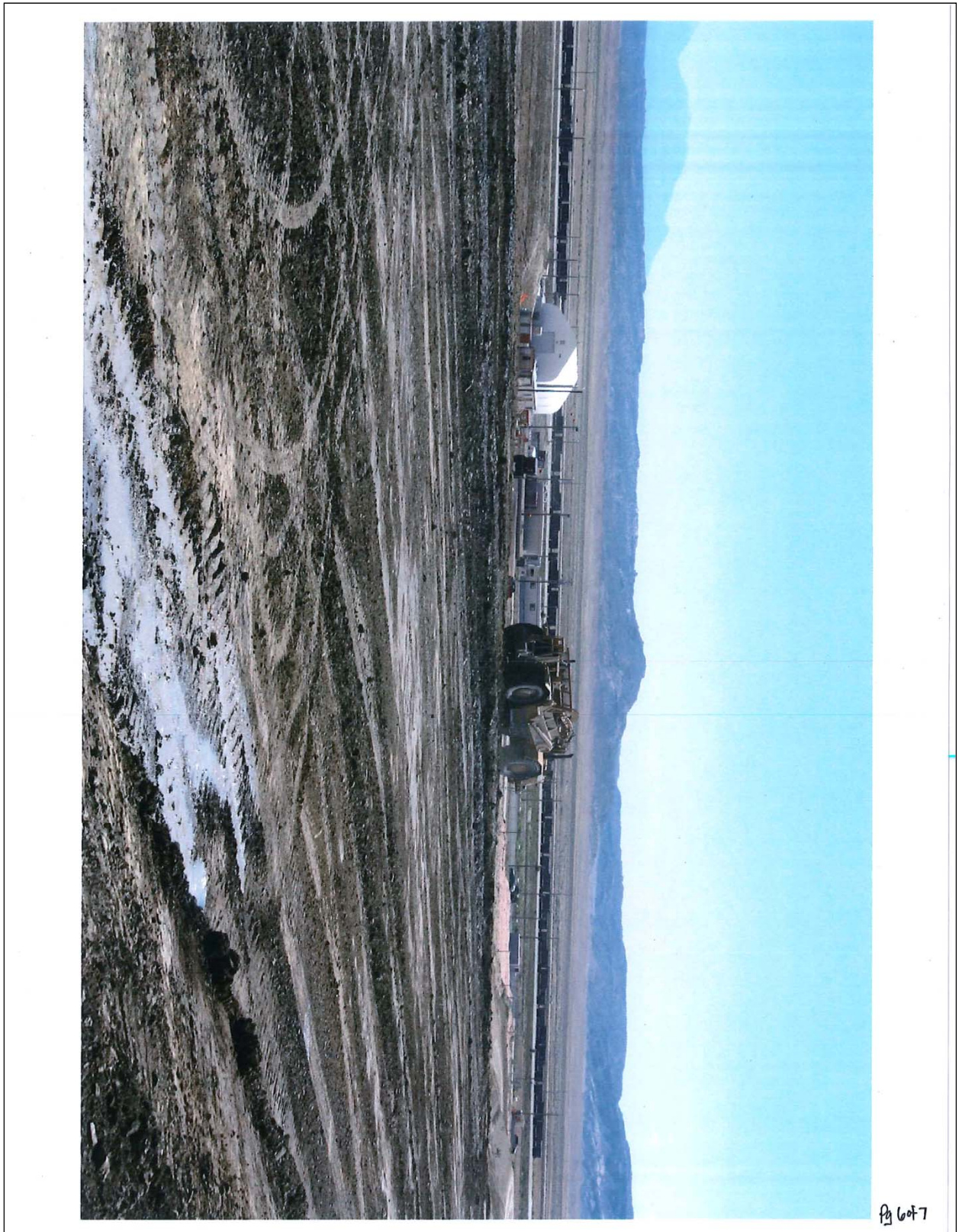
Appendix A4. Radon Barrier Lift Approval Package (continued)

FIELD DENSITY TEST	
PROJECT: Moab UMTRA Project LIFT IDENTIFICATION: URQ10140911-00 TEST ID NUMBER(S): # 2 TEST LOCATION: P1	OTHER: _____ DATE: 9/13/2014 TEST METHOD: D1556 <input checked="" type="checkbox"/> D6938
ASTM D6938 (DENSITY DETERMINATION) Make/Model Troxler 3430 Gauge Serial # 28098 Last Calibration Date: 2/14/14 Daily Standard Counts: <i>Off-Cell Standard</i> Density 2286 Moisture 672 <i>Method A (Direct Transmission)</i> Depth Setting 8 (inches) Count Time 1 (minutes) Moisture Count 204 Density Count 1053 Wet Density (ρ_m) 133.5 (lbs/ft³) Dry Density 115.9 (lbs/ft³) Moisture Density 17.6 (lbs/ft³) Moisture Fraction 15.2 (%)	ASTM D1556 (DENSITY DETERMINATION) Testing Apparatus _____ Calibrated Vol. (lbs/ft ³) _____ Bulk Density of sand (ρ_1) _____ g/cm ³ _____ lbs/ft ³ Mass of Sand to Fill Cone & Plate (M_2) _____ g Mass of bottle & cone before filling _____ g Mass of bottle & cone after filling _____ g Mass of sand to fill cone, plate, & hole (M_1) _____ g Mass of sand to fill hole _____ g Mass of wet soil in container _____ g Mass of container _____ g Mass of wet soil (M_3) _____ g Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm ³ Dry Mass of soil $M_4 = 100 M_3 / (w + 100)$ _____ g Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft ³ Dry Density $\rho_d = M_4 / V$ _____ g/cm ³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft ³
MOISTURE DETERMINATION _____ ASTM D2216 @ 110° C or _____ ASTM D4643 Container ID _____ Mass of container & wet specimen (M_{cms}) _____ g Mass of container & dry specimen ($M_{c ds}$) _____ g Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$ _____ g Mass of container (M_c) _____ g Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$ _____ g Moisture content (w) $w = (M_w / M_s) \times 100$ 0.0 % Dry Density (ρ_d) = $(100 \times \rho_m) / (100 + w)$ $\rho_d = (100 \times N/A) / (100 + N/A) = 115.9$ lbs/ft ³ <i>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_m)</i> Percent Compaction = $\rho_d / \gamma_{d max} \times 100$ $115.9 / 113.5 \times 100 = 102.1$ %	Soil Description: Brown Clay Proctor ID: Radon Barrier # 3 (2014) Standard Proctor (ASTM D698) Maximum Dry Density ($\gamma_{d max}$) 113.5 (lbs/ft ³) Optimum Moisture (w_{opt}) 14.5 (%) Required Moisture: 14.5 11.5 % to 17.5 % Required Percent Compaction: 95.0 (%)
Comments:	TEST RESULTS: <input checked="" type="checkbox"/> Pass Date: 9/13/14 <input type="checkbox"/> Failed Moisture <input type="checkbox"/> Failed Compaction Time: 1137 By: Mitch Hogan  (print) (signature)
 QA/QC APPROVAL	09/16/14 DATE
Density Testing DOE-EM/GJRAC1783 Rev. 0	
QC-F-002 File Index No. 43.8.2 Page 4 of 7	

Appendix A4. Radon Barrier Lift Approval Package (continued)



Appendix A4. Radon Barrier Lift Approval Package (continued)



Appendix A4. Radon Barrier Lift Approval Package (continued)



Pg 7 of 7

Appendix A4. Radon Barrier Buyoff Surveys

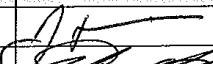
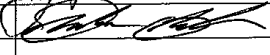


Radon Barrier Buyoff Form

Client: Department of Energy
Project: Moab UMTRA Project
Date: 09-12-2014

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

Lift Area	Lift Area
URL01	

Approver Name/Title	Signature	Sign Date
Kirk Briscoe / Operation Manager		9-12-14
Beachem Bosh / QA/QC Representative		9-12-14

Appendix A4. Radon Barrier Buyoff Surveys (continued)

Moab UMTRA Crescent Junction Disposal Cell
 Radon Barrier Survey
 Measured by Beachem Bosh
 Checked by Mitch Hogan
 September 12, 2014

Point #	Northing	Easting	Design Elevation	Measured Elevation	Difference (feet)	Difference (inches)	Pre-Installation Elevation	Thickness
8399	6795099	2122640	4993.0	4993.1	0.10	1.2	4989.0	4.04
8400	6795050	2122646	4991.7	4991.8	0.10	1.2	4987.7	4.04
8426	6795651	2122621	4998.0	4998.1	0.10	1.2	4994.0	4.04
8427	6795601	2122627	4998.9	4999.0	0.10	1.2	4995.0	4.04
8428	6795552	2122633	4999.9	5000.0	0.10	1.2	4996.0	4.04
8429	6795502	2122640	5000.9	5001.0	0.10	1.2	4997.0	4.04
8430	6795453	2122646	5001.9	5002.0	0.10	1.2	4997.9	4.04
8431	6795403	2122652	5000.6	5000.7	0.10	1.2	4996.7	4.04
8432	6795353	2122658	4999.4	4999.5	0.10	1.2	4995.5	4.04
8433	6795304	2122665	4998.1	4998.2	0.10	1.2	4994.2	4.04
8434	6795254	2122671	4996.9	4997.0	0.10	1.2	4992.9	4.04
8435	6795205	2122677	4995.6	4995.7	0.10	1.2	4991.7	4.04
8436	6795155	2122683	4994.4	4994.5	0.10	1.2	4990.5	4.04
8437	6795105	2122690	4993.1	4993.2	0.10	1.2	4989.2	4.04
8438	6795056	2122696	4991.9	4992.0	0.10	1.2	4988.0	4.04
8439	6795006	2122702	4990.6	4990.8	0.15	1.9	4986.6	4.15
8459	6795905	2122639	4993.1	4993.2	0.10	1.2	4989.1	4.01
8460	6795856	2122646	4994.1	4994.2	0.10	1.2	4990.2	4.01
8461	6795806	2122652	4995.1	4995.2	0.10	1.2	4991.2	4.01
8462	6795757	2122658	4996.1	4996.2	0.10	1.2	4992.2	4.01
8463	6795707	2122664	4997.1	4997.2	0.10	1.2	4993.2	4.01
8464	6795657	2122670	4998.1	4998.2	0.12	1.5	4994.2	4.02
8465	6795608	2122677	4999.1	4999.2	0.15	1.8	4995.1	4.10
8466	6795558	2122683	5000.1	5000.3	0.21	2.5	4996.1	4.18
8467	6795509	2122689	5001.1	5001.2	0.18	2.1	4997.1	4.10
8468	6795459	2122695	5002.0	5002.2	0.16	1.9	4998.1	4.13
8469	6795409	2122702	5000.8	5000.9	0.16	1.9	4996.9	4.07
8470	6795360	2122708	4999.5	4999.7	0.17	2.0	4995.6	4.12
8471	6795310	2122714	4998.3	4998.4	0.10	1.2	4994.4	4.07
8472	6795261	2122720	4997.1	4997.2	0.10	1.2	4993.1	4.07
8473	6795211	2122727	4995.8	4995.9	0.10	1.2	4991.9	4.07
8474	6795161	2122733	4994.6	4994.7	0.10	1.2	4990.6	4.07
8475	6795112	2122739	4993.3	4993.4	0.10	1.2	4989.3	4.07
8476	6795062	2122745	4992.0	4992.1	0.10	1.2	4988.1	4.07
8477	6795012	2122752	4990.8	4990.9	0.13	1.5	4986.8	4.12
8495	6795988	2122679	4991.7	4991.8	0.10	1.2	4987.7	4.06
8496	6795961	2122683	4992.3	4992.4	0.10	1.2	4988.3	4.06
8497	6795912	2122689	4993.2	4993.4	0.17	2.1	4989.3	4.08
8498	6795862	2122695	4994.2	4994.4	0.14	1.7	4990.3	4.07
8499	6795812	2122701	4995.2	4995.4	0.16	1.9	4991.3	4.11
8500	6795763	2122708	4996.2	4996.4	0.15	1.8	4992.3	4.03
8501	6795713	2122714	4997.2	4997.4	0.13	1.6	4993.3	4.03
8502	6795664	2122720	4998.2	4998.4	0.19	2.3	4994.3	4.09
8503	6795614	2122726	4999.2	4999.4	0.18	2.2	4995.3	4.11
8504	6795564	2122733	5000.2	5000.4	0.20	2.4	4996.3	4.17
8505	6795515	2122739	5001.2	5001.3	0.12	1.4	4997.3	4.10
8506	6795465	2122745	5002.2	5002.4	0.13	1.5	4998.2	4.11

Appendix A4. Radon Barrier Buyoff Surveys (continued)

8507	6795416	2122751	5001.0	5001.1	0.11	1.3	4997.0	4.11
8508	6795366	2122758	4999.7	4999.9	0.12	1.5	4995.8	4.01
8509	6795316	2122764	4998.5	4998.6	0.10	1.2	4994.5	4.08
8510	6795267	2122770	4997.3	4997.4	0.10	1.2	4993.3	4.08
8511	6795217	2122776	4996.1	4996.2	0.10	1.2	4992.2	4.08
8512	6795168	2122782	4994.8	4994.9	0.10	1.2	4990.8	4.08
8513	6795118	2122789	4993.5	4993.6	0.10	1.2	4989.6	4.08
8514	6795068	2122795	4992.3	4992.4	0.10	1.2	4988.4	4.08
8515	6795019	2122801	4991.0	4991.2	0.22	2.6	4987.0	4.21
8516	6794969	2122807	4989.7	4989.9	0.20	2.4	4985.7	4.20
8533	6795994	2122729	4991.9	4992.0	0.11	1.3	4988.0	4.03
8534	6795968	2122732	4992.4	4992.5	0.11	1.3	4988.5	4.00
8535	6795918	2122738	4993.4	4993.6	0.13	1.6	4989.5	4.04
8536	6795868	2122745	4994.4	4994.6	0.22	2.6	4990.5	4.15
8537	6795819	2122751	4995.4	4995.6	0.13	1.6	4991.5	4.06
8538	6795769	2122757	4996.4	4996.5	0.10	1.2	4992.4	4.09
8539	6795720	2122763	4997.4	4997.6	0.15	1.8	4993.5	4.03
8540	6795670	2122770	4998.4	4998.6	0.13	1.6	4994.5	4.02
8541	6795620	2122776	4999.4	4999.5	0.12	1.5	4995.4	4.11
8542	6795571	2122782	5000.4	5000.6	0.21	2.5	4996.5	4.17
8543	6795521	2122788	5001.4	5001.6	0.14	1.7	4997.5	4.10
8544	6795471	2122795	5002.4	5002.5	0.11	1.3	4998.4	4.10
8545	6795422	2122801	5001.2	5001.3	0.15	1.8	4997.2	4.15
8546	6795372	2122807	4999.9	5000.1	0.18	2.1	4996.0	4.14
8547	6795323	2122813	4998.8	4998.9	0.10	1.2	4994.8	4.04
8548	6795273	2122820	4997.5	4997.6	0.10	1.2	4993.5	4.04
8549	6795223	2122826	4996.2	4996.3	0.10	1.2	4992.3	4.04
8550	6795174	2122832	4995.0	4995.1	0.10	1.2	4991.0	4.04
8551	6795124	2122838	4993.7	4993.8	0.10	1.2	4989.8	4.04
8552	6795075	2122845	4992.5	4992.6	0.10	1.2	4988.5	4.04
8553	6795025	2122851	4991.2	4991.3	0.10	1.2	4987.3	4.04
8554	6794975	2122857	4989.9	4990.0	0.11	1.4	4985.9	4.10
8571	6796001	2122779	4992.1	4992.2	0.15	1.8	4988.1	4.08
8572	6795974	2122782	4992.6	4992.7	0.12	1.4	4988.6	4.12
8573	6795924	2122788	4993.6	4993.8	0.18	2.1	4989.6	4.17
8574	6795875	2122794	4994.6	4994.8	0.17	2.1	4990.7	4.07
8575	6795825	2122801	4995.6	4995.8	0.18	2.1	4991.6	4.15
8576	6795775	2122807	4996.6	4996.7	0.13	1.5	4992.7	4.06
8577	6795726	2122813	4997.6	4997.7	0.13	1.6	4993.7	4.07
8578	6795676	2122819	4998.6	4998.7	0.15	1.8	4994.7	4.06
8579	6795626	2122826	4999.7	4999.8	0.10	1.2	4995.6	4.17
8580	6795577	2122832	5000.7	5000.8	0.10	1.2	4996.7	4.06
8581	6795527	2122838	5001.7	5001.8	0.10	1.2	4997.7	4.06
8582	6795478	2122844	5002.6	5002.7	0.10	1.2	4998.6	4.10
8583	6795428	2122851	5001.4	5001.5	0.10	1.2	4997.4	4.12
8584	6795378	2122857	5000.2	5000.3	0.10	1.2	4996.2	4.10
8585	6795329	2122863	4998.9	4999.0	0.10	1.2	4994.9	4.06
8586	6795279	2122869	4997.7	4997.8	0.10	1.2	4993.8	4.06
8587	6795230	2122875	4996.4	4996.5	0.10	1.2	4992.4	4.06
8588	6795180	2122882	4995.2	4995.3	0.10	1.2	4991.2	4.06
8589	6795130	2122888	4993.9	4994.0	0.10	1.2	4989.9	4.06
8590	6795081	2122894	4992.7	4992.8	0.10	1.2	4988.8	4.06
8591	6795031	2122900	4991.4	4991.5	0.10	1.2	4987.4	4.06
8592	6794982	2122907	4990.1	4990.3	0.21	2.5	4986.1	4.18
8609	6796007	2122828	4992.3	4992.4	0.13	1.6	4988.3	4.12
8610	6795980	2122832	4992.8	4992.9	0.14	1.7	4988.9	4.04

Appendix A4. Radon Barrier Buyoff Surveys (continued)

8611	6795930	2122838	4993.8	4994.0	0.18	2.2	4989.9	4.11
8612	6795881	2122844	4994.8	4994.9	0.14	1.7	4990.9	4.07
8613	6795831	2122850	4995.8	4996.0	0.18	2.1	4991.8	4.16
8614	6795782	2122857	4996.8	4996.9	0.11	1.4	4992.8	4.09
8615	6795732	2122863	4997.8	4998.0	0.18	2.2	4993.8	4.18
8616	6795682	2122869	4998.8	4999.0	0.18	2.2	4994.9	4.11
8617	6795633	2122875	4999.8	4999.9	0.11	1.4	4995.8	4.11
8618	6795583	2122881	5000.8	5001.0	0.16	1.9	4996.8	4.13
8619	6795534	2122888	5001.8	5002.0	0.20	2.4	4997.8	4.17
8620	6795484	2122894	5002.8	5003.0	0.16	1.9	4998.8	4.14
8621	6795434	2122900	5001.5	5001.7	0.21	2.5	4997.6	4.18
8622	6795385	2122906	5000.3	5000.4	0.12	1.5	4996.4	4.06
8623	6795335	2122913	4999.1	4999.2	0.10	1.2	4995.2	4.02
8624	6795285	2122919	4997.9	4998.0	0.10	1.2	4994.0	4.02
8625	6795236	2122925	4996.6	4996.7	0.10	1.2	4992.7	4.02
8626	6795186	2122931	4995.4	4995.5	0.10	1.2	4991.4	4.02
8627	6795137	2122938	4994.1	4994.2	0.10	1.2	4990.2	4.02
8628	6795087	2122944	4992.8	4992.9	0.10	1.2	4988.9	4.02
8647	6796013	2122878	4992.4	4992.6	0.13	1.6	4988.5	4.12
8648	6795986	2122881	4993.0	4993.1	0.14	1.7	4989.1	4.04
8649	6795937	2122887	4994.0	4994.1	0.16	2.0	4990.0	4.13
8650	6795887	2122894	4995.0	4995.1	0.11	1.3	4991.0	4.09
8651	6795837	2122900	4996.0	4996.1	0.13	1.6	4992.1	4.04
8652	6795788	2122906	4997.0	4997.1	0.11	1.4	4993.1	4.02
8653	6795738	2122912	4998.0	4998.1	0.12	1.4	4994.0	4.09
8654	6795689	2122919	4999.0	4999.1	0.11	1.3	4995.1	4.03
8655	6795639	2122925	5000.0	5000.1	0.13	1.5	4996.0	4.07
8656	6795589	2122931	5001.0	5001.1	0.12	1.4	4997.1	4.02
8685	6796019	2122927	4992.6	4992.7	0.11	1.3	4988.7	4.03
8686	6795992	2122931	4993.2	4993.3	0.14	1.6	4989.2	4.11
8687	6795943	2122937	4994.2	4994.3	0.13	1.6	4990.2	4.08
8688	6795893	2122943	4995.2	4995.3	0.12	1.4	4991.2	4.04

Appendix A5.
Infiltration and Biointrusion Barrier

Lift Approval Summary
Lift Approval Package
Infiltration and Biointrusion Barrier Buyoff Survey
Durability and Gradation Test Results

Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Summary

September 2014									
Date	Lift ID #	# of Passing Gradation Tests	# of Passing Durability Tests	Quantity Approved (yd ³)	Cumulative Quantity Approved (yd ³)	Average Thickness (ft)	Area (ft. ²)	Notes	
9/17/2014	UBL01140916-00	1	1	6589	6589	0.6	296,489	1	
<p>Total # of Gradation Tests Performed = 1</p> <p>Total # of Durability Tests Performed = 1</p> <p>Total # of Gradation Tests Included with Lift Approval Package = 1</p> <p>Total # of Durability Tests Included with Lift Approval Package = 1</p> <p>Total Quantity Approved (yd³) = 1</p> <p>Quantity per Gradation Test (yd³) = 1</p> <p>Quantity per Durability Test (yd³) = 296,489</p> <p>Total Average Thickness (ft.) = 296,489</p>									

1. To access durability and gradation test information, please view lift packets.

Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package

LIFT APPROVAL FORM

PROJECT:	Moab UMTRA	OTHER:	
NW CORNER		DATE:	9/12/2014

P 1	6795203 N. 2122792 E.		
EW:	268	X	0.500 = 134
NS:	1122	X	0.752 = 844
P 2	6795843 N. 2122702 E.		
EW:	268	X	0.164 = 44
NS:	1122	X	0.182 = 204
P 3	6795558 N. 2122758 E.		
EW:	268	X	0.373 = 100
NS:	1122	X	0.436 = 489
P 4	6795558 N. 2122758 E.		
EW:		X	=
NS:		X	=
P 5	6795558 N. 2122758 E.		
EW:		X	=
NS:		X	=
Page 2 attached:	Y		N

IDENTIFY LOTS ABOVE

LIFT ID:	UBL01140916-00	NW CORNER:	6796029 N. 2122658 E.
Uncompacted Thickness:	N/A	Compacted Thickness:	0.6
Debris Insp. By:	N/A	Date:	N/A
Time:	N/A		
NW CORNER of debris placement:	N/A	EW Dimension:	N/A
		NS Dimension:	N/A
Lift Area (ft ²):	296,489	Lift Volume (yd ³):	6,589

Comments: QC verified that final grade and thickness of the underlying Radon Barrier had been bought off and that the final surface of Radon Barrier was satisfactory prior to placement of Infiltration and Biointrusion Barrier material. QC verified that the aggregate used was the correct material source. QC verified that the rock layer was spread to a near uniform thickness of >0.5' with satisfactory results. QC verified that the material had an even blend. QC verified that the underlying Radon Barrier was not damaged during placement operations. QC verified that a minimum a two passes were performed with a smooth-drum roller over the entire lift area during compaction efforts. QC verified that samples collected for Sieve Analysis were in accordance with the current version of ASTM D75, and project specifications. On the above lift map, the dotted area is 70' from the east edge. This is documented due to in-place testing frequency every 5,000 yd³. The 70' area will be include in the next sample area when determining radon location. See UBR01 for more random location sampling information. On 9/12/2014 QC observed placement. On 9/13/2014 QC observed placement. On 9/15/2014 QC observed placement. Operations finish placement today. On 9/16/2014 the three random locations were sampled for in-place gradation testing. On 9/17/2014 results from the in-place sampling was satisfactory.

Attached Forms: Grid Slope Compaction Macro Print Screen Moisture/ Density

KEYING IN NOTES: N E S W Satisfactory MOISTURE/ DENSITY TESTS ID # (S): N/A

LIFT APPROVED BY: Mitch Hogan / *Mitch Hogan* DATE: 9/17/2014 TIME: 1646

QA/QC APPROVAL: *[Signature]* DATE: 10/08/2014

Density Testing
DOE-EM/GJRAC1783
Rev. 1

QC-F-001
File index No. 43.8.2
Page 1 of 11 *4-11/14*

Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (continued)

Slope Elevation Survey						
Average lift thickness=		0.6	Bounding Box	Northing	Easting	
Grid Size=		N/A	Lower Left	N		
Lift ID:		UBL01140916-00	Upper Right	A		
Last Lift Elevations			Lift Approval Elevations			Lift Thickness
Northing	Easting	Elevation	Northing	Easting	Elevation	Thickness
6795099	2122640	4993.062	6795099	2122640	4993.637	0.6
6795050	2122646	4991.772	6795050	2122646	4992.366	0.6
6795651	2122621	4998.056	6795651	2122621	4998.653	0.6
6795601	2122627	4998.997	6795601	2122627	4999.591	0.6
6795552	2122633	4999.997	6795552	2122633	5000.663	0.7
6795502	2122640	5001.036	6795502	2122640	5001.628	0.6
6795453	2122646	5001.971	6795453	2122646	5002.544	0.6
6795403	2122652	5000.745	6795403	2122652	5001.415	0.7
6795353	2122658	4999.492	6795353	2122658	5000.163	0.7
6795304	2122665	4998.228	6795304	2122665	4998.849	0.6
6795254	2122671	4996.963	6795254	2122671	4997.56	0.6
6795205	2122677	4995.735	6795205	2122677	4996.325	0.6
6795155	2122683	4994.490	6795155	2122683	4995.11	0.6
6795105	2122690	4993.218	6795105	2122690	4993.817	0.6
6795056	2122696	4991.994	6795056	2122696	4992.543	0.5
6795006	2122702	4990.762	6795006	2122702	4991.307	0.5
6795905	2122639	4993.159	6795905	2122639	4993.802	0.6
6795856	2122646	4994.162	6795856	2122646	4994.803	0.6
6795806	2122652	4995.208	6795806	2122652	4995.765	0.6
6795757	2122658	4996.209	6795757	2122658	4996.805	0.6
6795707	2122664	4997.244	6795707	2122664	4997.787	0.5
6795657	2122670	4998.174	6795657	2122670	4998.82	0.6
6795608	2122677	4999.201	6795608	2122677	4999.768	0.6
6795558	2122683	5000.257	6795558	2122683	5000.769	0.5
6795509	2122689	5001.228	6795509	2122689	5001.766	0.5
6795459	2122695	5002.199	6795459	2122695	5002.748	0.5
6795409	2122702	5000.948	6795409	2122702	5001.48	0.5
6795360	2122708	4999.710	6795360	2122708	5000.326	0.6
6795310	2122714	4998.439	6795310	2122714	4999.021	0.6
6795261	2122720	4997.211	6795261	2122720	4997.77	0.6
6795211	2122727	4995.942	6795211	2122727	4996.555	0.6
6795161	2122733	4994.680	6795161	2122733	4995.313	0.6
6795112	2122739	4993.402	6795112	2122739	4994.022	0.6
6795062	2122745	4992.143	6795062	2122745	4992.799	0.7
6795012	2122752	4990.920	6795012	2122752	4991.473	0.6
6795988	2122679	4991.795	6795988	2122679	4992.495	0.7
6795961	2122683	4992.390	6795961	2122683	4992.988	0.6
6795912	2122689	4993.402	6795912	2122689	4993.964	0.6
6795862	2122695	4994.372	6795862	2122695	4994.962	0.6
6795812	2122701	4995.386	6795812	2122701	4995.906	0.5
6795763	2122708	4996.376	6795763	2122708	4996.947	0.6
6795713	2122714	4997.364	6795713	2122714	4997.961	0.6
6795664	2122720	4998.423	6795664	2122720	4998.96	0.5
6795614	2122726	4999.411	6795614	2122726	4999.935	0.5
6795564	2122733	5000.433	6795564	2122733	5000.951	0.5
6795515	2122739	5001.348	6795515	2122739	5001.917	0.6
6795465	2122745	5002.355	6795465	2122745	5002.902	0.5

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Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package (continued)


CENTRAL UTAH TESTING & INSPECTION

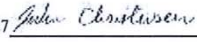
SIEVE ANALYSIS: AGGREGATES (ASTM C136-CURRENT AASHTO T27-CURRENT)
MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-CURRENT AASHTO T11-CURRENT)

CLIENT: PORTAGE _____ JOB#: 1467 _____ DATE: 09/17/14 _____
 PROJECT: MOAB UMTRA _____
 SAMPLE LOCATION: UBL01 IN-PLACE SAMPLE _____
 MATERIAL TYPE: COVER BIOBARRIER _____
 TESTED BY: JC _____ SAMPLED BY: CLIENT _____ LAB #: 8061 _____

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
8 in. (200mm)		0.0	100.0	
6 in. (150mm)		0.0	100.0	
4 in. (100mm)		0.0	100.0	100
3 in. (75mm)	3532.2	1.2	98.8	
2 in. (50mm)	59123.7	20.8	78.0	50 - 100
1 1/2 in. (37.5mm)	54045.6	19.0	59.0	40 - 60
1 in. (25mm)	60156.1	21.1	37.9	20 - 40
3/4 in. (19mm)	31127.4	10.9	26.9	
1/2 in. (12.5mm)	1541.1	7.7	19.2	15 - 25
3/8 in. (9.5mm)	680.8	3.4	15.8	
# 4 (4.75mm)	834.8	4.2	11.6	10 - 20
# 8 (2.36mm)	404.5	2.0	9.6	5 - 15
# 16 (1.18mm)	278.8	1.4	8.2	5 - 10
# 30 (600um)	196.7	1.0	7.2	
# 50 (300um)	207.8	1.0	6.2	
#100 (150um)	228.7	1.1	5.1	
#200 (75um)	245.1	1.2	3.8	0 - 5
-#200 (-75um)	32.5			

Total Sample Aggregate Weight: 284624.2
 - 3/4" Aggregate Weight: 5385.9 - 3/4" After Wash Weight: 4650.8

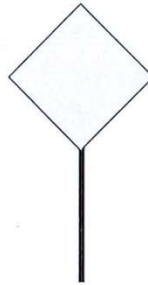
REMARKS:  10/08/2014

I certify that this test was performed in accordance with the current version(s) of ASTM C117 & C136/AASHTO T11 & T27 

909 W FARMERS FREEWAY GUNNISON, UT 84634 (435) 201-1533 FAX (866) 469-2718

10/14/14
By [Signature]

**Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)**



CENTRAL UTAH TESTING & INSPECTION



909 West Farmer's Freeway
Gunnison, Utah 84634
Phone (435) 201-1533 Fax (866) 469-2718

November 19, 2014

Portage, Inc.
1075 South Utah Ave., Suite 200
Idaho Falls, Idaho 83402

Project: Moab UMTRA
Material: Cover Biobarrier
Rock Source: Freemont Junction
Sample/Test Date: 09/17/2014
Sample Location: UBL01 In-Place Sample

ROCK SCORE

Criteria	Avg. Test Value	Rock Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.664	8.3	9	74.7	90
Absorption, %	0.70	6.8	2	13.6	20
Sodium Sulfate Loss, %	0.73	10.0	11	110.0	110
LA Abrasion, %	7.1	6.7	1	6.7	10
Schmidt Hammer	68	9.6	3	28.8	30
Total Score				233.8	260
Rock Score					89.9

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**Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)**

TEST SUMMARY

Laboratory Test	Test Method	Average Test Value
Specific Gravity, Oven Dry	ASTM C-127	2.664
Specific Gravity, SSD	ASTM C-127	2.683
Specific Gravity, Apparent	ASTM C-127	2.715
Absorption, %	ASTM C-127	0.70
Sodium Sulfate Loss, %	ASTM C-88, Sodium Sulfate, 5 Cycles	0.73
LA Abrasion Loss, %	ASTM C-131, Grading A, 100 Revolutions	7.1
Schmidt Hammer, Rebound #	ISRM Method	68

It has been a pleasure to have been of service. If any additional information is needed, please feel free to contact our office at (435) 201-1533.

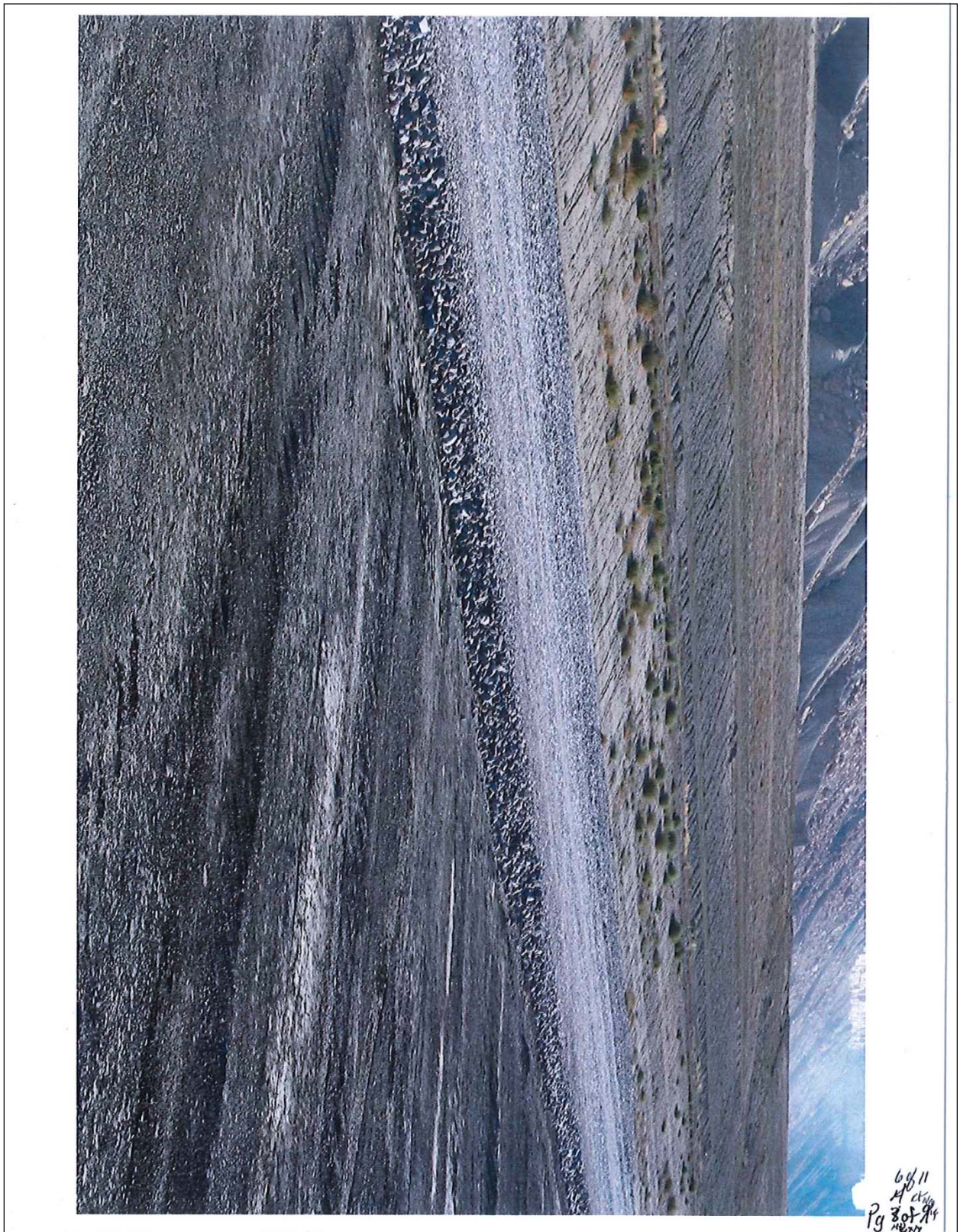
Sincerely,



John Christensen
Laboratory Manager

A5 of 11

Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)



Appendix A5. Infiltration and Biointrusion Barrier Lift Approval Package
(continued)



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11/11
Pg 8 of 9
11/11/14

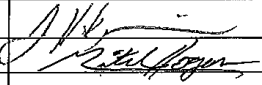
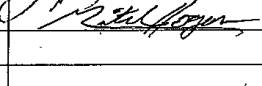
Appendix A5. Infiltration and Biointrusion Barrier Buyoff Survey

Moab UMTRA Project Biointrusion Barrier Buyoff Form

CLIENT: Department of Energy
PROJECT: Moab UMTRA Project
DATE: 9-17-14

In signing this document, the signatory agrees that the lift is complete and meets both the project specifications and RAIP requirements.

LIFT AREA	LIFT AREA
UBL01	

APPROVER NAME/TITLE	SIGNATURE	SIGN DATE
Kirk Briscoe/ Operations Manager		9-17-14
Mitch Hogan/ QA/QC Representative		9-17-14

COMMENTS		

Appendix A5. Infiltration and Biointrusion Barrier Buyoff Survey (continued)

Biointrusion Buyoff Survey									
Lift Area Buyoff ID:			UBL01			Date: 9/17/2014			
Point #	Northing	Easting	Surveyed Elevation	Pre Installation Elevation	Design Elevation	Thickness in inches	Difference in feet	Difference in inches	
8399	6795099	2122640	4993.637	4993.062	4993.462	6.9	0.6	6.9	
8400	6795050	2122646	4992.366	4991.772	4992.172	7.1	0.6	7.1	
8426	6795651	2122621	4998.653	4998.056	4998.456	7.2	0.6	7.2	
8427	6795601	2122627	4999.591	4998.997	4999.397	7.1	0.6	7.1	
8428	6795552	2122633	5000.663	4999.997	5000.397	8.0	0.7	8.0	
8429	6795502	2122640	5001.628	5001.036	5001.44	7.1	0.6	7.1	
8430	6795453	2122646	5002.544	5001.971	5002.37	8.9	0.6	8.9	
8431	6795403	2122652	5001.415	5000.745	5001.15	8.0	0.7	8.0	
8432	6795353	2122658	5000.163	4999.492	4999.89	8.1	0.7	8.1	
8433	6795304	2122665	4998.849	4998.228	4998.63	7.5	0.6	7.5	
8434	6795254	2122671	4997.56	4996.963	4997.36	7.2	0.6	7.2	
8435	6795205	2122677	4996.325	4995.735	4996.14	7.1	0.6	7.1	
8436	6795155	2122683	4995.11	4994.490	4994.89	7.4	0.6	7.4	
8437	6795105	2122690	4993.817	4993.218	4993.62	7.2	0.6	7.2	
8438	6795055	2122696	4992.543	4991.994	4992.39	6.6	0.5	6.6	
8439	6795005	2122702	4991.307	4990.762	4991.11	6.5	0.5	6.5	
8459	6795005	2122639	4993.802	4993.159	4993.56	7.7	0.6	7.7	
8460	6795858	2122646	4994.803	4994.162	4994.56	7.7	0.6	7.7	
8461	6795806	2122652	4995.765	4995.208	4995.61	6.7	0.6	6.7	
8462	6795757	2122658	4996.805	4996.209	4996.61	7.2	0.6	7.2	
8463	6795707	2122664	4997.787	4997.244	4997.64	6.5	0.5	6.5	
8464	6795657	2122670	4998.82	4998.174	4998.55	7.8	0.6	7.8	
8465	6795608	2122677	4999.768	4999.201	4999.55	6.8	0.6	6.8	
8466	6795558	2122683	5000.769	5000.257	5000.55	6.1	0.5	6.1	
8467	6795509	2122689	5001.766	5001.228	5001.55	6.5	0.5	6.5	
8468	6795459	2122695	5002.748	5002.199	5002.54	6.6	0.5	6.6	
8469	6795409	2122702	5001.48	5000.948	5001.29	6.4	0.5	6.4	
8470	6795360	2122708	5000.326	4999.710	5000.04	7.4	0.6	7.4	
8471	6795310	2122714	4999.021	4998.439	4998.84	7.0	0.6	7.0	
8472	6795261	2122720	4997.77	4997.211	4997.61	6.7	0.6	6.7	
8473	6795211	2122727	4996.555	4995.942	4996.34	7.4	0.6	7.4	
8474	6795161	2122733	4995.313	4994.680	4995.08	7.6	0.6	7.6	
8475	6795112	2122739	4994.022	4993.402	4993.80	7.4	0.6	7.4	
8476	6795062	2122745	4992.799	4992.143	4992.54	7.9	0.7	7.9	
8477	6795012	2122752	4991.473	4990.920	4991.29	6.6	0.6	6.6	
8495	6795968	2122679	4992.495	4991.795	4992.20	8.4	0.7	8.4	
8496	6795918	2122683	4992.988	4992.390	4992.79	7.2	0.6	7.2	
8497	6795912	2122689	4993.964	4993.402	4993.73	6.7	0.6	6.7	
8498	6795862	2122695	4994.962	4994.372	4994.73	7.1	0.6	7.1	
8499	6795812	2122701	4995.906	4995.386	4995.73	6.2	0.5	6.2	
8500	6795763	2122708	4996.947	4996.376	4996.73	6.9	0.6	6.9	
8501	6795713	2122714	4997.961	4997.364	4997.73	7.2	0.6	7.2	
8502	6795664	2122720	4998.96	4998.423	4998.73	6.4	0.5	6.4	
8503	6795614	2122726	4999.935	4999.411	4999.73	6.3	0.5	6.3	
8504	6795564	2122733	5000.951	5000.433	5000.73	6.2	0.5	6.2	
8505	6795515	2122739	5001.917	5001.348	5001.73	6.8	0.6	6.8	
8506	6795465	2122745	5002.902	5002.355	5002.73	6.6	0.5	6.6	
8507	6795416	2122751	5001.691	5001.092	5001.48	7.2	0.6	7.2	
8508	6795366	2122758	5000.378	4999.851	5000.23	6.3	0.5	6.3	
8509	6795316	2122764	4999.179	4998.585	4998.99	7.1	0.6	7.1	
8510	6795267	2122770	4997.997	4997.382	4997.76	7.4	0.6	7.4	
8511	6795217	2122776	4996.765	4996.248	4996.65	6.2	0.5	6.2	
8512	6795168	2122782	4995.486	4994.872	4995.27	7.4	0.6	7.4	
8513	6795118	2122789	4994.19	4993.633	4994.03	6.2	0.5	6.2	
8514	6795068	2122795	4992.945	4992.443	4992.84	6.0	0.5	6.0	
8515	6795019	2122801	4991.737	4991.198	4991.48	6.5	0.5	6.5	
8516	6794969	2122807	4990.493	4989.934	4990.23	6.7	0.6	6.7	
8533	6795994	2122729	4992.537	4991.991	4992.38	6.6	0.5	6.6	
8534	6795944	2122732	4993.173	4992.529	4992.92	7.7	0.6	7.7	
8535	6795894	2122738	4994.055	4993.564	4993.92	6.0	0.5	6.0	
8536	6795844	2122745	4994.955	4994.435	4994.92	6.1	0.5	6.1	
8537	6795794	2122751	4995.855	4995.325	4995.82	6.6	0.6	6.6	
8538	6795744	2122757	4996.755	4996.225	4996.92	7.1	0.6	7.1	
8539	6795694	2122763	4997.655	4997.125	4997.92	7.1	0.6	7.1	
8540	6795644	2122770	4998.555	4998.025	4998.92	6.5	0.5	6.5	
8541	6795594	2122776	4999.455	4998.925	4999.92	6.6	0.5	6.6	
8542	6795544	2122782	5000.355	5000.827	5000.92	6.3	0.5	6.3	
8543	6795494	2122788	5001.255	5001.558	5001.92	6.8	0.6	6.8	
8544	6795444	2122795	5002.155	5002.531	5002.92	7.5	0.6	7.5	
8545	6795394	2122801	5003.055	5003.322	5003.67	6.5	0.5	6.5	
8546	6795344	2122807	5003.955	5004.096	5004.42	6.2	0.5	6.2	
8547	6795294	2122813	4994.855	4994.868	4995.27	6.0	0.5	6.0	
8548	6795244	2122820	4995.755	4995.780	4996.18	7.0	0.6	7.0	
8549	6795194	2122826	4996.655	4996.680	4997.08	7.1	0.6	7.1	
8550	6795144	2122832	4997.555	4997.580	4997.98	7.1	0.6	7.1	
8551	6795094	2122838	4998.455	4998.480	4998.88	6.6	0.6	6.6	
8552	6795044	2122845	4999.355	4999.380	4999.78	6.7	0.6	6.7	
8553	6795025	2122851	4999.855	4999.880	4999.92	6.1	0.5	6.1	

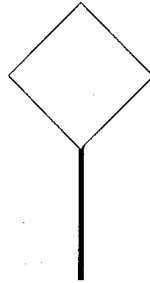
Appendix A5. Infiltration and Biointrusion Barrier Buyoff Survey (continued)

8554	6794975	2122857	4990.632	4990.029	4990.42	7.2	0.6	7.2
8571	6798001	2122779	4992.807	4992.211	4992.58	7.2	0.6	7.2
8572	6795974	2122782	4993.325	4993.717	4993.10	7.3	0.6	7.3
8573	6795924	2122788	4994.31	4993.778	4994.10	6.4	0.5	6.4
8574	6795875	2122794	4995.293	4994.771	4995.10	6.2	0.5	6.2
8575	6795925	2122801	4996.293	4995.779	4996.10	6.2	0.5	6.2
8576	6795775	2122807	4997.333	4998.727	4997.10	7.3	0.6	7.3
8577	6795726	2122813	4998.333	4997.730	4998.10	7.2	0.6	7.2
8578	6795678	2122819	4999.316	4998.749	4999.10	6.8	0.6	6.8
8579	6795628	2122826	5000.338	4999.766	5000.17	6.9	0.6	6.9
8580	6795577	2122832	5001.282	5000.762	5001.16	6.2	0.5	6.2
8581	6795527	2122838	5002.362	5001.762	5002.16	7.2	0.6	7.2
8582	6795478	2122844	5003.211	5002.702	5003.10	6.1	0.5	6.1
8583	6795428	2122851	5002.085	5001.517	5001.92	6.8	0.6	6.8
8584	6795378	2122857	5000.881	5000.301	5000.70	6.7	0.6	6.7
8585	6795329	2122863	4999.509	4998.981	4999.38	6.3	0.5	6.3
8586	6795279	2122869	4998.333	4997.811	4998.21	6.3	0.5	6.3
8587	6795230	2122875	4997.077	4996.501	4996.90	6.9	0.6	6.9
8588	6795180	2122882	4995.836	4995.282	4995.68	6.6	0.6	6.6
8589	6795130	2122888	4994.582	4993.977	4994.38	7.3	0.6	7.3
8590	6795081	2122894	4993.327	4992.817	4993.22	6.1	0.5	6.1
8591	6795031	2122900	4992.093	4991.452	4991.85	7.7	0.6	7.7
8592	6794982	2122907	4990.858	4990.312	4990.60	6.6	0.5	6.6
8609	6796007	2122828	4992.969	4992.384	4992.75	7.0	0.6	7.0
8610	6795980	2122832	4993.547	4992.930	4993.29	7.4	0.6	7.4
8611	6795930	2122838	4994.505	4993.971	4994.29	6.4	0.5	6.4
8612	6795881	2122844	4995.453	4994.934	4995.29	6.2	0.5	6.2
8613	6795831	2122850	4996.496	4995.968	4996.29	6.3	0.5	6.3
8614	6795782	2122857	4997.541	4996.903	4997.29	7.7	0.6	7.7
8615	6795732	2122863	4998.567	4997.974	4998.29	7.1	0.6	7.1
8616	6795682	2122869	4999.613	4998.973	4999.29	7.7	0.6	7.7
8617	6795633	2122875	5000.553	4999.903	5000.29	7.8	0.6	7.8
8618	6795583	2122881	5001.467	5000.950	5001.29	6.2	0.5	6.2
8619	6795534	2122888	5002.504	5001.986	5002.29	6.2	0.5	6.2
8620	6795484	2122894	5003.465	5002.952	5003.29	6.2	0.5	6.2
8621	6795434	2122900	5002.246	5001.746	5002.04	6.0	0.5	6.0
8622	6795385	2122906	5000.93	5000.413	5000.79	6.2	0.5	6.2
8623	6795335	2122913	4999.745	4999.210	4999.61	6.4	0.5	6.4
8647	6798013	2122878	4993.221	4992.573	4992.94	7.8	0.6	7.8
8648	6795986	2122881	4993.692	4993.124	4993.48	6.8	0.6	6.8
8649	6795937	2122887	4994.67	4994.144	4994.48	6.3	0.5	6.3
8650	6795887	2122894	4995.635	4995.088	4995.48	7.2	0.6	7.2
8651	6795837	2122900	4996.693	4996.110	4996.48	7.0	0.6	7.0
8652	6795788	2122906	4997.683	4997.094	4997.48	7.1	0.6	7.1

Comments: QC performed a visual inspection of the final surface with satisfactory results. Visual inspection notes: The area was free of humping, thickened edges and defects. The layer uniform thickness was satisfactory see above survey results for layer thickness.

Approval Date: 9/17/2014 Total Square Feet: 296,499
 North West Corner: 6796029 N. 2122858 E.
 QC Signature: Mitch Hogan/ *[Signature]* Reviewed By: Kathy Turvy/ *[Signature]*

Appendix A5. Infiltration and Biointrusion Barrier Durability and Gradation Test Results



CENTRAL UTAH TESTING & INSPECTION



909 West Farmer's Freeway
Gunnison, Utah 84634
Phone (435) 201-1533 Fax (866) 469-2718

November 19, 2014

Portage, Inc.
1075 South Utah Ave., Suite 200
Idaho Falls, Idaho 83402

Project: Moab UMTRA
Material: Cover Biobarrier
Rock Source: Freemont Junction
Sample/Test Date: 09/03/2014
Sample Location: Stockpile Before Placement

ROCK SCORE

Criteria	Avg. Test Value	Rock Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.636	7.7	9	69.3	90
Absorption, %	0.77	6.4	2	12.8	20
Sodium Sulfate Loss, %	0.84	10.0	11	110.0	110
LA Abrasion, %	6.5	7.1	1	7.1	10
Schmidt Hammer	51	6.6	3	19.8	30
Total Score				219.0	260
Rock Score					84.2

**Appendix A5. Infiltration and Biointrusion Barrier
Durability and Gradation Test Results (continued)**

TEST SUMMARY

Laboratory Test	Test Method	Average Test Value
Specific Gravity, Oven Dry	ASTM C-127	2.636
Specific Gravity, SSD	ASTM C-127	2.656
Specific Gravity, Apparent	ASTM C-127	2.691
Absorption, %	ASTM C-127	0.77
Sodium Sulfate Loss, %	ASTM C-88, Sodium Sulfate, 5 Cycles	0.84
LA Abrasion Loss, %	ASTM C-131, Grading A, 100 Revolutions	6.5
Schmidt Hammer, Rebound #	ISRM Method	51

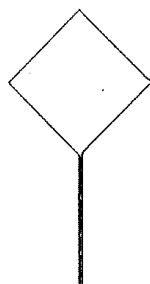
It has been a pleasure to have been of service. If any additional information is needed, please feel free to contact our office at (435) 201-1533.

Sincerely,



John Christensen
Laboratory Manager

Appendix A5. Infiltration and Biointrusion Barrier Durability and Gradation Test Results *(continued)*



CENTRAL UTAH TESTING & INSPECTION



909 West Farmer's Freeway
Gunnison, Utah 84634
Phone (435) 201-1533 Fax (866) 469-2718

November 19, 2014

Portage, Inc.
1075 South Utah Ave., Suite 200
Idaho Falls, Idaho 83402

Project: Moab UMTRA
Material: Cover Biobarrier
Rock Source: Freemont Junction
Sample/Test Date: 09/17/2014
Sample Location: UBL01 In-Place Sample

ROCK SCORE

Criteria	Avg. Test Value	Rock Score	Weight	Score & Weight	Max Score
Mineral Type			Igneous		
Specific Gravity	2.664	8.3	9	74.7	90
Absorption, %	0.70	6.8	2	13.6	20
Sodium Sulfate Loss, %	0.73	10.0	11	110.0	110
LA Abrasion, %	7.1	6.7	1	6.7	10
Schmidt Hammer	68	9.6	3	28.8	30
Total Score				233.8	260
Rock Score					89.9

Pg 4 of 11

**Appendix A5. Infiltration and Biointrusion Barrier
Durability and Gradation Test Results (*continued*)**

TEST SUMMARY

Laboratory Test	Test Method	Average Test Value
Specific Gravity, Oven Dry	ASTM C-127	2.664
Specific Gravity, SSD	ASTM C-127	2.683
Specific Gravity, Apparent	ASTM C-127	2.715
Absorption, %	ASTM C-127	0.70
Sodium Sulfate Loss, %	ASTM C-88, Sodium Sulfate, 5 Cycles	0.73
LA Abrasion Loss, %	ASTM C-131, Grading A, 100 Revolutions	7.1
Schmidt Hammer, Rebound #	ISRM Method	68

It has been a pleasure to have been of service. If any additional information is needed, please feel free to contact our office at (435) 201-1533.

Sincerely,



John Christensen
Laboratory Manager

19 5/11

Appendix A5. Infiltration and Biointrusion Barrier Durability and Gradation Test Results *(continued)*

CENTRAL UTAH TESTING & INSPECTION

SIEVE ANALYSIS: AGGREGATES (ASTM C136-CURRENT AASHTO T27-CURRENT) MATERIALS FINER THAN No. 200 SCREEN (ASTM C117-CURRENT AASHTO T11-CURRENT)

CLIENT: NIELSON CONSTRUCTION JOB#: 1357 DATE: 09/03/14
 PROJECT: MISC. QC
 SAMPLE LOCATION: CLIENT SAMPLED
 MATERIAL TYPE: COVER BIOBARRIER
 TESTED BY: JC SAMPLED BY: CLIENT LAB #: 8006

Sieve Size	Weight Retained	Percent Retained	Percent Passing	Band/Target
8 in. (200mm)		0.0	100.0	
6 in. (150mm)		0.0	100.0	
4 in. (100mm)		0.0	100.0	100
3 in. (75mm)	7036.7	3.0	97.0	
2 in. (50mm)	58708.6	24.9	72.1	50 - 100
1 1/2 in. (37.5mm)	42342.5	18.0	54.1	40 - 60
1 in. (25mm)	39769.1	16.9	37.3	20 - 40
3/4 in. (19mm)	19312.6	8.2	29.1	
1/2 in. (12.5mm)	1817.6	9.9	19.1	15 - 25
3/8 in. (9.5mm)	787.9	4.3	14.8	
# 4 (4.75mm)	721.0	3.9	10.9	10 - 20
# 8 (2.36mm)	319.1	1.7	9.1	5 - 15
# 16 (1.18mm)	196.6	1.1	8.0	5 - 10
# 30 (600um)	163.3	0.9	7.2	
# 50 (300um)	210.7	1.2	6.0	
#100 (150um)	222.6	1.2	4.8	
#200 (75um)	210.9	1.2	3.6	0 - 5
-#200 (-75um)	59.6			

Total Sample Aggregate Weight: 235628.9
 - 3/4" Aggregate Weight: 5313.7 - 3/4" After Wash Weight: 4709.3

REMARKS: _____

I certify that this test was performed in accordance with the current version(s) of ASTM C117 & C136/AASHTO T11 & T27 XXXXXXXXXX

909 W FARMERS FREEWAY GUNNISON, UT 84634 (435) 201-1533 FAX (866) 469-2718

**Appendix A6.
Frost Protection**

**Standard Proctor Test Results Summary
Lift Approval Summary
Lift Approval Package**

Appendix A6. Frost Protection Standard Proctor Test Results Summary

Proctor ID #	Date Sampled	Date Approved	Maximum Dry Density (lb/ft³)	Optimum Moisture Content (%)	Soils Description
Frost Protection # 1 (2014)	9/8/2014	9/12/2014	119.0	13.0	Lt Brown Clay
Frost Protection # 2 (2014)	9/19/2014	9/22/2014	112.5	15.5	Lt Brown Clay
Frost Protection # 3 (2014)	9/19/2014	9/26/2014	115.5	14.0	Brown Clay

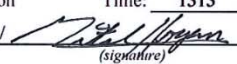

Appendix A6. Frost Protection Lift Approval Summary

September 2014											
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd ³)	Cumulative Quantity Approved (yd ³)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)	
9/19/14	UFL01140919-00	2	3598	3,598	N/A	0.6	FP#1(2014)	2	0	95.5	
9/19/14	UFL10140919-00	2	3043	6,641	N/A	0.6	FP#1(2014)	2	0	91.3	
9/25/14	UFL01140924-00	2	4198	10,839	N/A	0.7	FP#1(2014)	2	0	93.7	
9/25/14	UFL10140924-00	2	3550	14,389	N/A	0.7	FP#1(2014)	2	0	94.8	
<p>Average CAES Screen Passing Pixels (%) = N/A</p> <p>Total Quantity Approved (yd³) = 14,389</p> <p>Total # of Nuclear Density Guage Tests = 8</p> <p>Total # of Moisture Tests = 8</p> <p>Quantity per Moisture Test (yd³) = 1,799</p> <p>Total Average Thickness (ft.) = 0.7</p>											

Appendix A6. Frost Protection Lift Approval Package (continued)

FIELD DENSITY TEST															
PROJECT: Moab UMTRA Project	OTHER: _____														
LIFT IDENTIFICATION: <u>UFL01140924-00</u>	DATE: <u>9/25/2014</u>														
TEST ID NUMBER(S): _____	# <u>1</u>														
TEST LOCATION: <u>P2</u>	TEST METHOD: <u>N/A</u> D1556 <u>x</u> D6938														
<p style="text-align: center;">ASTM D6938 (DENSITY DETERMINATION)</p> <p>Make/Model <u>Troxler 3430</u> Gauge Serial # <u>28098</u> Last Calibration Date: <u>2/14/14</u> Daily Standard Counts: <i>Off-Cell Standard</i></p> <p>Density <u>2275</u> Moisture <u>680</u> <i>Method A (Direct Transmission)</i> Depth Setting <u>8</u> (inches) Count Time <u>1</u> (minutes) Moisture Count <u>172</u> Density Count <u>1148</u></p> <p>Wet Density (ρ_m) <u>130.1</u> (lbs/ft³) Dry Density <u>115.8</u> (lbs/ft³) Moisture Density <u>14.4</u> (lbs/ft³) Moisture Fraction <u>12.4</u> (%)</p>	<p style="text-align: center;">ASTM D1556 (DENSITY DETERMINATION)</p> <p>Testing Apparatus _____ Calibrated Vol. (lbs/ft³) _____ Bulk Density of sand (ρ_s) _____ g/cm³ _____ lbs/ft³ Mass of Sand to Fill Cone & Plate (M_2) _____ g</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Mass of bottle & cone before filling cone, plate & hole</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of bottle & cone after filling cone, plate & hole</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of sand to fill cone, plate, & hole (M_1)</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of sand to fill hole</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of wet soil in container</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of wet soil (M_3)</td><td style="text-align: right;">g</td></tr> </table> <p>Test Hole Volume $V = (M_1 - M_2) / \rho_s$ _____ cm³ Dry Mass of soil $M_d = 100 M_3 / (w + 100)$ _____ g Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft³ Dry Density $\rho_d = M_d / V$ _____ g/cm³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft³</p>	Mass of bottle & cone before filling cone, plate & hole	g	Mass of bottle & cone after filling cone, plate & hole	g	Mass of sand to fill cone, plate, & hole (M_1)	g	Mass of sand to fill hole	g	Mass of wet soil in container	g	Mass of container	g	Mass of wet soil (M_3)	g
Mass of bottle & cone before filling cone, plate & hole	g														
Mass of bottle & cone after filling cone, plate & hole	g														
Mass of sand to fill cone, plate, & hole (M_1)	g														
Mass of sand to fill hole	g														
Mass of wet soil in container	g														
Mass of container	g														
Mass of wet soil (M_3)	g														
<p style="text-align: center;">MOISTURE DETERMINATION</p> <p>_____ ASTM D2216 @ 110° C or _____ ASTM D4643</p> <p>Container ID _____</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Mass of container & wet specimen (M_{cms})</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container & dry specimen ($M_{c ds}$)</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container (M_c)</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$</td><td style="text-align: right;">g</td></tr> <tr><td>Moisture content (w) $w = (M_w / M_s) \times 100$</td><td style="text-align: right; background-color: yellow;">0.0 %</td></tr> </table>	Mass of container & wet specimen (M_{cms})	g	Mass of container & dry specimen ($M_{c ds}$)	g	Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$	g	Mass of container (M_c)	g	Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$	g	Moisture content (w) $w = (M_w / M_s) \times 100$	0.0 %	<p>Soil Description: <u>Lt Brown Clay</u> # <u>118-2014</u> Proctor ID: <u>Frost Protection #12014</u> Standard Proctor (ASTM D698)</p> <p>Maximum Dry Density ($\gamma_{d max}$) <u>119.0</u> (lbs/ft³) Optimum Moisture (w_{opt}) <u>13.0</u> (%) Required Moisture: <u>8.0</u> % to <u>18.0</u> % Required Percent Compaction: <u>90.0</u> (%)</p>		
Mass of container & wet specimen (M_{cms})	g														
Mass of container & dry specimen ($M_{c ds}$)	g														
Mass of water (M_w) $M_w = M_{cms} - M_{c ds}$	g														
Mass of container (M_c)	g														
Mass of dry specimen (M_s) $M_s = M_{c ds} - M_c$	g														
Moisture content (w) $w = (M_w / M_s) \times 100$	0.0 %														
<p>Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$) $\rho_d = (100 \times \text{N/A}) / (100 + \text{N/A}) = 115.8$ lbs/ft³ <small>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_w)</small></p> <p>Percent Compaction = $\rho_d / \gamma_{d max} \times 100$ $115.8 / 119.0 \times 100 = 97.3$ %</p>	<p>TEST RESULTS:</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="width: 50%;"><input checked="" type="checkbox"/> Pass</td><td style="width: 50%;">Date: <u>9/25/14</u></td></tr> <tr><td><input type="checkbox"/> Failed Moisture</td><td></td></tr> <tr><td><input type="checkbox"/> Failed Compaction</td><td>Time: <u>1304</u></td></tr> </table> <p>By: <u>Beachem Bosh</u> (print) (signature)</p>	<input checked="" type="checkbox"/> Pass	Date: <u>9/25/14</u>	<input type="checkbox"/> Failed Moisture		<input type="checkbox"/> Failed Compaction	Time: <u>1304</u>								
<input checked="" type="checkbox"/> Pass	Date: <u>9/25/14</u>														
<input type="checkbox"/> Failed Moisture															
<input type="checkbox"/> Failed Compaction	Time: <u>1304</u>														
<p> (print) <u>11/18/2014</u> (DATE)</p>	<p style="text-align: right;">QC-F-002 File Index No. 43.8.2 Page <u>3</u> of <u>7</u></p>														

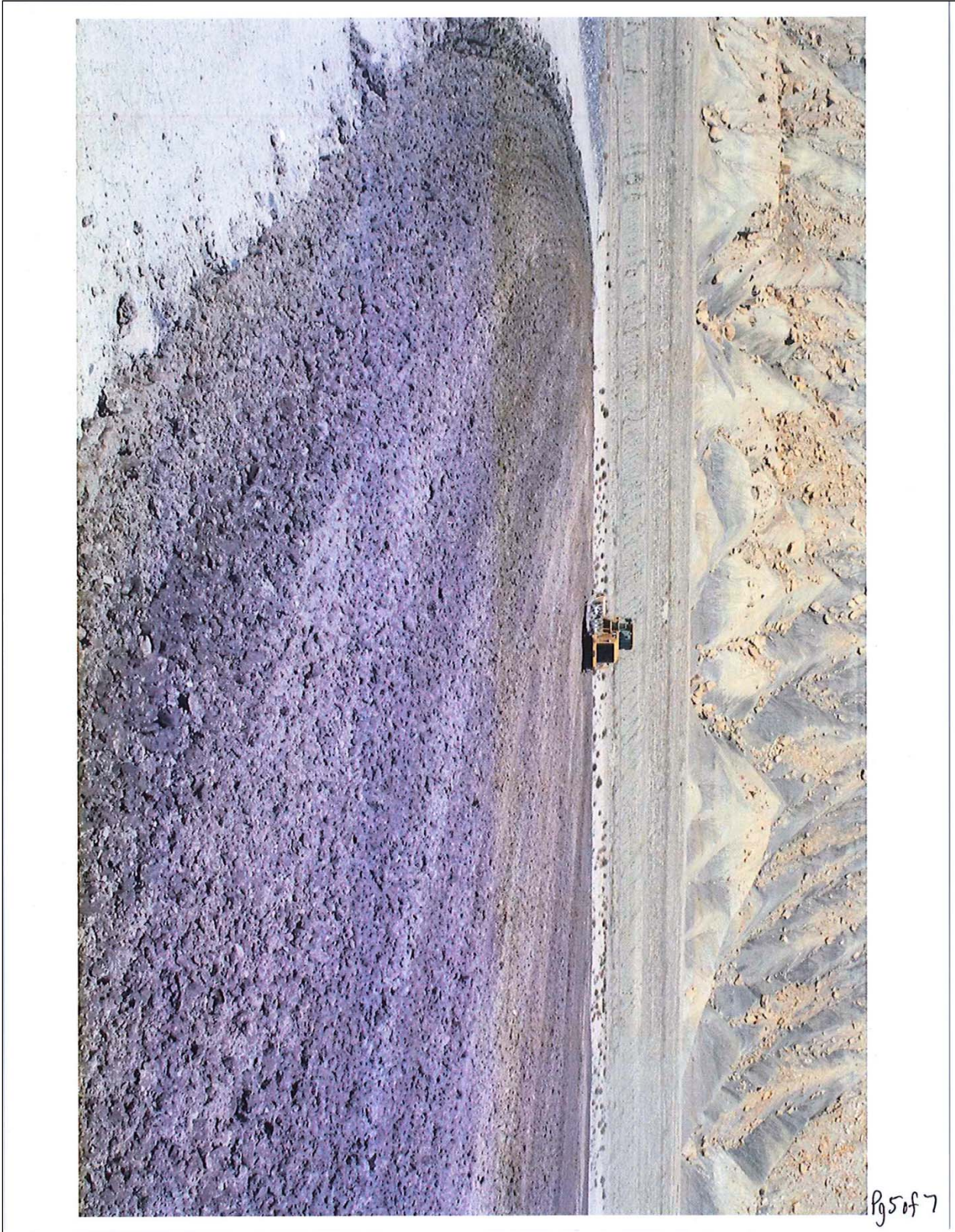
Appendix A6. Frost Protection Lift Approval Package (continued)

FIELD DENSITY TEST	
PROJECT: Moab UMTRA Project LIFT IDENTIFICATION: UFL01140924-00 TEST ID NUMBER(S): # 2 TEST LOCATION: P1	OTHER: _____ DATE: 9/25/2014 TEST METHOD: N/A D1556 x D6938
ASTM D6938 (DENSITY DETERMINATION) Make/Model Troxler 3430 Gauge Serial # 28098 Last Calibration Date: 2/14/14 Daily Standard Counts: <i>Off-Cell Standard</i> Density 2275 Moisture 680 <i>Method A (Direct Transmission)</i> Depth Setting 8 (inches) Count Time 1 (minutes) Moisture Count 184 Density Count 1394 Wet Density (ρ_m) 122.6 (lbs/ft ³) Dry Density 107.1 (lbs/ft ³) Moisture Density 15.5 (lbs/ft ³) Moisture Fraction 14.5 (%)	ASTM D1556 (DENSITY DETERMINATION) Testing Apparatus _____ Calibrated Vol. (lbs/ft ³) _____ Bulk Density of sand (ρ_1) _____ g/cm ³ _____ lbs/ft ³ Mass of Sand to Fill Cone & Plate (M_2) _____ g Mass of bottle & cone before filling cone, plate & hole _____ g Mass of bottle & cone after filling cone, plate & hole _____ g Mass of sand to fill cone, plate, & hole (M_1) _____ g Mass of sand to fill hole _____ g Mass of wet soil in container _____ g Mass of container _____ g Mass of wet soil (M_3) _____ g Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm ³ Dry Mass of soil $M_d = 100 M_3 / (w + 100)$ _____ g Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft ³ Dry Density $\rho_d = M_d / V$ _____ g/cm ³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft ³
MOISTURE DETERMINATION _____ ASTM D2216 @ 110° C or _____ ASTM D4643 Container ID _____ Mass of container & wet specimen (M_{cms}) _____ g Mass of container & dry specimen ($M_{c ds}$) _____ g Mass of water (M_w) _____ g $M_w = M_{cms} - M_{c ds}$ Mass of container (M_c) _____ g Mass of dry specimen (M_s) _____ g $M_s = M_{c ds} - M_c$ Moisture content (w) $w = (M_w / M_s) \times 100$ 0.0 % Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$) $\rho_d = (100 \times \text{N/A}) / (100 + \text{N/A}) = 107.1$ lbs/ft ³ <i>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_w)</i> Percent Compaction = $\rho_d / \gamma_{d max} \times 100$ $107.1 / 119.0 \times 100 = 90.0$ %	Soil Description: Lt Brown Clay Proctor ID: Frost Protection # 1 (2014) Standard Proctor (ASTM D698) Maximum Dry Density ($\gamma_{d max}$) 119.0 (lbs/ft ³) Optimum Moisture (w_{opt}) 13.0 (%) Required Moisture: 8.0 % to 18.0 % Required Percent Compaction: 90.0 (%)
Comments:	TEST RESULTS: <input checked="" type="checkbox"/> Pass Date: 9/25/14 <input type="checkbox"/> Failed Moisture <input type="checkbox"/> Failed Compaction Time: 1313 By: Mitch Hogan /  (print) (signature)
 QA/QC APPROVAL	10/28/2014 DATE

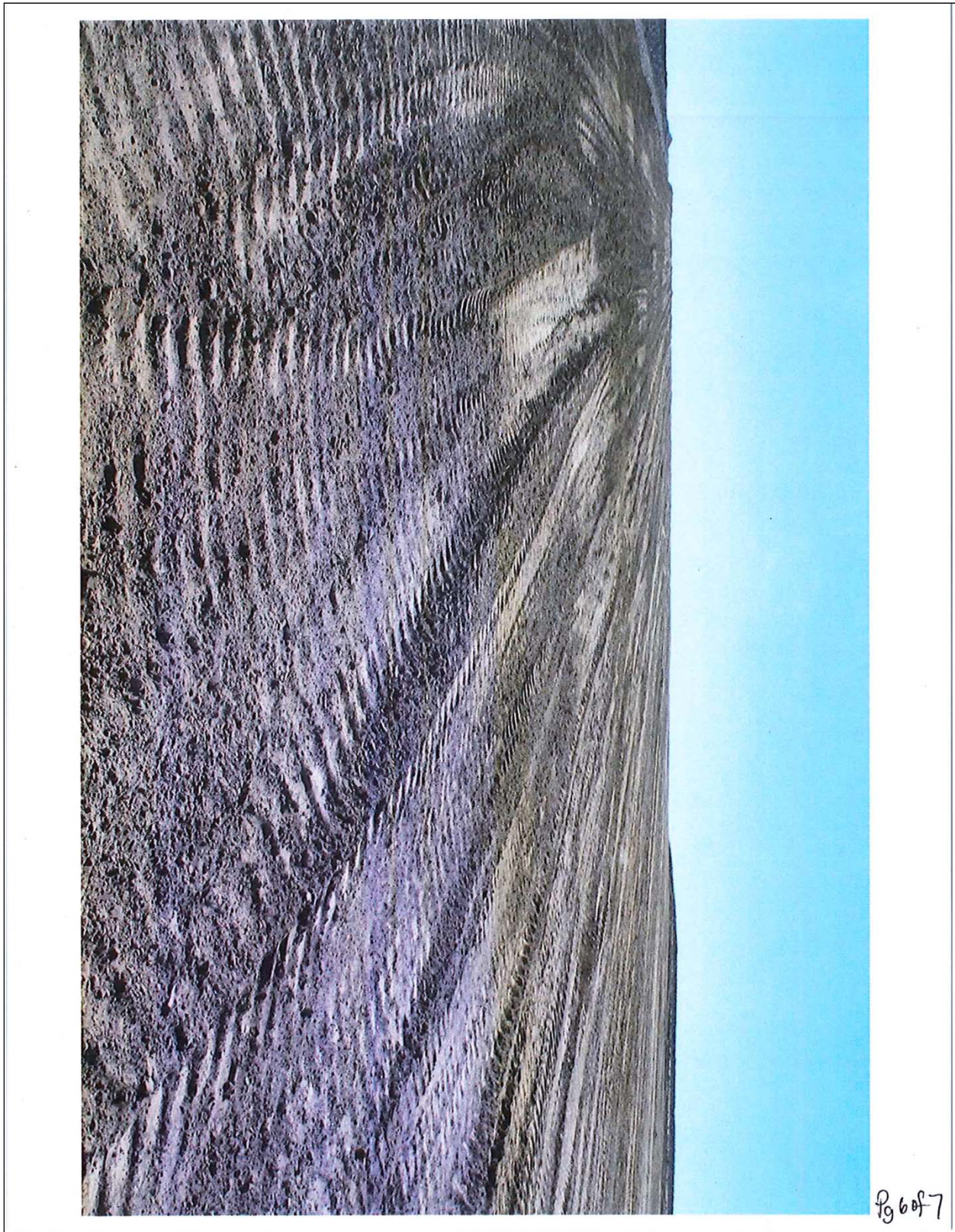
Density Testing
 DOE-EM/GJRAC1783
 Rev. 0

QC-F-002
 File Index No. 43.8.2
 Page 4 of 7

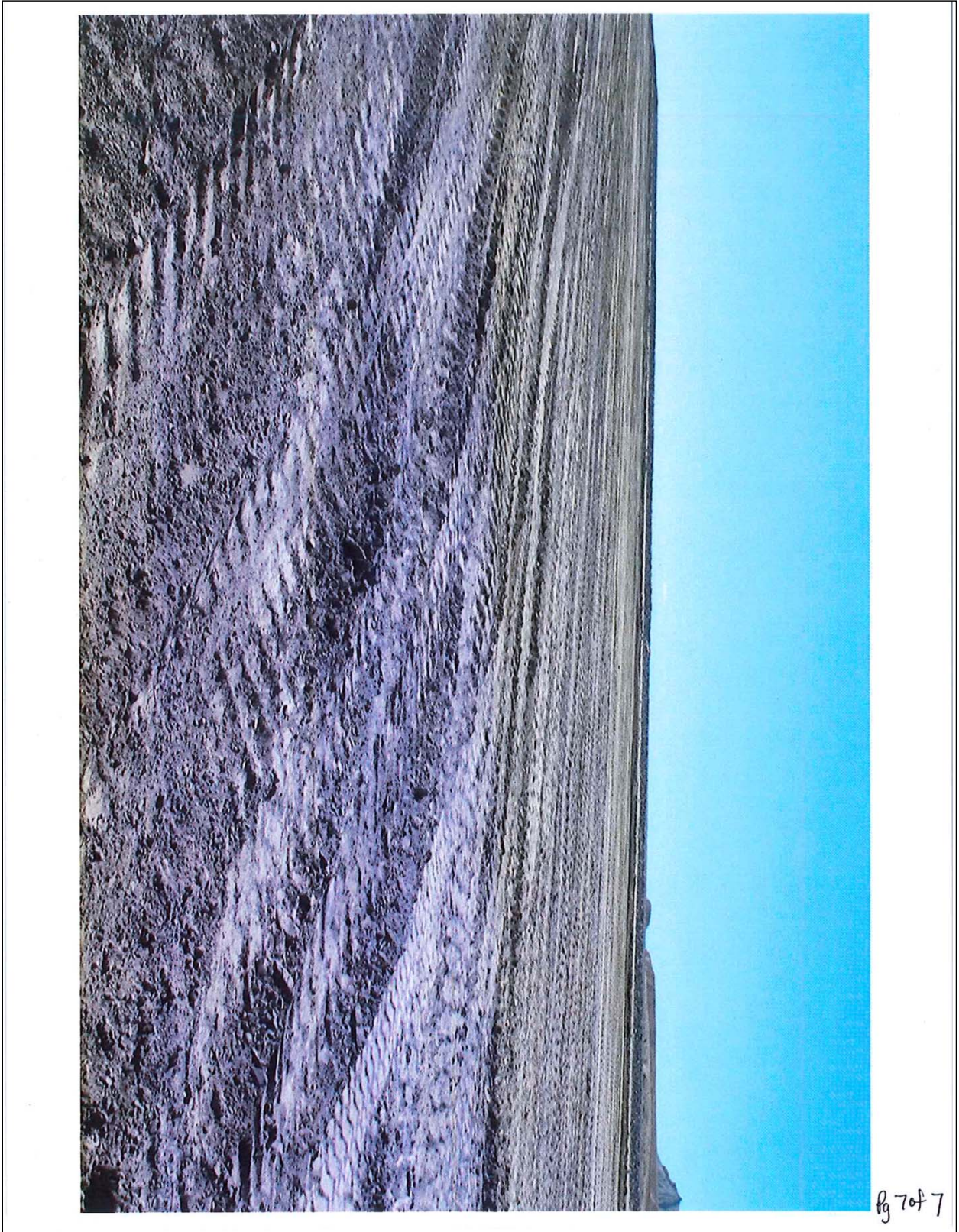
Appendix A6. Frost Protection Lift Approval Package (continued)



Appendix A6. Frost Protection Lift Approval Package (*continued*)



Appendix A6. Frost Protection Lift Approval Package (*continued*)



**Appendix A8.
Spoils Embankment**

**Standard Proctor Test Results Summary
Lift Approval Summary
Lift Approval Package**

Appendix A8. Spoils Embankment Standard Proctor Test Results Summary

Proctor ID #	Date Sampled	Date Approved	Maximum Dry Density (lb/ft³)	Optimum Moisture Content (%)	Soils Description
Spoils # 1 (2014)	7/24/2014	8/4/2014	119.0	12.5	Tan Sandy Silt

Appendix A8. Spoils Embankment Lift Approval Summary

September 2014										
Date	Lift ID #	# of Passing Moisture Tests	Quantity Approved (yd ³)	Cumulative Quantity Approved (yd ³)	CAES Screen Passing Pixels (%)	Average Thickness (ft)	Proctor ID #	# of Nuclear Density Gauge Verifications	# of Sandcone Verifications	Verified Compaction (%)
9/30/14	USG66140930-00	2	6519	6,519	N/A	1.0	FP#2(2014)	2	1	94.1
9/30/14	USE66140930-00	2	6777	13,296	N/A	1.0	FP#2(2014)	3	0	94.5
<p>Average CAES Screen Passing Pixels (%) = N/A</p> <p>Total Quantity Approved (yd³) = 13,296</p> <p>Total # of Nuclear Density Gauge Tests = 5</p> <p>Total # of Moisture Tests = 4</p> <p>Quantity per Moisture Test (yd³) = 3,324</p> <p>Total Average Thickness (ft.) = 1.0</p>										

Appendix A8. Spoils Embankment Lift Approval Package (continued)

FIELD DENSITY TEST

PROJECT: Moab UMTRA Project		OTHER: _____	
LIFT IDENTIFICATION: USG66140930-00		DATE: 9/30/2014	
TEST ID NUMBER(S): _____		# 1	
TEST LOCATION: P2		TEST METHOD: <u> </u> D1556 <u> X </u> D6938	

<p style="text-align: center;">ASTM D6938 (DENSITY DETERMINATION)</p> <p>Make/Model Troxler 3430 Gauge Serial # 28098 Last Calibration Date: 2/14/14 Daily Standard Counts: <i>Off-Cell Standard</i></p> <p>Density 2274 Moisture 670 <i>Method A (Direct Transmission)</i> Depth Setting 8 (inches) Count Time 1 (minutes) Moisture Count 212 Density Count 1242</p> <p>Wet Density (ρ_m) 126.9 (lbs/ft³) Dry Density 108.4 (lbs/ft³) Moisture Density 18.5 (lbs/ft³) Moisture Fraction 17.0 (%)</p> <p style="text-align: center;">MOISTURE DETERMINATION</p> <p style="text-align: center;">____ ASTM D2216 @ 110° C or ____ ASTM D4643</p> <p>Container ID _____</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Mass of container & wet specimen (M_{cms})</td> <td style="width: 5%;"></td> <td style="width: 25%; text-align: right;">g</td> </tr> <tr> <td>Mass of container & dry specimen ($M_{c ds}$)</td> <td></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of water (M_w)</td> <td></td> <td style="text-align: right;">g</td> </tr> <tr> <td>$M_w = M_{cms} - M_{c ds}$</td> <td></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of container (M_c)</td> <td></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Mass of dry specimen (M_s)</td> <td></td> <td style="text-align: right;">g</td> </tr> <tr> <td>$M_s = M_{c ds} - M_c$</td> <td></td> <td style="text-align: right;">g</td> </tr> <tr> <td>Moisture content (w)</td> <td></td> <td style="text-align: right;">%</td> </tr> <tr> <td>$w = (M_w / M_s) \times 100$</td> <td></td> <td style="text-align: right; background-color: yellow;">0.0</td> </tr> </table> <p>Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$) $\rho_d = (100 \times \text{N/A}) / (100 + \text{N/A}) = \mathbf{108.4}$ lbs/ft³ <small>Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_c)</small></p> <p>Percent Compaction = $\rho_d / \gamma_d \text{max} \times 100$ $108.4 / 112.5 \times 100 = \mathbf{96.4}$ %</p>	Mass of container & wet specimen (M_{cms})		g	Mass of container & dry specimen ($M_{c ds}$)		g	Mass of water (M_w)		g	$M_w = M_{cms} - M_{c ds}$		g	Mass of container (M_c)		g	Mass of dry specimen (M_s)		g	$M_s = M_{c ds} - M_c$		g	Moisture content (w)		%	$w = (M_w / M_s) \times 100$		0.0	<p style="text-align: center;">ASTM D1556 (DENSITY DETERMINATION)</p> <p>Testing Apparatus _____ Calibrated Vol. (lbs/ft³) _____ Bulk Density of sand (ρ_1) _____ g/cm³ _____ lbs/ft³ Mass of Sand to Fill Cone & Plate (M_2) _____ g</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Mass of bottle & cone before filling cone, plate & hole</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of bottle & cone after filling cone, plate & hole</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of sand to fill cone, plate, & hole (M_1)</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of sand to fill hole</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of wet soil in container</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of wet soil (M_3)</td><td style="text-align: right;">g</td></tr> </table> <p>Test Hole Volume $V = (M_1 - M_2) / \rho_1$ _____ cm³ Dry Mass of soil $M_4 = 100 M_3 / (w + 100)$ _____ g Wet Density $\rho_m = (M_3 / V) \times 62.43$ _____ lbs/ft³ Dry Density $\rho_d = M_4 / V$ _____ g/cm³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ _____ lbs/ft³</p> <p>Soil Description: Brown Clay. Proctor ID: Frost Protection # 2 (2014) Standard Proctor (ASTM D698)</p> <p>Maximum Dry Density ($\gamma_d \text{max}$) 112.5 (lbs/ft³) Optimum Moisture (w_{opt}) 15.5 (%) Required Moisture: 10.5 % to 20.5 % Required Percent Compaction: 90.0 (%)</p>	Mass of bottle & cone before filling cone, plate & hole	g	Mass of bottle & cone after filling cone, plate & hole	g	Mass of sand to fill cone, plate, & hole (M_1)	g	Mass of sand to fill hole	g	Mass of wet soil in container	g	Mass of container	g	Mass of wet soil (M_3)	g
Mass of container & wet specimen (M_{cms})		g																																								
Mass of container & dry specimen ($M_{c ds}$)		g																																								
Mass of water (M_w)		g																																								
$M_w = M_{cms} - M_{c ds}$		g																																								
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$M_s = M_{c ds} - M_c$		g																																								
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Mass of wet soil (M_3)	g																																									

<p>Comments:</p>	<p>TEST RESULTS:</p> <table style="width: 100%;"> <tr> <td><input checked="" type="checkbox"/> Pass</td> <td>Date: 9/30/14</td> </tr> <tr> <td><input type="checkbox"/> Failed Moisture</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Failed Compaction</td> <td>Time: 0940</td> </tr> </table> <p>By: Mitch Hogan / <i>Mitch Hogan</i> <small>(print) (signature)</small></p>	<input checked="" type="checkbox"/> Pass	Date: 9/30/14	<input type="checkbox"/> Failed Moisture		<input type="checkbox"/> Failed Compaction	Time: 0940
<input checked="" type="checkbox"/> Pass	Date: 9/30/14						
<input type="checkbox"/> Failed Moisture							
<input type="checkbox"/> Failed Compaction	Time: 0940						

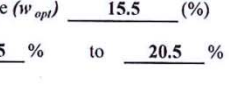

QA/QC APPROVAL

10/08/14
 DATE

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Appendix A8. Spoils Embankment Lift Approval Package (continued)

FIELD DENSITY TEST																						
PROJECT: Moab UMTRA Project LIFT IDENTIFICATION: USG66140930-00 TEST ID NUMBER(S): # 2 TEST LOCATION: P1	OTHER: _____ DATE: 9/30/2014 TEST METHOD: <input checked="" type="checkbox"/> D1556 <input checked="" type="checkbox"/> D6938																					
ASTM D6938 (DENSITY DETERMINATION) Make/Model <u>Troxler 3430</u> Gauge Serial # <u>28098</u> Last Calibration Date: <u>2/14/14</u> Daily Standard Counts: <i>Off-Cell Standard</i> Density <u>2274</u> Moisture <u>670</u> <i>Method A (Direct Transmission)</i> Depth Setting <u>8</u> (inches) Count Time <u>1</u> (minutes) Moisture Count <u>208</u> Density Count <u>1279</u> Wet Density (ρ_m) <u>125.8</u> (lbs/ft ³) Dry Density <u>107.7</u> (lbs/ft ³) Moisture Density <u>18.1</u> (lbs/ft ³) Moisture Fraction <u>16.8</u> (%)	ASTM D1556 (DENSITY DETERMINATION) Testing Apparatus <u>Ω</u> Calibrated Vol. (lbs/ft ³) <u>0.03784</u> Bulk Density of sand (ρ_1) <u>1.54</u> g/cm ³ <u>96.4</u> lbs/ft ³ Mass of Sand to Fill Cone & Plate (M_2) <u>1654.5</u> g <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Mass of bottle & cone before filling cone, plate & hole</td><td style="text-align: right;">7103.0</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of bottle & cone after filling cone, plate & hole</td><td style="text-align: right;">2541.5</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of sand to fill cone, plate, & hole (M_1)</td><td style="text-align: right;">4561.5</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of sand to fill hole</td><td style="text-align: right;">2907.0</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of wet soil & container</td><td style="text-align: right;">3614.8</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container</td><td style="text-align: right;">8.9</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of wet soil (M_3)</td><td style="text-align: right;">3605.9</td><td style="text-align: right;">g</td></tr> </table> Test Hole Volume $V = (M_1 - M_2) / \rho_1$ <u>1883</u> cm ³ Dry Mass of soil $M_4 = 100 M_3 / (w + 100)$ <u>3110.0</u> g Wet Density $\rho_m = (M_3 / V) \times 62.43$ <u>119.6</u> lbs/ft ³ Dry Density $\rho_d = M_4 / V$ <u>1.7</u> g/cm ³ Dry Unit Weight $\gamma_d = \rho_d \times 62.43$ <u>103.1</u> lbs/ft ³	Mass of bottle & cone before filling cone, plate & hole	7103.0	g	Mass of bottle & cone after filling cone, plate & hole	2541.5	g	Mass of sand to fill cone, plate, & hole (M_1)	4561.5	g	Mass of sand to fill hole	2907.0	g	Mass of wet soil & container	3614.8	g	Mass of container	8.9	g	Mass of wet soil (M_3)	3605.9	g
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MOISTURE DETERMINATION ASTM D4643 Container ID <u>D-6</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>Mass of container & wet specimen (M_{cms})</td><td style="text-align: right;">526.8</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container & dry specimen (M_{cds})</td><td style="text-align: right;">483.8</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of water (M_w) $M_w = M_{cms} - M_{cds}$</td><td style="text-align: right;">43.0</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of container (M_c)</td><td style="text-align: right;">214.1</td><td style="text-align: right;">g</td></tr> <tr><td>Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$</td><td style="text-align: right;">269.7</td><td style="text-align: right;">g</td></tr> <tr><td>Moisture content (w) $w = (M_w / M_s) \times 100$</td><td style="text-align: right;">15.9</td><td style="text-align: right;">%</td></tr> </table>	Mass of container & wet specimen (M_{cms})	526.8	g	Mass of container & dry specimen (M_{cds})	483.8	g	Mass of water (M_w) $M_w = M_{cms} - M_{cds}$	43.0	g	Mass of container (M_c)	214.1	g	Mass of dry specimen (M_s) $M_s = M_{cds} - M_c$	269.7	g	Moisture content (w) $w = (M_w / M_s) \times 100$	15.9	%	Soil Description: <u>Brown Clay.</u> Proctor ID: <u>Frost Protection # 2 (2014)</u> Standard Proctor (ASTM D698) Maximum Dry Density (γ_{dmax}) <u>112.5</u> (lbs/ft ³) Optimum Moisture (w_{opt}) <u>15.5</u> (%) Required Moisture: <u>10.5</u> % to <u>20.5</u> % Required Percent Compaction: <u>90.0</u> (%)			
Mass of container & wet specimen (M_{cms})	526.8	g																				
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Moisture content (w) $w = (M_w / M_s) \times 100$	15.9	%																				
Dry Density ($\rho_d = (100 \times \rho_m) / (100 + w)$) $\rho_d = (100 \times 119.6) / (100 + 15.9) = 103.1$ lbs/ft ³ Note: Wet Density from ASTM D 1556 (ρ_m) takes precedence over ASTM D 6938 (ρ_w) Percent Compaction = $\rho_d / \gamma_{dmax} \times 100$ $103.1 / 112.5 \times 100 = 91.7$ %	TEST RESULTS: <input checked="" type="checkbox"/> Pass Date: <u>9/30/14</u> <input type="checkbox"/> Failed Moisture <input type="checkbox"/> Failed Compaction Time: <u>1342</u> By: <u>Mitch Hogan</u> /  (print) (signature)																					
Comments: Microwave oven power setting on HIGH. Initial time setting of 3 minutes and subsequent incremental drying periods of 1 minute until a change of 0.1 % or less of the initial wet mass of the soil.	QA/QC APPROVAL:  DATE: <u>10/02/2014</u>																					

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