STOCKPILES GEOTECHNICAL TEST RESULTS

Atterberg Limits Test
ASTM D 4318

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Top Soil
Depth: -
Sample Number: Top Soil -02
Test Date: 12/17/2013
Technician: DPM
Sampled Date: 11/21/2013
Sampled By: MWH
Method: Method A

Test Configuration

Liquid Limits Device: 1080
Material Size of Fines: -#40

Plastic Limits

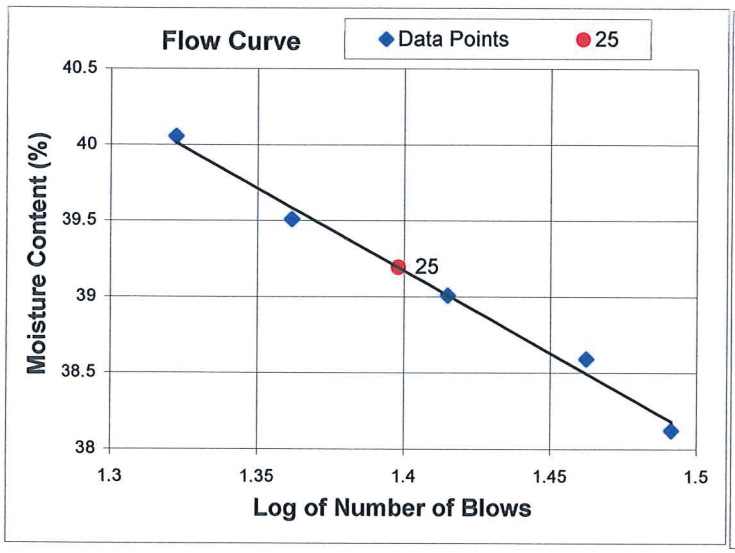
	Sample 1	Sample 2	Sample 3
Weight of Wet Soil & Pan (g):	6.323	6.629	6.240
Weight of Dry Soil & Pan (g):	5.723	6.008	5.667
Weight of Water (g):	0.600	0.621	0.573
Weight of Pan (g):	0.733	0.765	0.750
Moisture Content (%):	12.0	11.8	11.7

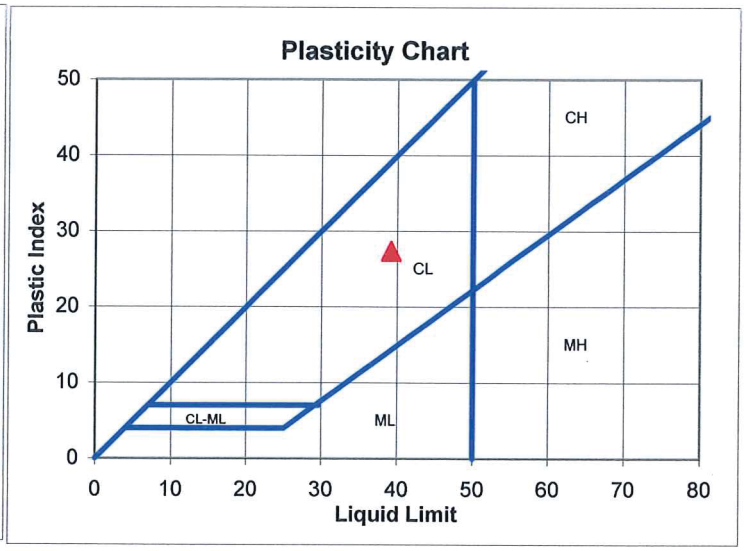
Average: 11.8%
Standard Deviation: 0.2%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Number of Blows:	21	23	26	29	31
Weight of Wet Soil & Pan (g):	15.014	16.095	14.344	15.245	15.759
Weight of Dry Soil & Pan (g):	10.936	11.749	10.533	11.213	11.619
Weight of Water (g):	4.078	4.346	3.811	4.032	4.140
Weight of Pan (g):	0.755	0.749	0.763	0.765	0.759
Moisture Content (%):	40.1	39.5	39.0	38.6	38.1

Plastic Limit: 12
Liquid Limit: 39
Plastic Index: 27
Atterberg Classification CL





Data Entered By: DPM Date: 12/18/2013 Data Checked By: CJ
File Name: atterberg-ASTM_4318-R6_11.xls Date: 12/18/2013

ADVANCED TERRA TESTING

Atterberg Limits Test
ASTM D 4318

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: UNC Site
Project Number: -

Boring Number: Top Soil
Depth: -
Sample Number: Top Soil - 01
Test Date: 12/17/2013
Technician: DPM
Sampled Date: 11/21/2013
Sampled By: MWH
Method: Method A

Test Configuration

Liquid Limits Device:
Material Size of Fines: -#40

Plastic Limits

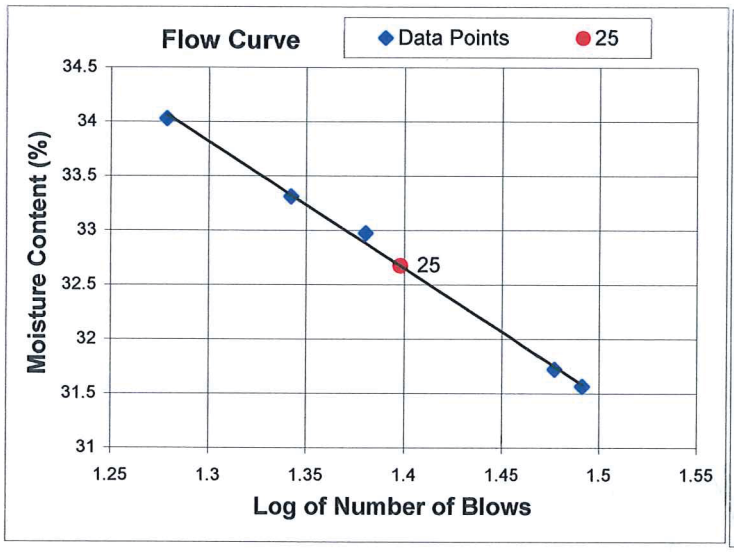
	Sample 1	Sample 2	Sample 3
Weight of Wet Soil & Pan (g):	6.485	6.219	6.437
Weight of Dry Soil & Pan (g):	5.942	5.695	5.911
Weight of Water (g):	0.543	0.524	0.526
Weight of Pan (g):	0.736	0.755	0.745
Moisture Content (%):	10.4	10.6	10.2

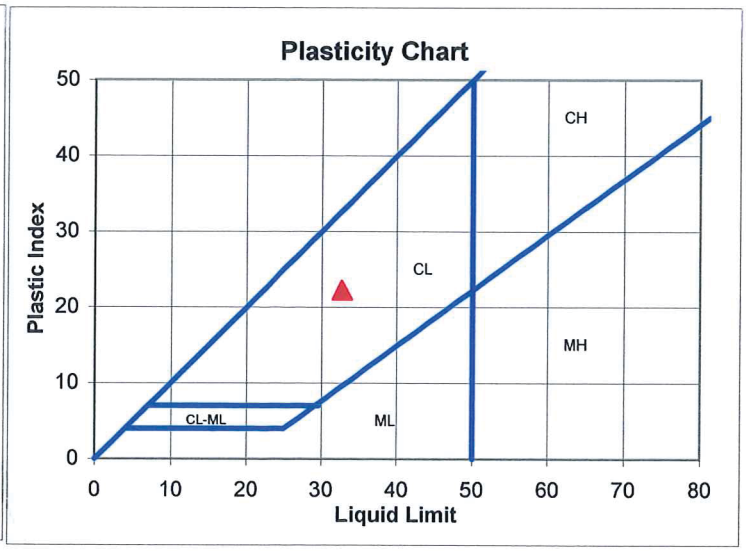
Average: 10.4%
Standard Deviation: 0.2%

Liquid Limits

	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Number of Blows:	31	30	22	19	24
Weight of Wet Soil & Pan (g):	13.666	13.191	14.510	14.997	14.290
Weight of Dry Soil & Pan (g):	10.570	10.194	11.074	11.381	10.931
Weight of Water (g):	3.096	2.997	3.436	3.616	3.359
Weight of Pan (g):	0.762	0.746	0.759	0.754	0.744
Moisture Content (%):	31.6	31.7	33.3	34.0	33.0

Plastic Limit: 10
Liquid Limit: 33
Plastic Index: 22
Atterberg Classification CL





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File Name: atterberg-ASTM_4318-R6_12.xls Date: 12/18/2013

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soils Using Sieve Analsis
ASTM D 6913

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Stockpile 1
Depth: -
Sample Number: TI-SP1-01(BULK)
Sampled Date: 11/13/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: CW

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 255.75
Weight of Dry Soil & Pan (g): 253.33
Weight of Water (g): 2.42
Weight of Pan (g): 6.58
Weight of Dry Soil (g): 246.75
Moisture (%): 1.0

Total Wet Weight of Sample (g): 1,011.20
Total Dry Weight of Sample (g): 1,001.56
Calculated Weight Plus #200 (g): 828.13
Moisture of Total Sample (%): 1.0
Percent Retained #200 Sieve (%): 82.7

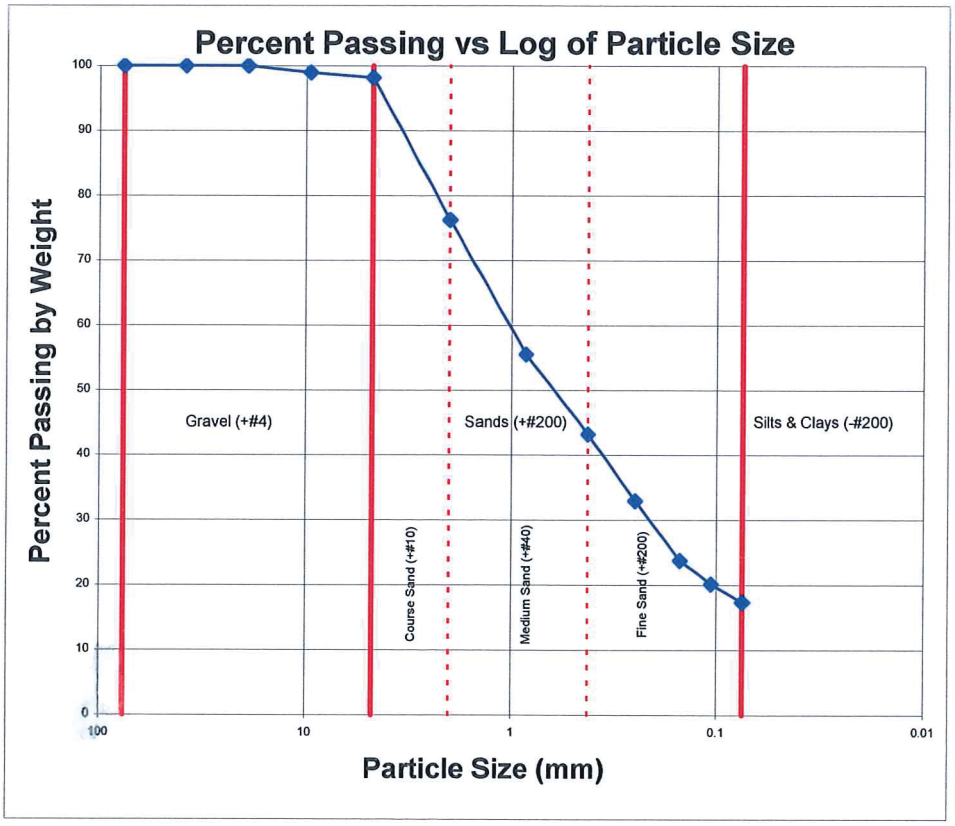
Plus Split Data

Original Weight of +#4 (g): 20.55
Calculated Weight of +#4 (g): 18.58

Minus Split Data

Original Weight of -#4 (g): 990.65
Calculated Dry Weight of -#4 (g): 982.98

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	76.2	0.00	0.00	0.00	0.00	100.0
1.5"	38.10	0.00	0.00	0.00	0.00	100.0
3/4"	19.05	0.00	0.00	0.00	0.00	100.0
3/8"	9.525	10.28	0.00	10.28	10.28	99.0
#4	4.750	8.30	0.00	8.30	8.30	98.1
250.5g split out of -#4 material.						
#10	2.000	58.54	3.08	55.46	219.76	76.2
#20	0.850	56.05	3.83	52.22	206.93	55.5
#40	0.425	34.98	3.74	31.24	123.79	43.2
#60	0.250	29.64	3.80	25.84	102.39	33.0
#100	0.150	26.74	3.57	23.17	91.81	23.8
#140	0.106	12.76	3.55	9.21	36.50	20.1
#200	0.075	10.89	3.73	7.16	28.37	17.3



Data Entered By: DPM
Date: 12/17/2013
File Name: 2512_77_grainSize-ASTM-C33-D1140-D6319-D2487-R4_2.xls

Checked By: CW
Date: 12/17/2013

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soils Using Sieve Analsis
ASTM D 6913

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Stockpile 2
Depth: -
Sample Number: TI-SP2-01A(BULK)
Sampled Date: 11/13/2013
Test Date: 12/18/2013

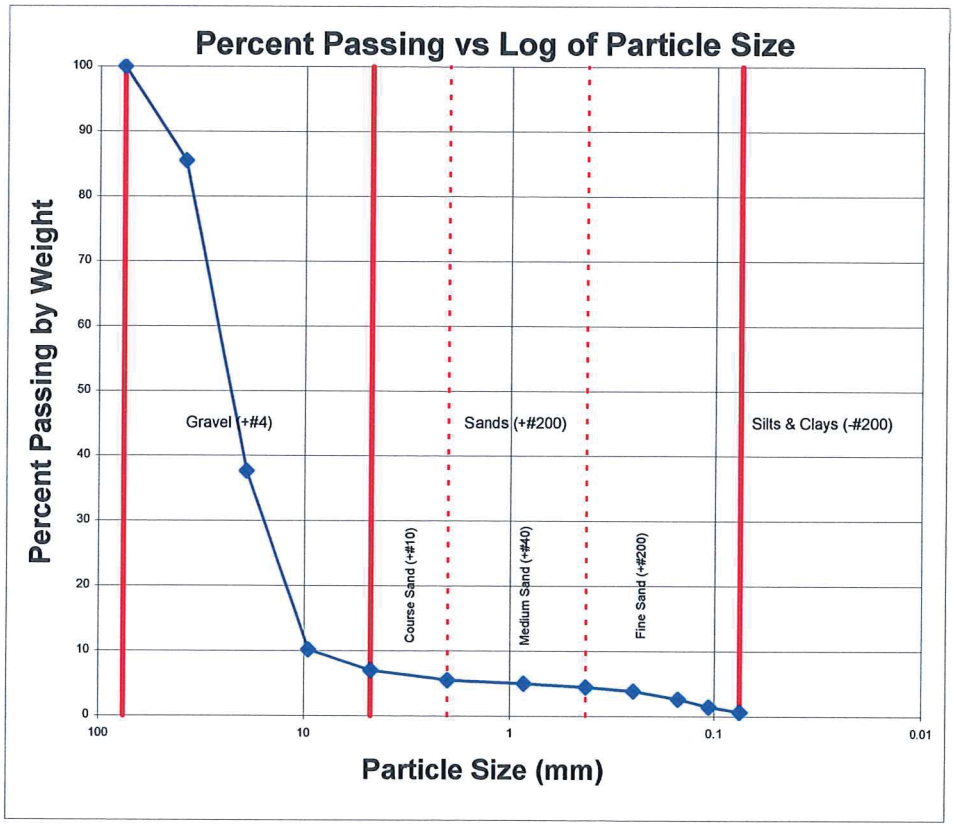
Sampled By: MWH
Technician: CW

Grain Size Data

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	76.2	0.00	0.00	0.00	0.00	100.0
1.5"	38.10	3240.00	0.00	3240.00	3240.00	85.5
3/4"	19.05	10675.00	0.00	10675.00	10675.00	37.7
3/8"	9.525	6140.00	0.00	6140.00	6140.00	10.1
#4	4.750	703.90	0.00	703.90	703.90	7.0
#10	2.000	333.48	0.00	333.48	333.48	5.5
#20	0.850	116.56	0.00	116.56	116.56	5.0
#40	0.425	116.68	0.00	116.68	116.68	4.5
#60	0.250	135.56	0.00	135.56	135.56	3.8
#100	0.150	268.83	0.00	268.83	268.83	2.6
#140	0.106	264.53	0.00	264.53	264.53	1.5
#200	0.075	180.23	0.00	180.23	180.23	0.7

Total Wet Weight of Sample (g): 22,320.00
Total Dry Weight of Sample (g): 22,320.00
Calculated Weight Plus #200 (g): 22,174.77
Moisture of Total Sample (%): 0.0
Percent Retained #200 Sieve (%): 99.3

Wet Weight of Soil (g): 22,320.00
Dry Weight of Soil (g): 22,320.00



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Date: 12/19/2013
File Name: 2512_77_grainSize-ASTM-C33-D1140-D6319-D2487-R4_3.xls

Checked By: CJ
Date: 12/19/2013

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soils Using Sieve Analsis
ASTM D 6913

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Stockpile 2
Depth: -
Sample Number: TI-SP2-01C(BULK)
Sampled Date: 11/13/2013
Test Date: 12/18/2013

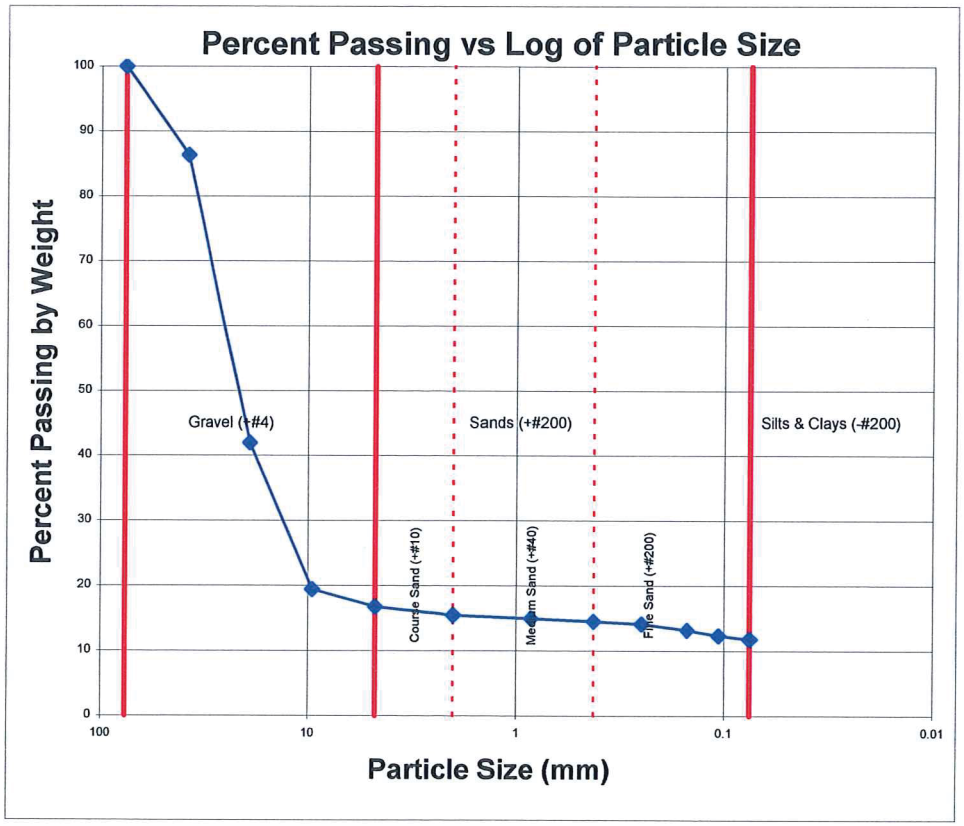
Sampled By: MWH
Technician: CW

Grain Size Data

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	76.2	0.00	0.00	0.00	0.00	100.0
1.5"	38.10	3250.00	0.00	3250.00	3250.00	86.3
3/4"	19.05	10565.00	0.00	10565.00	10565.00	42.0
3/8"	9.525	5365.00	0.00	5365.00	5365.00	19.4
#4	4.750	645.22	0.00	645.22	645.22	16.7
#10	2.000	298.56	0.00	298.56	298.56	15.5
#20	0.850	122.72	0.00	122.72	122.72	14.9
#40	0.425	99.70	0.00	99.70	99.70	14.5
#60	0.250	98.30	0.00	98.30	98.30	14.1
#100	0.150	222.47	0.00	222.47	222.47	13.2
#140	0.106	207.81	0.00	207.81	207.81	12.3
#200	0.075	121.60	0.00	121.60	121.60	11.8

Total Wet Weight of Sample (g): 23,805.00
Total Dry Weight of Sample (g): 23,805.00
Calculated Weight Plus #200 (g): 20,996.38
Moisture of Total Sample (%): 0.0
Percent Retained #200 Sieve (%): 88.2

Wet Weight of Soil (g): 23,805.00
Dry Weight of Soil (g): 23,805.00



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File Name: 2512_77_grainSize-ASTM-C33-D1140-D6319-D2487-R4_4.xls

Checked By: CJ
Date: 12/19/2013

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soils Using Sieve Analsis
ASTM D 6913

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Stockpile 3
Depth: -
Sample Number: TI-SP3-01A(BULK)
Sampled Date: 11/13/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: CW

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 268.39
Weight of Dry Soil & Pan (g): 255.82
Weight of Water (g): 12.57
Weight of Pan (g): 8.45
Weight of Dry Soil (g): 247.37
Moisture (%): 5.1

Total Wet Weight of Sample (g): 26,195.00
Total Dry Weight of Sample (g): 25,767.52
Calculated Weight Plus #200 (g): 23,705.02
Moisture of Total Sample (%): 1.7
Percent Retained #200 Sieve (%): 92.0

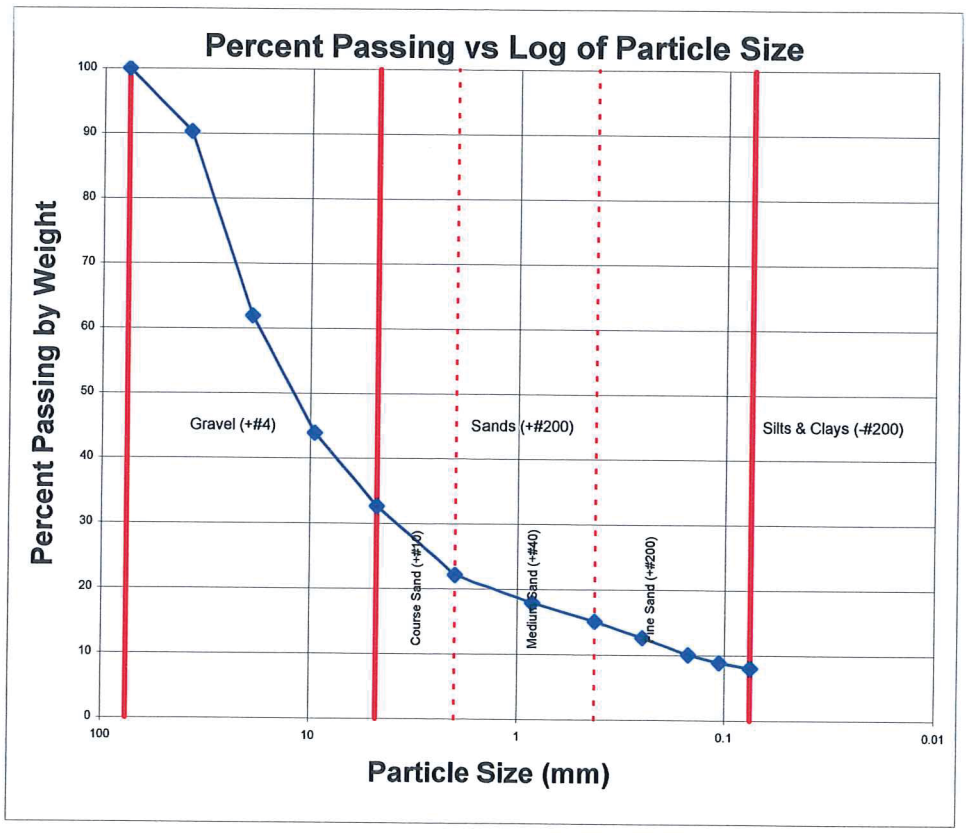
Plus Split Data

Original Weight of +#4 (g): 18,255.00
Calculated Weight of +#4 (g): 17,355.00

Minus Split Data

Original Weight of -#4 (g): 7,940.00
Calculated Dry Weight of -#4 (g): 8,412.52

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	76.2	0.00	0.00	0.00	0.00	100.0
1.5"	38.10	2500.00	0.00	2500.00	2500.00	90.3
3/4"	19.05	7315.00	0.00	7315.00	7315.00	61.9
3/8"	9.525	4640.00	0.00	4640.00	4640.00	43.9
#4	4.750	2900.00	0.00	2900.00	2900.00	32.6
253.38g split out of -#4 material.						
#10	2.000	81.41	3.67	77.74	2712.22	22.1
#20	0.850	34.85	3.81	31.04	1082.93	17.9
#40	0.425	24.66	3.71	20.95	730.91	15.1
#60	0.250	21.75	3.61	18.14	632.87	12.6
#100	0.150	22.58	3.64	18.94	660.78	10.1
#140	0.106	12.49	3.56	8.93	311.55	8.9
#200	0.075	10.12	3.85	6.27	218.75	8.0



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File Name: 2512_77_grainSize-ASTM-C33-D1140-D6319-D2487-R4_1.xls

Checked By: CW
Date: 12/17/2013

ATT
ADVANCED TERRA TESTING

Particle Size Distribution (Gradation) of Soils Using Sieve Analsis
ASTM D 6913

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number:

Boring Number: Stockpile 4
Depth: -
Sample Number: TI-SP4-01A(BULK)
Sampled Date: 11/13/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: CW

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 238.21
Weight of Dry Soil & Pan (g): 235.29
Weight of Water (g): 2.92
Weight of Pan (g): 6.56
Weight of Dry Soil (g): 228.73
Moisture (%): 1.3

Total Wet Weight of Sample (g): 25,386.45
Total Dry Weight of Sample (g): 25,380.07
Calculated Weight Plus #200 (g): 25,164.96
Moisture of Total Sample (%): 0.0
Percent Retained #200 Sieve (%): 99.2

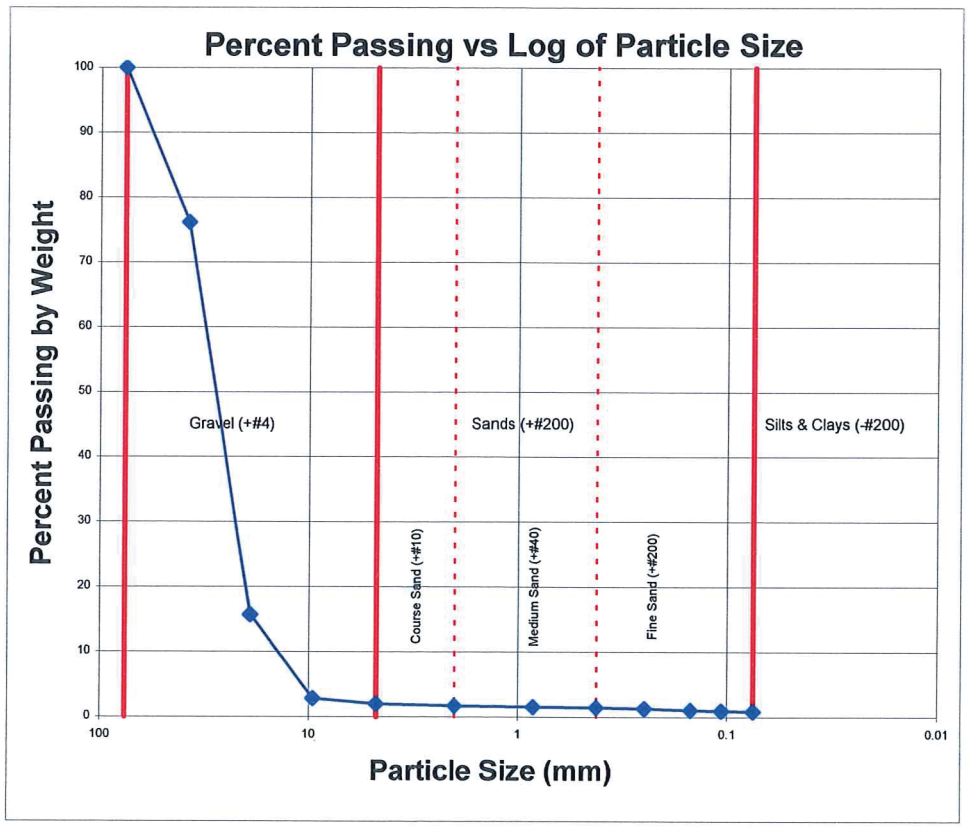
Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	76.2	0.00	0.00	0.00	0.00	100.0
1.5"	38.10	6065.00	0.00	6065.00	6065.00	76.1
3/4"	19.05	15325.00	0.00	15325.00	15325.00	15.7
3/8"	9.525	3275.00	0.00	3275.00	3275.00	2.8
#4	4.750	215.00	0.00	215.00	215.00	2.0
235.26g split out of -#4 material.						
#10	2.000	36.31	3.71	32.60	70.18	1.7
#20	0.850	20.15	3.71	16.44	35.39	1.6
#40	0.425	20.36	3.62	16.74	36.04	1.4
#60	0.250	20.18	3.56	16.62	35.78	1.3
#100	0.150	28.50	3.81	24.69	53.15	1.1
#140	0.106	17.66	3.95	13.71	29.51	0.9
#200	0.075	15.37	3.80	11.57	24.91	0.8

Plus Split Data

Original Weight of +#4 (g): 24,880.00
Calculated Weight of +#4 (g): 24,880.00

Minus Split Data

Original Weight of -#4 (g): 506.45
Calculated Dry Weight of -#4 (g): 500.07



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File Name: 2512_77_grainSize-ASTM-C33-D1140-D6319-D2487-R4_0.xls

Checked By: CJ
Date: 12/17/2013

ATT
ADVANCED TERRA TESTING

Particle Size Analysis of Soils
ASTM D 422

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: UNC Site
Project Number: -

Boring Number: Top Soil
Depth: -
Sample Number: Top Soil - 01
Sampled Date: 11/21/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: DPM

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 30.34
Weight of Dry Soil & Pan (g): 29.07
Weight of Water (g): 1.27
Weight of Pan (g): 3.85
Weight of Dry Soil (g): 25.22
Moisture (%): 5.0

General Sample Data

Total Wet Weight of Sample (g): 3,010.02
Total Dry Weight of Sample (g): 2,870.46
Calculated Weight Plus #200 (g): 1,004.98
Moisture of Total Sample (%): 4.9
Percent Retained #200 Sieve (%): 35.0

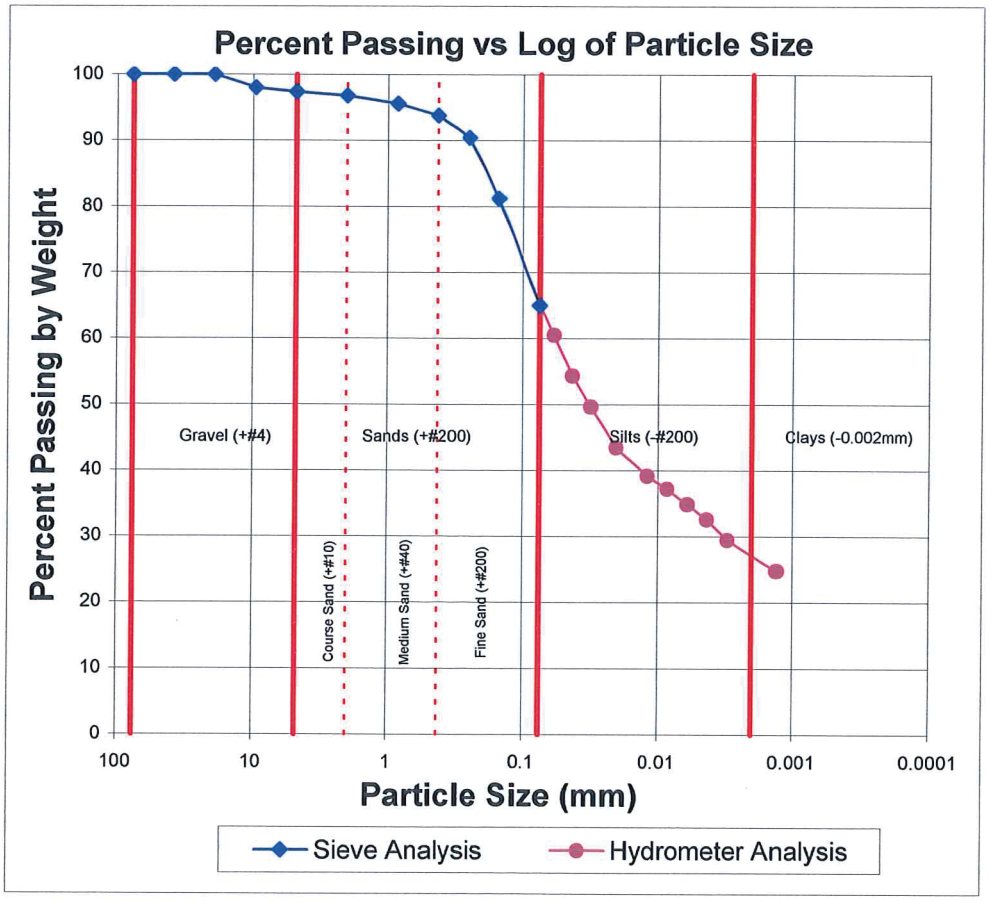
Plus Split Data

Original Weight of +#10 (g): 105.02
Calculated Weight of +#10 (g): 92.42

Minus Split Data

Original Weight of -#10 (g): 2,905.00
Calculated Dry Weight of -#10 (g): 2,778.04

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	57.21	0.00	57.21	57.21	98.0
#4	**4.750**	18.00	0.00	18.00	18.00	97.4
#10	**2.000**	17.21	0.00	17.21	17.21	96.8
65.222g split out of -#10 material.						
#20	**0.850**	4.42	3.63	0.79	35.34	95.5
#40	**0.425**	4.78	3.62	1.16	51.89	93.7
#60	**0.250**	5.86	3.71	2.15	96.18	90.4
#100	**0.150**	9.70	3.81	5.89	263.48	81.2
#200	**0.075**	14.07	3.66	10.41	465.67	65.0



Data Entered By: DPM
Date: 12/18/2013
File Name: 2512_77_hydrometer-ASTM-D422-R0.xls_16.xls

Checked By: CJ
Date: 12/18/2013

ATT
ADVANCED TERRA TESTING

Particle Size Analysis of Soils
ASTM D 422

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: UNC Site
Project Number: -

Boring Number: Top Soil
Depth: -
Sample Number: Top Soil - 01
Sampled Date: 11/21/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: DPM

Hydrometer Data

Test Configuration

Hydrometer Type: 152H
Specific Gravity: 2.68
Deflocculant: Sodium Hexametaphosphate
Deflocculant Correction: 5.0
Specific Gravity Correction Factor - α: 1.00

Total Wet Weight of Sample (g): 3,010.02
Total Dry Weight of Sample (g): 2,870.46
Wet Weight of Sub-Sample (g): 65.222
Dry Weight of Sub-Sample (g): 62.102
Corrected Dry Weight of Sub-Sample - W(g): 64.155

Elapsed Time (min)	Hydrometer Reading	Corrected Hydrometer Reading	Temperature (°C)	Temperature Coefficient (K)	Effective Depth (L)	Grain Diameter (mm)	Percent in Suspension (%)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
0	-	-	-	-	-	-	-	-	-
0.5	44.0	39.0	19.4	0.0138	9.08	0.0589	60.5	1736.39	60.5
1	40.0	35.0	19.4	0.0138	9.73	0.0431	54.3	1558.30	54.3
2	37.0	32.0	19.4	0.0138	10.23	0.0313	49.6	1424.73	49.6
5	33.0	28.0	19.4	0.0138	10.88	0.0204	43.4	1246.64	43.4
15	30.3	25.3	19.5	0.0138	11.33	0.0120	39.2	1124.20	39.2
30	29.0	24.0	19.7	0.0138	11.54	0.0086	37.2	1068.55	37.2
60	27.5	22.5	20.0	0.0137	11.78	0.0060	34.9	1001.76	34.9
120	26.0	21.0	20.3	0.0137	12.03	0.0043	32.6	934.98	32.6
250	24.0	19.0	20.9	0.0137	12.36	0.0030	29.5	845.93	29.5
1440	21.0	16.0	19.8	0.0138	12.85	0.0013	24.8	712.37	24.8

Data Entered By: DPM
Date: 12/18/2013
File Name: 2512_77_hydrometer-ASTM-D422-R0.xls_16.xls

Checked By: CJ
Date: 12/18/2013

ATT
ADVANCED TERRA TESTING

Particle Size Analysis of Soils
ASTM D 422

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Top Soil
Depth: -
Sample Number: Top Soil - 02
Sampled Date: 11/21/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: DPM

Grain Size Data

Hygroscopic Moisture of Fines

Weight of Wet Soil & Pan (g): 62.72
Weight of Dry Soil & Pan (g): 58.48
Weight of Water (g): 4.25
Weight of Pan (g): 3.83
Weight of Dry Soil (g): 54.64
Moisture (%): 7.8

General Sample Data

Total Wet Weight of Sample (g): 1,289.07
Total Dry Weight of Sample (g): 1,196.98
Calculated Weight Plus #200 (g): 327.27
Moisture of Total Sample (%): 7.7
Percent Retained #200 Sieve (%): 27.3

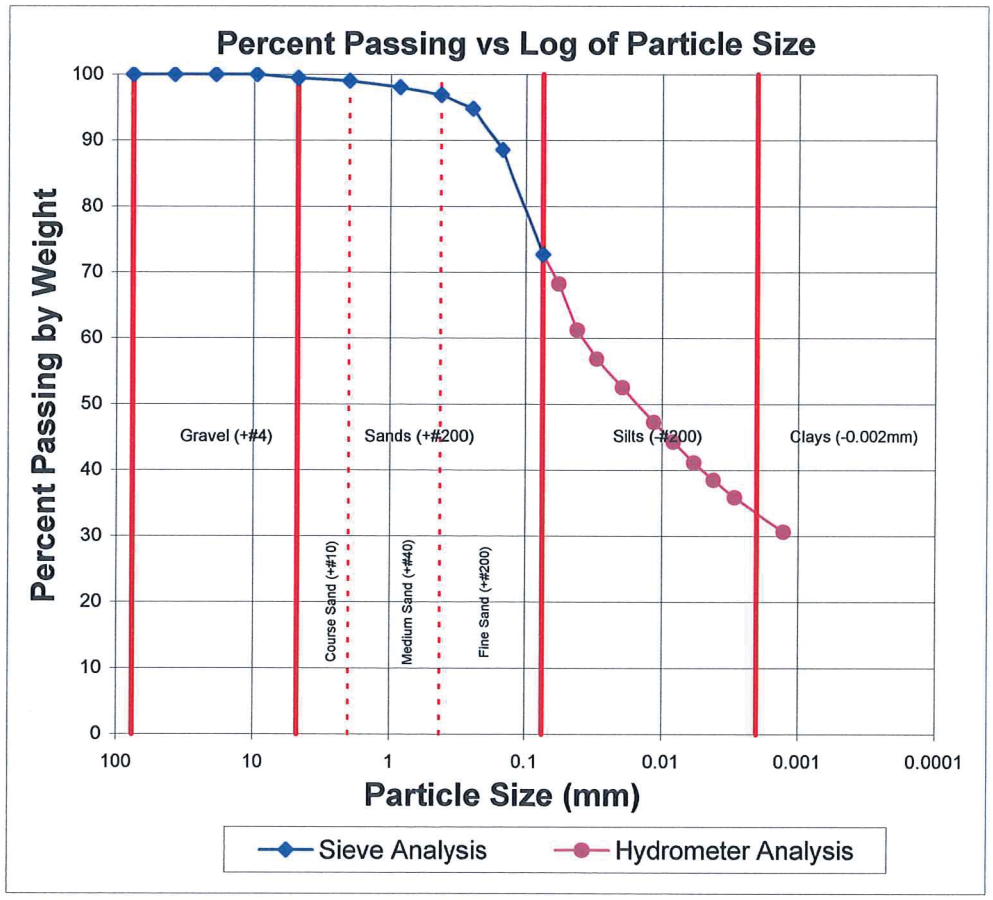
Plus Split Data

Original Weight of +#10 (g): 1,273.27
Calculated Weight of +#10 (g): 11.57

Minus Split Data

Original Weight of -#10 (g): 15.80
Calculated Dry Weight of -#10 (g): 1,185.41

Sieve Number	Sieve Size (mm)	Weight of Retained Soil & Pan (g)	Weight of Pan (g)	Weight of Retained Soil (g)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
3"	**76.2**	0.00	0.00	0.00	0.00	100.0
1.5"	**38.10**	0.00	0.00	0.00	0.00	100.0
3/4"	**19.05**	0.00	0.00	0.00	0.00	100.0
3/8"	**9.525**	0.00	0.00	0.00	0.00	100.0
#4	**4.750**	6.22	0.00	6.22	6.22	99.5
#10	**2.000**	5.35	0.00	5.35	5.35	99.0
60.293g split out of -#10 material.						
#20	**0.850**	4.42	3.86	0.56	11.87	98.0
#40	**0.425**	4.42	3.77	0.65	13.77	96.9
#60	**0.250**	4.96	3.78	1.18	25.00	94.8
#100	**0.150**	7.21	3.68	3.53	74.79	88.6
#200	**0.075**	12.66	3.68	8.98	190.27	72.7



Data Entered By: DPM
Date: 12/18/2013
File Name: 2512_77_hydrometer-ASTM-D422-R0.xls_15.xls

Checked By: CJ
Date: 12/18/2013

ATT
ADVANCED TERRA TESTING

Particle Size Analysis of Soils
ASTM D 422

Client: MWH
Job Number: 2512-77
Project: Church Rock
Location: Tailings Impoundment
Project Number: -

Boring Number: Top Soil
Depth: -
Sample Number: Top Soil - 02
Sampled Date: 11/21/2013
Test Date: 12/16/2013

Sampled By: MWH
Technician: DPM

Hydrometer Data

Test Configuration

Hydrometer Type: 152H
Specific Gravity: 2.71
Deflocculant: Sodium Hexametaphosphate
Deflocculant Correction: 5.0
Specific Gravity Correction Factor - α: 0.99

Total Wet Weight of Sample (g): 1,289.07
Total Dry Weight of Sample (g): 1,196.98
Wet Weight of Sub-Sample (g): 60.293
Dry Weight of Sub-Sample (g): 55.947
Corrected Dry Weight of Sub-Sample - W(g): 56.512

Elapsed Time (min)	Hydrometer Reading	Corrected Hydrometer Reading	Temperature (°C)	Temperature Coefficient (K)	Effective Depth (L)	Grain Diameter (mm)	Percent in Suspension (%)	Calculated Weight of Retained Soil (g)	Percent Passing by Weight (%)
0	-	-	-	-	-	-	-	-	-
0.5	44.0	39.0	20.9	0.0134	9.08	0.0573	68.2	816.82	68.2
1	40.0	35.0	20.9	0.0134	9.73	0.0419	61.2	733.05	61.2
2	37.5	32.5	20.9	0.0134	10.14	0.0303	56.9	680.69	56.9
5	35.0	30.0	20.9	0.0134	10.55	0.0195	52.5	628.33	52.5
15	32.0	27.0	20.8	0.0134	11.05	0.0115	47.2	565.49	47.2
30	30.3	25.3	20.9	0.0134	11.33	0.0083	44.3	529.89	44.3
60	28.5	23.5	21.0	0.0133	11.62	0.0058	41.1	492.19	41.1
120	27.0	22.0	20.8	0.0134	11.87	0.0042	38.5	460.77	38.5
250	25.5	20.5	21.3	0.0133	12.11	0.0029	35.9	429.36	35.9
1440	22.5	17.5	19.9	0.0136	12.60	0.0013	30.6	366.52	30.6

Data Entered By: DPM
Date: 12/18/2013
File Name: 2512_77_hydrometer-ASTM-D422-R0.xls_15.xls

Checked By: CW
Date: 12/18/2013

ATT
ADVANCED TERRA TESTING

SPECIFIC GRAVITY TESTS ASTM D 854

CLIENT:	MWH	JOB NO.	2512-77
PROJECT:	Church Rock	LOCATOIN:	Tailings Impoundment

BORING NO.	Top Soil	Top Soil
DEPTH	-	-
SAMPLE NO.	Top Soil - 01	Top Soil - 02
DATE SAMPLED	11/21/13 MWH	11/21/13 MWH
DATE TESTED	12/17/13 DPM	12/17/13 DPM
Pycnometer #	1	FF
Weight of oven dry soil (g) (Wo)	25.048	31.273
Weight of flask, soil, and water. (g) (Wb)	177.688	184.582
Temperature (deg. C) (Tx)	19.4	20.2
Weight of water & flask at Tx (from cal. curve)(Wa)	161.996	164.843
Specific Gravity*	2.68	2.71

*Specific Gravity = Wo/[Wo+(Wa-Wb)]

Data entry by: DPM Date: 12/17/2013
Data checked by: av Date: 12/17/2013
FileName: MWSGAS41

ADVANCED TERRA TESTING, INC. ATT

UNCONFINED COMPRESSIVE STRENGTH
ASTM D 7012; Method C (Previously ASTM D 2938)

CLIENT: MWH

JOB NO.: 2512-77

LOCATION:

DATE TESTED: 1/23/14 HN/BL

PROJECT: Church Rock

Specimen ID Boring, Depth(ft.), Rock type	Diameter (in.)	Length (in.)	Mass (gms)	Wet Density (pcf)	Failure Load (lb)	Failure Types **	Compressive Strength (psi)
56A2	1.993	3.922	552.9	172.2	64,968	S/F	*20780
56A4	1.993	4.218	594.4	172.1	59,580	S/F	19,100
56B2	1.994	4.377	627.2	174.8	73,805	S/F	23,630
56B4	1.993	4.338	615.4	173.2	45,043	F	14,440

Notes and Comments:

* Indicates regardless of ASTM D 7012 method C, sample with L/D < 2.0.
was tested and correction factor for short sample was applied to the calculation.

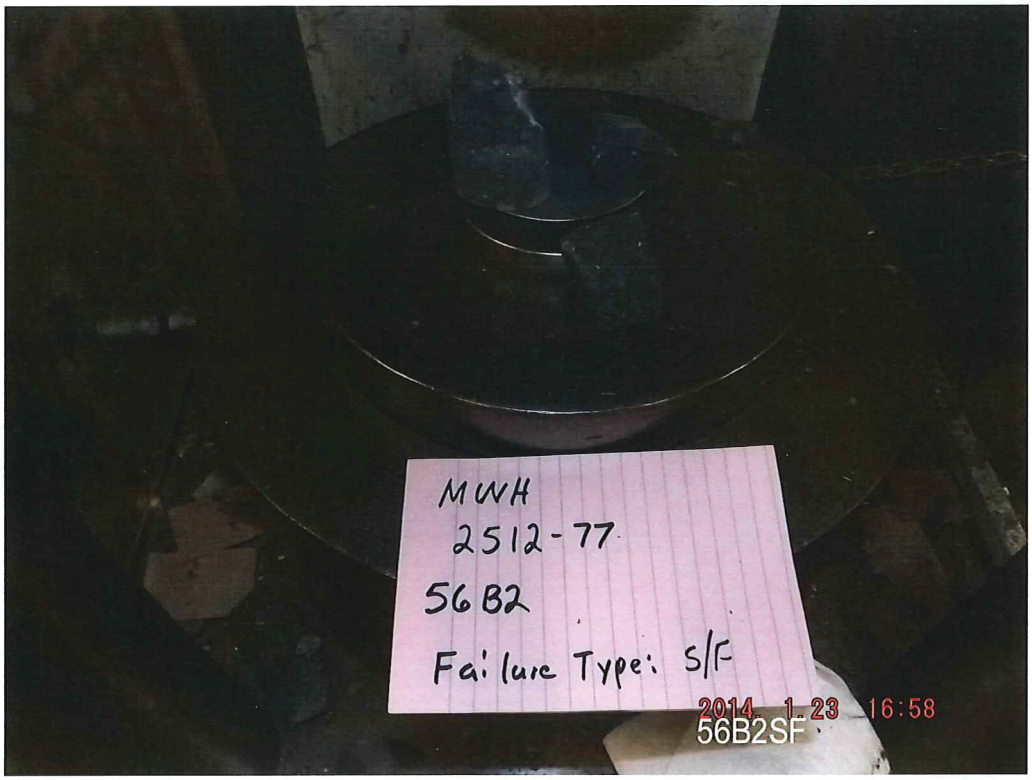
$C=Ca/[0.88+0.24b/h]$

Ca = Failure Load / Surface Area
b = Sample Diameter
h = Sample Length

** Failure types S: Shear Failure, M: Matrix Failure, F: Failure due to Fracture/Bedding, V: Void Failure, C: Combination

Data Entered By: BKL Date: 01/27/2014
Data Checked By: HN Date: 01/27/2014
Filename: MHUC77AA

ADVANCED TERRA TESTING, INC. ATT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56B2
Failure Type: S/F
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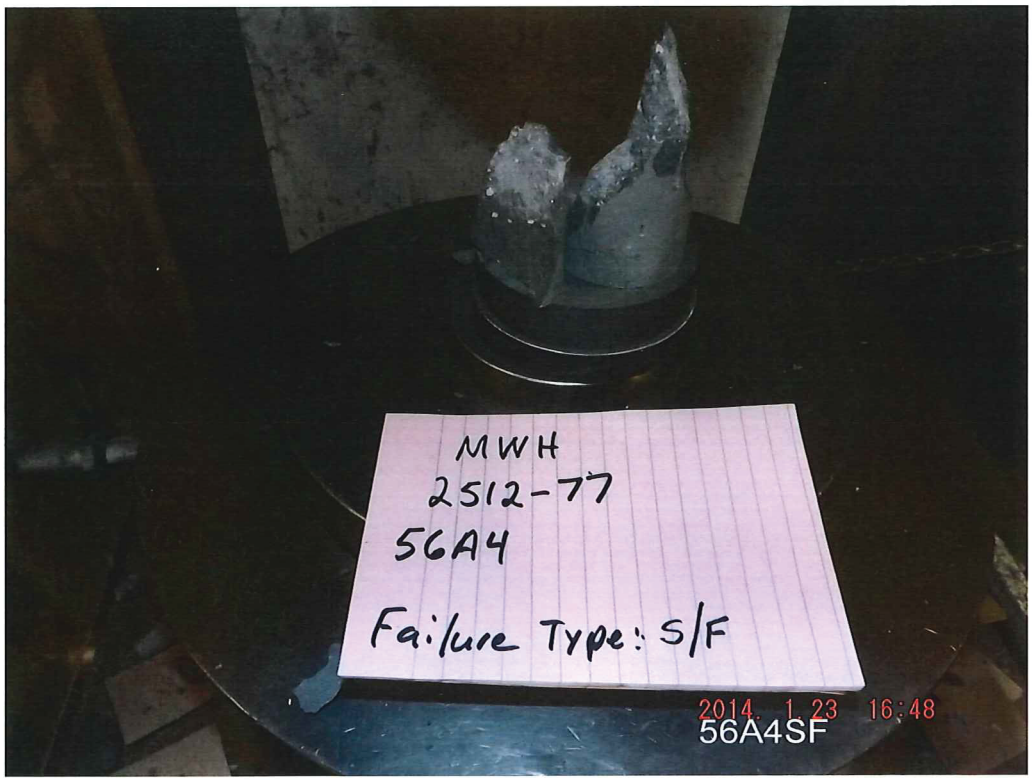
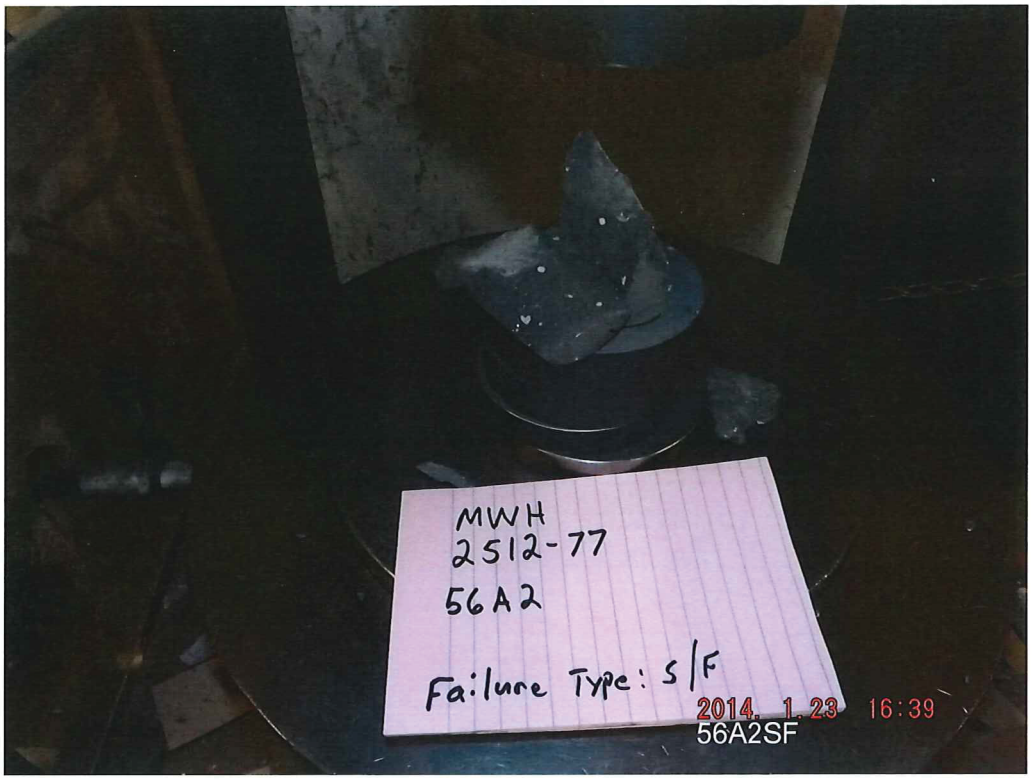
56B2SF


MWH
2512-77
56A4
Failure Type: S/F
2014. 1. 23 16:48
56A4SF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2512-77
56A2
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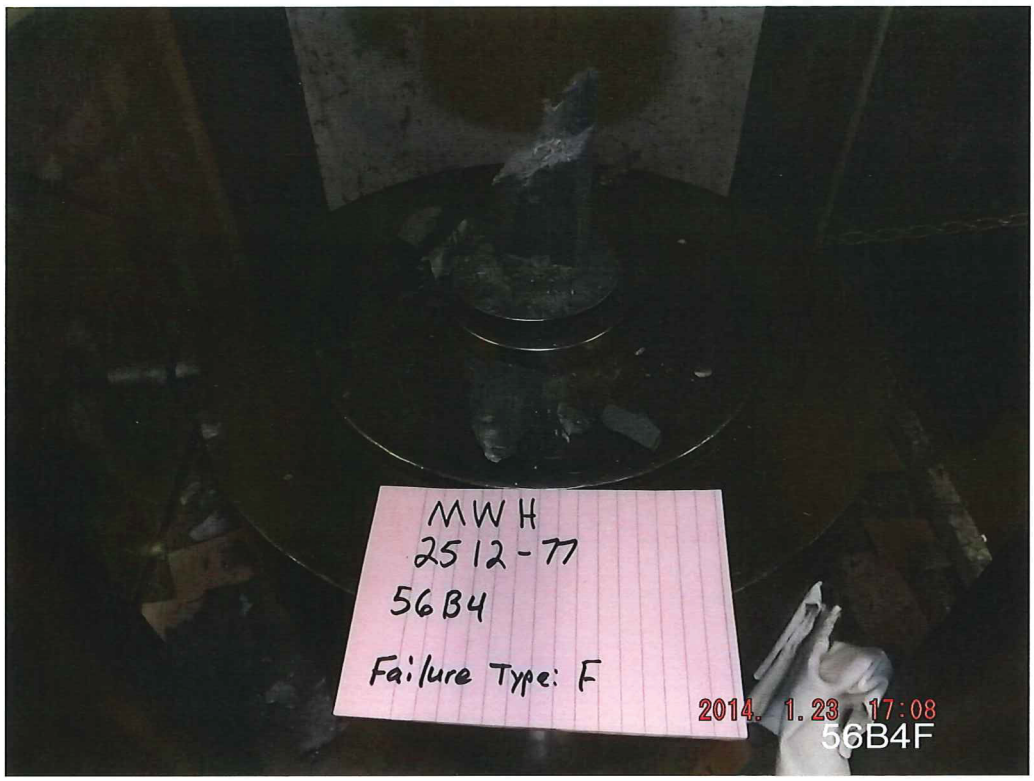
2014. 1. 23 16:39
56A2SF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56B4
Failure Type: F
2014. 1. 23 17:08
56B4F

SPLITTING TENSILE STRENGTH
By Method of Brazilian Disk
ASTM D 3967

CLIENT: MWH

JOB NO.: 2512-77

LOCATION:

DATE TESTED: 1/23/14 HN/BL

PROJECT: Church Rock

Specimen ID Boring, Sample No., Depth(ft.)	Diameter (in.)	Length (in.)	Mass (gms)	Wet Density (pcf)	Failure Load (lb)	Failure Type *	Splitting Tensile Strength (psi)
56A1	1.992	0.958	132.8	169.5	3,946	S	1,320
56A3	1.991	1.032	145.6	172.6	4,528	S	1,400
56B1	1.992	0.984	140.7	174.8	4,696	S	1,530
56B3	1.991	0.977	138.4	173.3	5,259	S	1,720

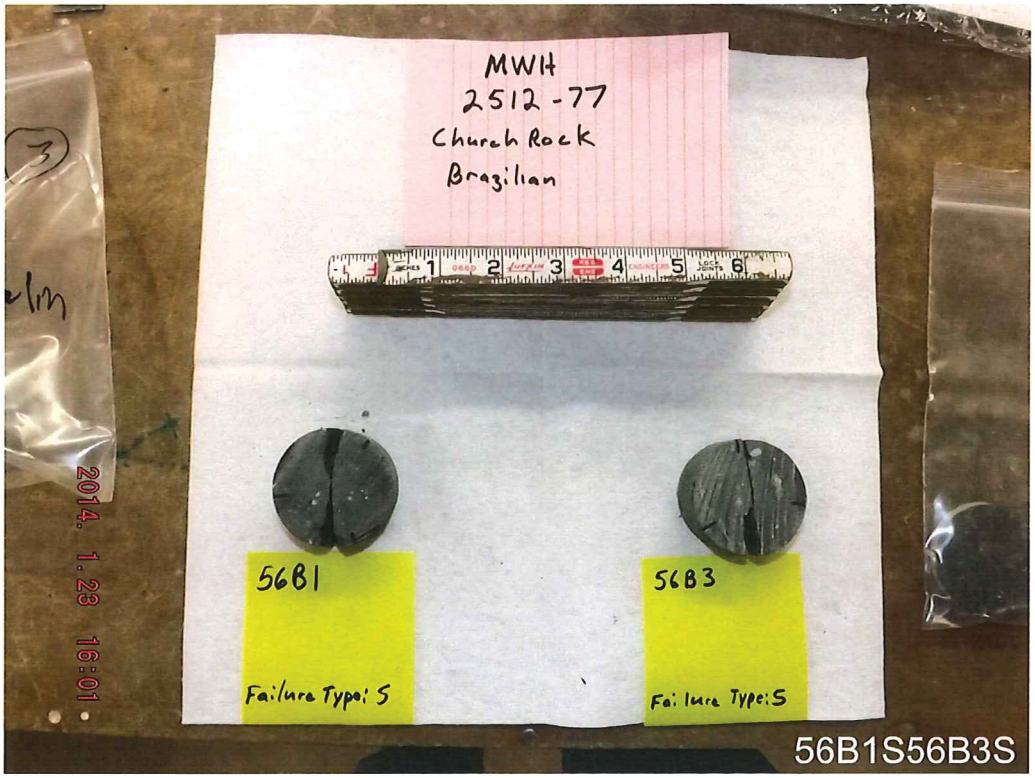
Notes and Comments:

Splitting Tensile Strength=2P/piLD.
P=Failure Load
pi = 3.1415926....
D = Sample Diameter
L = Sample Length

* Failure Type: S: Single Failure Plane, M: Multiple Failure Planes

Data Entered By: BKL Date: 01/27/2014
Data Checked By: HN Date: 01/27/2014
Filename: MHBD77BD

ADVANCED TERRA TESTING, Inc.
ATT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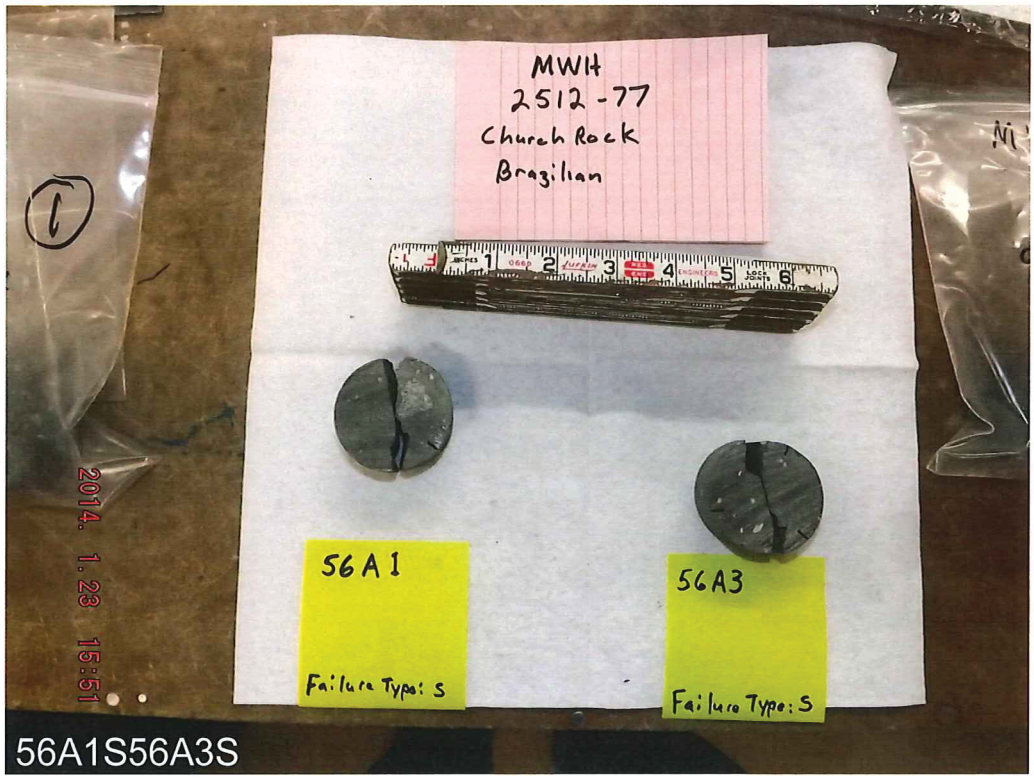
2512-77
Church Rock
Brazilian
56B1
Failure Type: S
56B3
Failure Type: S
2014. 1. 23 16:01
56B1S56B3S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2512-77
Church Rock
Brazilian
56A1
Failure Type: S
56A3
Failure Type: S
2014. 1. 23 15:51
56A1S56A3S

CTC-GEOTEK, INC
ENGINEERING TESTING INSPECTION

Project Name: Church Rock (ATT Job No. 2512-77)
Quarry Source: Church Rock
Project Number: 143002

Specific Gravity of Coarse Aggregate (ASTM C-127)
Sample: TI-SP2-01

Trial Number	1	2	3	Average
SSD Aggregate Weight	1156.6	1277.3	1303.0	
Immersed Agg. Weight	742.1	819	830.2	
Tare No.	R15	R-18	R-21	
Dry Agg. & Tare Weight	1268.9	1389.7	1403.0	
Tare Weight	133.4	132.8	127.1	
Dry Aggregate Weight	1135.5	1256.9	1275.9	
Apparent Specific Gravity	2.886	2.870	2.863	2.873
Bulk(SSD) Specific Gravity	2.790	2.787	2.756	2.778
Bulk(Oven Dry) Spec. Gravity	2.739	2.743	2.699	2.727
Percent Absorption	1.858	1.623	2.124	1.868

Specific Gravity of Coarse Aggregate (ASTM C-127)
Sample: TI-SP4-01

Trial Number	1	2	3	Average
SSD Aggregate Weight	1250.7	1300.9	1311.9	
Immersed Agg. Weight	797.7	830.3	832.4	
Tare No.	R17	R-20	R-24	
Dry Agg. & Tare Weight	1343.8	1396.9	1406.2	
Tare Weight	117.5	120.7	124.4	
Dry Aggregate Weight	1226.3	1276.2	1281.8	
Apparent Specific Gravity	2.863	2.862	2.852	2.859
Bulk(SSD) Specific Gravity	2.762	2.764	2.736	2.754
Bulk(Oven Dry) Spec. Gravity	2.708	2.712	2.673	2.698
Percent Absorption	1.990	1.935	2.348	2.091

155 SOUTH NAVAJO STREET DENVER, COLORADO 80223 303 698 1050 (FAX) 303 698 1053

CTC-GEOTEK, INC.
155 South Navajo Street
Denver, Colorado 80223

Date: 2-17-2014
Technician: JW

Project Name: Church Rock (ATT Job No. 2512-77)
Quarry Source: Church Rock
Project Number: 143002

ASTM C 88-93, "Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate"

Sample Identification: **Sample TI-SP4-01**

Chemical Used: **Sodium Sulfate** (Na_2SO_2)

QUANTITATIVE EXAMINATION

	INITIAL INDEPENDENT GRADING		FINAL COMBINED FRACTION GRADING				
	Required Amount (gm)	Actual Amount (gm)	Grading of Original Sample (%)	Weight of Test Fractions Before Test (gm)	Weight of Test Fractions After Test (gm)	Percent Passing Designated Seive After Test	Weighted Percentage Loss
2 1/2" (63.0 mm) to 1 1/2" (37.5 mm)	**5000 ± 300**	**0.0**	—	—	—	—	—
2 1/2" (63.0 mm) to 2.0" (50.0 mm)	3000 ± 300	—					
2.0" (50.0 mm) to 1 1/2" (37.5 mm)	2000 ± 200	—					
1 1/2" (37.5 mm) to 3/4" (19.0 mm)	**1500 ± 50**	**1504.1**	100.0	1504.1	1346.6	10.5	10.47
1 1/2" (37.5 mm) to 1.0" (25.0 mm)	1000 ± 50	1010.2					
1.0 (25.0 mm) to 3/4" (19.0 mm)	500 ± 30	493.9					
3/4" (19.0 mm) to 3/8" (9.5 mm)	**1000 ± 10**	**1001.5**	100.0	1001.5	884.1	11.7	11.72
3/4" (19.0 mm) to 1/2" (12.5 mm)	670 ± 10	671.5					
1/2" (12.5 mm) to 3/8" (9.5 mm)	330 ± 10	330.0					
3/8" (9.5 mm) to No. 4 (4.75 mm)	**300 ± 5**	**303.7**	100.0	303.7	237.8	21.7	21.70
3/8" (9.5 mm) to No. 4 (4.75 mm)	300 ± 5	303.7					

* "Grading of Original Sample" is compared to the average grading of No. 467 (Coarse Aggregate) of ASTM C 33-93.

QUALITATIVE EXAMINATION

	Particles Exhibiting Distress								Total Number of Test Particles	
	Splitting		Crumbling		Cracking		Flaking			
	No.	%	No.	%	No.	%	No.	%	Initial	Final
2 1/2" (63.0 mm) to 1 1/2" (37.5 mm)	—	—	—	—	—	—	—	—	—	—
1 1/2" (37.5 mm) to 3/4" 19.0 mm)	0	0.0	3	6.8	0	0.0	0	0.0	44	42

CTC-GEOTEK, INC.
155 South Navajo Street
Denver, Colorado 80223

Date: 2-17-2014
Technician: JW

Project Name: Church Rock (ATT Job No. 2512-77)
Quarry Source: Church Rock
Project Number: 143002

ASTM C 88-93, "Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate"

Sample Identification: **Sample TI-SP2-01**

Chemical Used: **Sodium Sulfate** **(Na_2SO_2)**

QUANTITATIVE EXAMINATION

	INITIAL INDEPENDENT GRADING		FINAL COMBINED FRACTION GRADING				
	Required Amount (gm)	Actual Amount (gm)	Grading of Original Sample (%)	Weight of Test Fractions Before Test (gm)	Weight of Test Fractions After Test (gm)	Percent Passing Designated Seive After Test	Weighted Percentage Loss
2 1/2" (63.0 mm) to 1 1/2" (37.5 mm)	**5000 ± 300**	**0.0**	—	—	—	—	—
2 1/2" (63.0 mm) to 2.0" (50.0 mm)	3000 ± 300	—					
2.0" (50.0 mm) to 1 1/2" (37.5 mm)	2000 ± 200	—					
1 1/2" (37.5 mm) to 3/4" (19.0 mm)	**1500 ± 50**	**1504.5**	100.0	1504.5	1380.3	8.3	8.26
1 1/2" (37.5 mm) to 1.0" (25.0 mm)	1000 ± 50	998.0					
1.0 (25.0 mm) to 3/4" (19.0 mm)	500 ± 30	506.5					
3/4" (19.0 mm) to 3/8" (9.5 mm)	**1000 ± 10**	**1007.7**	100.0	1007.7	933.9	7.3	7.32
3/4" (19.0 mm) to 1/2" (12.5 mm)	670 ± 10	676.3					
1/2" (12.5 mm) to 3/8" (9.5 mm)	330 ± 10	331.4					
3/8" (9.5 mm) to No. 4 (4.75 mm)	**300 ± 5**	**300.1**	100.0	300.1	249.0	17.0	17.03
3/8" (9.5 mm) to No. 4 (4.75 mm)	300 ± 5	300.1					

* "Grading of Original Sample" is compared to the average grading of No. 467 (Coarse Aggregate) of ASTM C 33-93.

QUALITATIVE EXAMINATION

	Particles Exhibiting Distress								Total Number of Test Particles	
	Splitting		Crumbling		Cracking		Flaking			
	No.	%	No.	%	No.	%	No.	%	Initial	Final
2 1/2" (63.0 mm) to 1 1/2" (37.5 mm)	—	—	—	—	—	—	—	—	—	—
1 1/2" (37.5 mm) to 3/4" 19.0 mm)	0	0.0	1	2.2	1	2.2	0	0.0	46	43

CTC-GEOTEK, INC.
155 South Navajo Street
Denver, Colorado 80223

Date: 2-17-2014
Technician: JW

Project Name: Church Rock (ATT Job No. 2512-77)
Quarry Source: Church Rock
Project Number: 143002

ASTM C 131, "Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine"

Grading Used: Grading "A"

Sieve Size		Required Grading (gm)	Actual Grading Weights			
Passing	Retained		Sample TI-SP2-01	Sample TI-SP4-01		
1 1/2 in. (37.5 mm)	1.0 in. (25.0 mm)	1250 ± 25	1247.8	1249.2		
1.0 in. (25.0 mm)	3/4 in. (19.0 mm)	1250 ± 25	1250.5	1249.1		
3/4 in. (19.0 mm)	1/2 in. (12.5 mm)	1250 ± 10	1254.6	1250.3		
1/2 in. (12.5 mm)	3/8 in. (9.5 mm)	1250 ± 10	1249.6	1253.1		
Total Aggregate Accumulated		5000 ± 10	5002.5	5001.7		

Initial Weight (gm)	5002.5	5001.7		
Unwashed Weight at 100 Rev. (gm)	4716.1	4694.3		
Washed Weight at 500 Rev. (gm)	3779.7	3825.5		

Percent Loss at 100 Revolutions	5.7	6.1		
Percent Loss at 500 Revolutions	24.4	23.5		
Uniform Hardness Ratio	0.234	0.261		

*No. 12 (1.70 mm) Sieve was used to determine "Percent Loss"