GEOTECHNICAL INVESTIGATION REPORT

ST. GEORGE REPLACEMENT AIRPORT

St. George, Utah

Landmark Project No. 07330

October 15, 2007

Submitted to:

PBS&J
c/o Creamer & Noble Engineers
Attention: Dan Weiss
435 E. Tabernacle
St. George, Utah 84770

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1.0 INTRODUCTION

1.1 LOCATION OF PROJECT

The project is located approximately five miles southeast of St. George, Utah in Washington County. A vicinity map showing the project location relative to surrounding features is shown on Figure 1. The project will occupy approximately 1,300 acres in various sections within Township 43 South, Range 15 West. Land within the project is owned or administered by the Utah State School and Institutional Trust Lands Association (SITLA), the City of St. George, the U. S. Bureau of Land Management (BLM), and private individuals.

1.2 PURPOSE OF PROJECT

The purpose of the project is to provide a replacement airport meeting applicable FAA design standards that will serve the needs of the St. George area through 2020. The existing airport site, due to topographic constraints, is incapable of meeting forecasted demand levels and aircraft type.

1.3 PROJECT DESCRIPTION

The project centers around a 9,300 feet runway with future expansion potential and east and west taxiways. Projected aircraft information is presented in the following table:

Aircraft Type	Gross Weight (lbs)	Annual Departures
Dual Wheel - 50	50,000	3,680
Dual Wheel -75	75,000	1,226
Dual Wheel - 100	100,000	1,200
B-737-700	153,500	50
Learjet-35A/65A	18,000	1,200
Gulfstream-G-IV	75,000	50
Gulfstream-G-V	90,900	50

Infrastructure associated with the airport will include a passenger terminal and parking area, approximately 412,500 square feet of terminal apron, airport Rescue and Fire Fighting building, a maintenance complex, fuel farms at each end of the runway, and cargo and general/executive hangers. Access will be provided to the west side by upgrading the current paved road from the Little Valley area and via a connection from the future Southern Corridor Highway on the east side. A site plan showing the general layout of facilities is shown on Figure 2. Figure 2 also presents the locations of exploratory borings completed at the project. The borings with a "P" designation were drilled by Applied Geotechnical Engineering Consultants[1] as part of a preliminary investigation for the airport and the boring logs are not included in this report.

Parcels within the southwest portion of the project have been cleared and previously sprinkler irrigated. With the exception of the existing runway, a few corrals, and a covered facility for flying radio-controlled airplanes, the majority of the land within and surrounding the proposed replacement airport site is undeveloped.

2.0 GEOLOGIC SETTING

2.1 REGIONAL GEOLOGY

The St. George basin lies within the transitional zone between the Colorado Plateau to the east and the Basin and Range Province to the west. Southwestern Utah is located on a structural block proximate to the southern segment of the Intermountain Seismic belt, which is characterized by high-angle normal faults that tend to step down to the west (Higgins and Willis, 1995)[2]. The Hurricane fault with an offset of 6,000 to 8,000 feet forms the eastern edge of the transition zone. The Grand Wash-Reef Reservoir-Gunlock fault system with displacement of about 1,500 to 3,000 feet forms the western edge.

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[1]Preliminary Geotechnical Investigation, Proposed St. George Replacement Airport, St. George, Utah; Project No. 2010950, dated July 31, 2003.

[2]Higgins, J.M. and Willis, G.C., August 1995, Interim Geologic Map of the St. George Quadrangle, Washington County, Utah; Utah Geological Survey Open-File Report 323.

The regional dip of strata is to the northeast at about 5 to 10 degrees, however, strata within the St. George quadrangle has been compressed into broad north-east-trending synclines and anticlines of which theVirgin Anticline is the most prominent.

Strata within the airport area consists of Quaternary age alluvial, eolian, and colluvial deposits and the Triassic age Chinle Formation.

2.2 SEISMICITY

Seismicity at the project was determined using the United States Geological Survey, Earthquake Hazards Program website. Near the center of the proposed runway the site latitude is 37.0351 and the longitude is -113.5119. The peak ground acceleration resulting from a large earthquake at the site with a 2% probability of being exceeded in 50 years is 0.21g. The 10% probability of being exceeded in 50 years is 0.09g.

2.2.1 SURFACE FAULT RUPTURE and GROUND SHAKING

The projected trace of the Washington fault is located approximately 1.5 miles east of the site. The Washington fault is a major north-trending, high-angle, down-to-the west normal fault. Higgins and Willis (1995) indicate that the Washington fault displaces late Quaternary sediments and is considered active. Studies completed by Dames & Moore (1994)[3] for the Ivins Bench dam assigned a potential magnitude M 7.25 as an upper bound for the Washington Fault. Strong ground motion associated with movement along the Washington or other faults associated with the Intermountain Seismic Belt is possible.

A set of northwest trending, high angle normal faults with opposing offset form a small graben structure near the south end of the west taxiway and runway as shown on photograph 1 of Figure 3. These faults offset the Shinarump Conglomerate. Higgins and Willis did not find any evidence of Quaternary movement on these faults and evidence of Quaternary movement was not noted in our field investigation. These faults are not considered active and are not expected to impact planned development.

[3] Dames & Moore, 1994, Geotechnical Investigation of Ivins Bench Dam, submitted to Ivins Bench Irrigation Company.

2.3 SITE GEOLOGY

2.3.1 STRATIGRAPHY

The geology of the site is portrayed on Figure 4. The site generally consists of alluvial, colluvial, and eolian deposits overlying mudstone, claystone, and sandstone of the Chinle Formation. Descriptions of the material encountered are presented below.

Alluvial and eolian deposits (Qae,Qeao)- These deposits were encountered throughout the site with the exception of the extreme south end. Deposits range from fine-grained to gravel sized material and generally classify as silty or clayey sand. The older deposits (Qeao) forms somewhat higher topography at the site and has weak to strong carbonate (caliche) cementation (see Photograph 2, Figure 3). These deposits range up to 20 feet thick as encountered in several borings. Small dune deposits are present throughout and comprise the upper several feet particularly on the northern half of the site. With the exception of the upper several feet where dune deposits may be encountered, these deposits are medium dense to very dense.

Colluvial and alluvial deposits (Qac)- These deposits are relatively isolated and are deposited as accumulations of material at the toe of slopes. This material ranges from clayey to silty sand with abundant gravel and occasional cobbles.

Petrified Forest Member of the Chinle Formation -This member is blue to purple, mudstone and claystone with sandstone interbeds. The Petrified Forest Member of the Chinle Formation is responsible for most of the foundation distress throughout Washington County due to the high swell potential of bentonitic clay within the member. For the purpose of this report the material is classified as mudstone where the plasticity index is relative low (less than 20) and contains abundant sand. Where the plasticity index is high (+20) and predominantly lean to fat clay the material has been classified as claystone. It should be emphasized that the claystone interbeds will be present within the areas classified as mudstone.

The classification between mudstone and claystone is important for the terms of this report since the claystone will have a high swell potential and the mudstone will be low to moderate.

Due to the abundant clay and mudstone material this formation weathers to shallow slopes. It is generally covered by alluvial material, however, where exposed mudcracks are present near-surface particularly where claystone (lean to fat clay) is exposed.

Shinarump Conglomerate Member of the Chinle Formation- This member consists of gray-orange to yellowish-brown, well cemented, sandstone. Due to its resistant nature this member forms the caprock on many of the plateaus through the area. Excavations in this material will require blasting. The sandstone is moderately hard to hard with medium (8-24 inches) to widely (2-6 feet) spaced joints.

2.3.2 STRUCTURE

The majority of structural features within the airport area are masked by Quaternary deposits. Two anticlinal structures with an intervening syncline have been mapped by Willis and Higgins (1995) near the southern end of the project. The overall dip of the strata changes somewhat throughout the features, however, this in only apparent where the Shinarump Conglomerate is exposed. The bedrock dips to the southeast at 2-4 degrees on the eastern limb of the anticlines and the dip changes to around 5 degrees to the west-northwest on the western limb of the anticlines.

The west taxiway will have significant cuts in this area while the east taxiway will have significant fills. The bedding direction will influence the rippability of the near-surface bedrock particularly if ripping can be accomplished downslope and parallel to the dip direction. However, blasting should be anticipated for cuts in excess of 2-3 feet in the Shinarump Conglomerate.

Joint spacing within the bedrock is the result of regional deformation and the weathering characteristics of the bedrock. Regional deformation commonly produces a strong north-northeast joint trend with a minor northwest set. A weaker set perpendicular to the regional deformation is also prevalent. For the Petrified Forest Member joints are closely to moderately spaced (2.4 to 24 inches). The joint spacing combined with bedding plane partings results in material that can typically be excavated with moderate to heavy ripping. For the Shinarump Conglomerate joints are medium to widely spaced (0.67 to +6 feet) and bedding plane partings occur much less frequently. Blasting should be anticipated.

2.4 GROUNDWATER

Groundwater was not encountered in the borings, however, moist to wet conditions were noted in WT-4 beneath the existing pavement area. Water that percolates through surficial deposits tends to perch on top of the Petrified Forest Member. Significant groundwater in not anticipated, however, isolated zones of perched water may be encountered near the surficial deposit/Petrified Forest Member cotact.

A search of the Utah State Division of Water Rights well data base indicates that wells within the area have static water levels ranging from 140 to 226 feet below the existing ground surface.

3.0 SITE DESCRIPTION

3.1 SURFACE

In order to portray the existing topography, the proposed final elevations, the extent of cut and fill required, and the subsurface conditions; idealized cross-sections of the east and west taxiways and the runway were developed and are portrayed on Figures 5 through 7. The overall site elevation dips downward towards the south-southwest. The elevation of the existing ground surface at the west taxiway varies from 2880 feet on the north end to 2808 feet on the south end. The existing ground surface rises near boring WT-4 to a maximum elevation of approximately 2885 feet. The lowest area within the section is near boring WT-12 where a substantial drainage is located with a ground surface elevation of 2765 feet.

The elevation of the existing ground surface at the runway varies from 2875 feet on the north end to 2775 feet on the south end at boring RW-16. The existing ground surface rises near boring RW-4 to a maximum elevation of approximately 2877 feet. The lowest area within the section is near boring RW-16.

The elevation of the existing ground surface at the east taxiway varies from 2850 feet on the north end to 2820 feet on the south end. The existing ground surface rises near boring ET-6 to a maximum elevation of approximately 2872 feet. The lowest area within the section is near boring ET-13 with a ground surface elevation of 2795 feet.

Overall, vegetation at the site is sparse and consists of creosote, cactus, and low-lying desert plants. The southern portion of the old runway is intact and is being used as a landing strip for radio controlled model planes. The center and northern portions of the existing runway have been pulverized.

A parking awning is present near the south end of the existing runway to provide shade for flying of radio controlled model planes. Remaining structures are limited to small sheds/outbuildings and corrals. Several dirt roads traverse the site.

3.2 SUBSURFACE CONDITIONS

Subsurface conditions were evaluated by drilling 64 borings (borings ET-1, WT-11, WT-12, and RW-13 were not drilled due to access restriction and the fact that they are covered by deep fills) and excavating 15 test pits. The boring locations are shown on Figure 2. Borings were drilled to assess subsurface conditions and to obtain samples for testing. The boring logs are presented in Appendix A. Test pits were excavated adjacent to boring locations and were completed to: (1) evaluate the excavatability of the material with a CAT 320 C trackhoe, (2) obtain bulk samples for subsequent laboratory testing, and (3) complete moisture/ density tests with a nuclear density gauge to evaluate existing conditions. Test pit locations and depths are summarized in the following table.

Test Pit No.	Depth (ft)	Test Pit No.	Depth (ft)
TP-WT-1	Complete to 10 feet	TP-RW-6	Complete to 10.5 feet
TP-WT-3	Complete to 15 feet	TP-RW-8	Backhoe refusal at 4.5 ft in caliche
TP-WT-5	Backhoe refusal at 7 ft in caliche	TP-ET-2	Complete to 5 feet
TP-WT-8	Complete to 5 feet	TP-ET-5	Complete to 13 feet
TP-WT-9	Backhoe refusal at 1 ft in sandstone	TP-ET-7	Complete to 6 feet
TP-RW-2	Backhoe refusal at 3 ft in caliche	TP-A-3	Backhoe refusal at 5 ft in caliche
TP-RW-5	Complete to 15 feet	TP-A-4	Complete to 15 feet
		TP-LS-5	Backhoe refusal at 2 ft in caliche

Borings were completed with a CME 55 and a Mayhew 1000 drill rig. The CME 55 utilized 8.25-inch O.D. hollow-stem augers with a 3.0-inch O.D., split barrel, drive sampler. Where coring was required, NX core was obtained utilizing air-rotary methods. The Mayhew 1000 utilized a 6-inch drive bit with air-rotary drilling. Samples with the Mayhew 1000 were obtained with a 3.0 inch O.D., split barrel, drive sampler. All drive samples were driven with a 140 pound hammer dropping 30 inches.

Borings encountered surficial deposits overlying the Petrified Forest Member or the Shinarump Conglomerate Member of the Chinle Formation. Descriptions are presented below:

Surficial Deposits - Surficial deposits range from several inches to over 20 feet in depth with the deepest deposits on the north end of the site. The northern portion of the runway and taxiways will encounter this material and we anticipate that this material will predominantly be used as fill. Willis and Higgins (1995) identify these deposits as alluvial, eolian, or colluvial deposits. Based on drilling, these deposits classify as silty sand, silty gravel, clayey sand, poorly graded sand, or caliche. The surficial deposits are dry and consistency ranges from medium dense to dense with the exception of small dune deposits near the surface. Caliche cementation is prevalent particularly on the north, central, and east portions of the project where backhoe refusal was noted in confined excavations.

Bulk samples were obtained from borings and test pits on which California Bearing Ratio (CBR) tests were completed. The CBR values ranged from 5 to 65 with an average value of 32. Water soluble sulfates and solubility tests were also completed. Total water soluble sulfates ranged from 0.01% to 0.03%. Thus, the samples classify as having "negligible" sulfate exposure. However, previous studies by AGEC encountered water soluble sulfates in the "severe" exposure range. Three additional samples used to assess the effectiveness of lime stabilization had soluble sulfate concentrations of 864, 950, and 21,641 ppm.

Petrified Forest Member (Mudstone) - For the purposes of this report the Petrified Forest member has been divided into two classifications - mudstone or claystone. Material classified as mudstone includes sandy portions of the member, has a plasticity index of less than 20, and displays low to medium swell potential (less than 4% swell under loads of 250 to 500 psf). Where weathered or decomposed, this material classifies as lean clay. The mudstone portion of the member is located near the bottom of the member and lies above the contact with the Shinarump Conglomerate. The general location of this material is shown on the sections on Figures 5 through 7. It must be emphasized that the mudstone/claystone classification is gradational and claystone may be interbedded within mudstone. Overexcavation and replacement or improvement will be required where this material is encountered near final grades.

Petrified Forest Member (Claystone) - Claystone identified within the Petrified Forest member classifies as lean to fat clay, where weathered, or as claystone. This material generally has a plasticity index of greater than 20 and displays medium to high swell potential (greater than 4 percent under loads of 250 to 500 psf). This material is generally located higher in the Petrified Forest Member section and the general location is shown on Figures 5 through 7. Overexcavation and replacement or improvement will be required where this material is encountered near final grades.

CBR values in the Petrified Forest member (including both claystone and mudstone) range from 1.5 to 2.4.

Shinarump Conglomerate of the Chinle Formation - The Shinarump conglomerate classifies as a hard, durable sandstone. This deposit will be located towards the southern portions of the runway and taxiways as shown on Figures 5 through 7. The Shinarump is moderately hard, moderately jointed, and thinly to thickly bedded. Blasting should be expected in this formation. Unconfined compressive strengths in this material ranged from 4,080 to 15,720 psi.

4.0 LABORATORY DATA

Samples obtained during the field investigation were returned to our St. George laboratory where the samples were inspected to verify the field classifications and to select representative samples for laboratory testing. The tests were performed to assist in soil classification and to determine physical and engineering characteristics. To facilitate the timeframe for this report, samples upon which swell tests were completed were sent to the Intermountain Geotechical and Environmental Services (IGES) soils laboratory in Salt Lake City.

Laboratory tests included moisture and unit weight, mechanical sieve analyses, Atterberg limits, swell tests, water soluble sulfate and solubility, unconfined compressive strength, triaxial compression, moisture-density relationships, and California Bearing Ratio (CBR). The majority of the test results are presented on the boring logs in Appendix A. The results of the laboratory tests are summarized on Table 1. Table 1 is located behind the boring logs in Appendix A and at the beginning of Volume 2. Laboratory Test data is contained in Volume 2.

5.0 ANALYSES

5.1 SWELL POTENTIAL

A previous report completed by Applied Geotechnical Engineering Consultants (2003) included extensive analyses on swell potential of material at the site. The AGEC report generally classified the Petrified Forest member as mudstone and did not differentiate between mudstone and claystone as attempted herein.

Swell potentials determined by AGEC based on one-dimensional swell tests ranged from about 1.5 to 4.2 percent for all samples tested. The one-dimensional tests were completed at overburden pressures ranging from 250 to 4,500 psf.

The majority of one-dimensional swell tests completed by AGEC were at pressures of 1,000 psf or greater. Their highest swell of 4.2 percent was noted on a sample under a pressure of 500 psf. Since significant cuts will be required on the taxiways and runway, one-dimensional swell tests were completed for this report on a number of samples at loads of 150 to 500 psf. These loads would be similar to the loads on clays at depth following cuts and treatment of the upper 2-5 feet of soils. Our testing indicated significantly higher swell at lower pressures and testing is summarized in the following table.

Boring No.	Sample Depth (ft)	Description	Confining Pressure (psf)	% Swell
WT-5	27.0	Claystone	150	3.8
WT-5	37.0	Claystone	1000	4.2
WT-6	22.0	Claystone	150	9.9
WT-6	27	Claystone	500	8.3
WT-8	2.0	Claystone	250	2.2
RW-4	27.0	Claystone	500	4.9
RW-5	17.0	Claystone	500	6.3
RW-6	17.0	Claystone	500	9.1
RW-7	7.0	Claystone	1000	4.0
ET-6	22.0	Claystone	250	9.6
ET-7	7.0	Mudstone	2000	1.3
A-5	5.0	Claystone	2000	2.27
WD-5	17.0	Claystone	250	9.0
WD-6	32.0	Claystone	1000	4.8
WD-8	22.0	Claystone	250	7.4

To assess the effect of moisture increase below the existing runway pavement versus areas outside of the pavement both one-dimensional swell tests and soil suction tests were completed by AGEC. Samples in the Petrified Forest Member adjacent to the runway had moisture contents ranging from about 15 to 19 percent. Samples beneath the existing runway had significantly higher moisture contents ranging from 17 to 32 percent with samples averaging 26 to 31 percent moisture. Samples below the pavement also exhibited lower soil suction values implying that moisture contents have increased below the pavement section. AGEC concluded that changes in moisture content has occurred to a depth of about 20 feet below the runway. Additional heave on the order of 0.0 to 0.5 inches could occur with additional moisture changes within the upper 20 feet below the runway. They calculated potential heave ranging from 3.5 to 8.5 inches in areas that are not covered by pavement that currently have lower moisture contents but where the moisture content would likely increase over time when covered by pavement.

To assess the potential for increases in the moisture content under paved and unpaved section, continuous samples were obtained from WT-4 completed within the existing paved runway section. This boring encountered surficial deposits consisting of silty sand, clayey sand, and lean clay extending to 14 feet and claystone below 14 feet. The moisture content in the surficial deposits ranged from 8.1 to 19.7 percent (see boring log in Appendix A). In contrast moisture content in surficial deposits throughout the site generally ranged from 1.0 to 12.2 percent.

Appropriate treatment of near-surface claystone (upper 3-4 feet) will reduce moisture migration, however, based on field and laboratory investigations increases in the moisture content and associated swell within claystone at depth should be anticipated over time beneath paved areas. Methods to improve the upper 3-4 feet of expansive soils are presented subsequently in this report, however, adequate drainage measures are critical to minimize the potential of saturation of clays/claystone beneath both paved and unpaved areas.

5.2 SUBGRADE IMPROVEMENT

In order to evaluate potential methods of treating subgrade soils in clay/claystone tests were completed for three conditions: (1) blending the clay/claystone with on-site, non-swelling soils to reduce the swell potential and improve the support characteristics, (2) reducing the swell potential by overexcavation of the material and compacting the material at higher moisture contents and (3) lime stabilization of the potentially expansive soils.

5.2.1 SOIL BLENDING

To evaluate whether blending clay/claystone with non-swelling soils reduces the overall swell potential and improves support characteristics laboratory tests were completed using various blends of clay and non-swelling soils obtained from the site. Test were completed on the following blends:

- 25% non-expansive soil with 75% clay
- 50% non-expansive soil with 50% clay
- 75% non-expansive soil with 25% clay

The clay portion used in the tests was obtained from test pit TP-RW-6 at a depth of 10.5 feet. The non-swelling portion was obtained from test pit TP-RW-2. Test results are presented in the following table:

Blend	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Maximum Swell (%)	CBR Value
75% clay/25% non-expansive	112.0	16.0	12.5	1.5
50% clay/50% non-expansive	118.0	14.0	6.5	2.2
25% clay/75% non-expansive	123.0	10.5	2.4	4.7

Based on test results, blending expansive clay with non-expansive soils increases the maximum dry density, decreases the optimum moisture content, and significantly decreases the maximum swell. The CBR value did not significantly increase, however, an increase was noted.

5.2.2 MOISTURE CONDITIONING

FAA guidelines[4] recommends using ASTM D-1557 for moisture/density relationships for pavements designed to serve aircraft weighing 30,000 pounds or more. Dual wheel aircrafts with gross weights ranging from 50,00 to over 153,500 pounds are anticipated. To assess the effect that varying moisture content has on the swell potential, bulk samples of claystone were obtained from test pit TP- ET-7 at 7 feet. Moisture-density relationships (Proctor - ASTM D-1557) were completed on the sample to assess the maximum dry density and the optimum moisture content. The percent swell was then evaluated at moisture contents ranging from -2% to +4% over optimum under a 250 psf load. The samples were compacted at 90% of the maximum dry density. Test results are summarized below.

Sample Description	Optimum Moisture content and maximum dry density	% Swell -2%	% Swell Optimum	% Swell +2%	% Swell +4%
ET-7 at 7 feet	114.4 pcf @ 15.2%	5.94%	4.91%	3.11%	1.69%

AGEC completed similar tests, however, swells were evaluated at loads of 1,000 psf and moisture density relationships were evaluated using ASTM D-698. They recorded swells of less than 0.5% for moisture contents above optimum. The percentage of compaction of samples tested was not given. However, laboratory tests show a significant reduction in swell for samples compacted at +2 to +4% over the optimum moisture content.

5.2.3 LIME STABILIZATION

AGEC concluded from laboratory testing conducted by CTL Thompson that lime stabilization was ineffective in stabilizing and reducing swell potential of the natural mudstone/claystone. Percentages of "Quicklime" ranging from 3 to 7 percent were added to a blend of mudstone/claystone samples. Recorded swells were 2.6%, 0.5% and 1.2% for 3%, 5%, and 7% Quicklime, respectively.

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[4]U.S. Department of Transportation, Federal Aviation Administration, Airport Pavement Design and Evaluation, Advisory Circular No. 150/5320-6D, includes 1/30/96 and 4/30/2004 changes.

Since the swell noted in the AGEC report are in-line with those noted by compacting at water contents above optimum at similar pressures, additional evaluations were performed using lime stabilization. The analyses were completed by Dr. Dallas L. Little[5] for Chemical Lime Company. Utilizing "Soil Survey" reports for Washington County, reported data from the AGEC report, and data from additional tests completed as part of this investigation; Dr. Little evaluated the potential of the soils to exhibit significant growth of expansive ettringite. Based on the data evaluated, the thermodynamic threshold for ettringite to form was estimated to be where sulfate contents approximated 3,000 ppm. Approximately 15% of the soils tested had sulfate contents exceeding 3,000 ppm, thus, there is a potential to form ettringite. However, based on mass-balance calculations the potential would be low. To minimize migration of sulfates it was stresses that uniform mixing, proper drainage, minimization of moisture migration, and utilizing proper construction protocols would be required.

Dr. Little concluded that lime treatment of moderately plastic and highly plastic soils should have substantial benefit with increases of CBR values to 20 or greater. A more thorough analysis of soils from various locations throughout the project would be necessary before final recommendations could be provided. Dr. Little's write-up is included behind the figures attached to this report.

5.3 SUBGRADE SUPPORT

In order to evaluate subgrade support Landmark Testing & Engineering completed California Bearing Ratio (CBR) tests on eight samples obtained from test pit excavations throughout the site. Test results are summarized in the following table.

Sample Location/ Depth (ft)	Description	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Maximum Swell (%)	CBR Value
TP WT-1 @ 2'	Silty to clayey sand w/gravel	11.0	118	3.2	4.8

[5]Little, D.N., October 4, 2007, Initial Assessment of the Risk of Lime Treatment of Subgrade Soils for the St. George, Utah Replacement Airport, prepared for Chemical Lime Company.

Sample Location/ Depth (ft)	Description	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Maximum Swell (%)	CBR Value
TP WT-3 @ 15'	Poorly graded sand with gravel	8.5	125	1.7	19
TP WT-8 @ 3'	Lean clay (mudstone)	7.0	134	4.6	2.4
TP RW-2 @ 2'	Silty sand with gravel	7.5	130.5	0	65
TP RW-6 @ 10.5'	Lean clay (claystone)	16	112	12.5	1.5
TP ET-2 @ 5	Silty sand with gravel	7.5	128.5	0	37.5
TP ET-5 @ 7'	Sandy clay (claystone)	19	109	10.3	1.5
TP A-3 @ 5'	Silty sand with gravel	10.5	124	0.2	35

For surficial deposits CBR values range from 4.8 to 65 with an average of 32. For clayey soils CBR values ranged from 1.5 to 2.4.

6.0 EARTHWORK

6.1 EXCAVATABILITY

Four general types of subsurface conditions will be encountered throughout the site. These include:

1. Uncemented surficial deposits
2. Cemented surficial deposits (caliche)
3. Claystone/mudstone of the Petrified Forest Member
4. Sandstone (Shinarump Conglomerate Member)

Figure 8 shows the approximate lateral extent of various strata anticipated to encountered at finished grade elevation throughout the runway and taxiway sections. Excavatability requirements for each are included in the following sections.

UNCEMENTED SURFICIAL DEPOSITS

Surficial deposits identified as alluvial, eolian, or colluvial deposits generally classify as silty to clayey sand (SM or SC), silt (ML), silty gravel (GM), poorly graded sand (SP), or lean clay (CL). Shallow dune deposits are present particularly on the northeastern portion of the site. This material, where uncemented or weakly cemented, can be excavated with conventional excavating equipment. Lenses of cobble size material are not uncommon and occasional boulders are also present. Intervals weakly to strongly cemented with caliche will be present and are discussed in the following section.

We recommend that permanent cut slopes in uncemented surficial deposits be maintained at two horizontal to one vertical (2H:1V).

CEMENTED SURFICIAL DEPOSITS

Several rock mass ratings systems are available to assess the excavatability/rippability of rock strata. However, these systems do not work well with caliche deposits. Caliche cemented soils were identified in the majority of borings (see photograph 2 in Figure 3, Figures 5 through 7, and individual logs in Appendix A). These soils have very high SPT blowcounts (generally greater than 50 blows for 6 inches or less). In order to assess the excavatability of these deposits, sixteen test pits were excavated throughout the site. Test pit descriptions are presented in section 4.2 of this report. The test pits were excavated with a CAT 320 C trackhoe using a 3 ft wide bucket. Backhoe refusal in caliche deposits occurred in test pits TP-WT-5 at 7 feet, TP-RW-2 at 3 feet, TP-RW-8 at 4.5 feet, A-3 at 5 feet, and LS-5 at 2 feet. Refusal occurred in confined excavations, however, the caliche deposits could be penetrated with a hollow-stem auger during drilling.

Where strongly cemented, relatively thin (less than 2 feet thick), caliche deposits are encountered, we anticipate that the deposits can be ripped with a D-8 or D-9 dozer. Thicker deposits may require special excavation techniques such as hammer-hoe, rock saw, or blasting. Excavation of strongly cemented caliche deposits will likely not be possible with scrapers unless the deposits are pre-ripped.

Recommended permanent cut slopes in cemented surficial deposits (caliche) are one and one half horizontal to one vertical (1.5H:1V) or flatter.

CLAYSTONE/MUDSTONE OF THE PETRIFIED FOREST MEMBER

The Petrified Forest Member of the Chinle of the Formation is comprised of claystone and mudstone with occasional siltstone and sandstone interbeds. Where identified as claystone, we anticipate that this member can be excavated with conventional excavation equipment. Moderately hard ripping should be anticipated where isolated siltstone or sandstone beds are encountered.

Where identified as mudstone, sandstone interbeds become more prevalent and the formation becomes more granular. A combination of conventional excavation and moderately hard/hard ripping should be anticipated. Thick sandstone beds on the order of 3-4 feet are expected to be rare, however, if encountered these beds may require special excavation techniques such as hammer-hoe or blasting.

The claystone/mudstone slopes will weather when exposed to air and we recommend that permanent cut slopes be maintained at two horizontal to one vertical (2H:1V) or flatter. If interbedded with sandstone or siltstone, mudstone cuts may be maintained at one and one half horizontal to two vertical (1.5H:1V).

SANDSTONE (SHINARUMP CONGLOMERATE MEMBER)

The Shinarump Conglomerate member is comprised of moderately hard to hard, well-cemented sandstone.

A rock mass rating system presented by Kirsten[6] was used to assess the rippability/excavatability of the rock. The rippability is determined from the following formula $N = M_s(RQD/J_n)J_s(J_r/J_a)$ where:

- $N =$ Rippability Index
- $M_s =$ Rock Strength (unconfined compressive strength determined from Schmidt Hammer)
- RQD= Rock Quality Designation (estimated from three dimensional determination of discontinuities)
- $J_n =$ Number of joint sets
- $J_s =$ Dip angle and ratio of joint sets
- $J_r =$ Joint roughness number
- $J_a =$ Joint alteration number

For sandstone bedrock the following descriptions of rippability are assigned based on the rippability index.

Material Type	**Class**	**Rippability Index**	**Description of Rippability**	**Bulldozer Characteristics**
Soil	1	less than 1	Hand pick or spade	D3/D4E/D5B
Soft Rock	2	1-9.9	Power tools/ easy ripping	D6D/D7G
Intermediate Rock	3	10-999	Hard - very hard ripping	D8K/D9H
Hard Rock	4	Larger than 1000	Extremely hard ripping/blasting	D10

For sandstone throughout the project the factor with the most variation is the RQD. With a conservative RQD value of 40%, a rippability index of 1875 was determined. Blasting should be anticipated for excavations within the Shinarump Conglomerate.

[6]Kirsten, H.A.D., "Case Histories of Groundmass Characterization for Excavatability" *Rock Classification System for Engineering Purposes, ASTM STP 984,* Louis Kirkaldie, Ed; American Society for Testing and Materials, Philadelphia, 1988.

Permanent cut slopes in competent sandstone of the Shinarump Conglomerate member may be maintained at one horizontal to one vertical (1H:1V). Isolated slopes may be cut to one-half horizontal to one vertical (0.5H:1V), however, these cuts should be evaluated on a case-by-case basis depending on the dip direction of joints and bedding.

7.0 SUBGRADE PREPARATION

Generalize cross-sections along the runway and taxiways are presented on Figures 5 through 7. For the west taxiway the majority of the taxiway will be within cut material ranging from surficial deposits, surficial deposits with caliche zones, claystone, minor mudstone, and sandstone. The future expansion area south of WT-10 will be placed on significant amounts of fill.

The runway section will encountered both cuts and fill with maximum fills on the order to 8 feet and maximum cuts on the order of 27 feet. Subgrade strata at final grade elevation will range from surficial deposits, surficial deposits with caliche zones, minor claystone, and sandstone.

The east taxi-way has projected fills up to 25 feet and maximum cuts of 20 feet. Subgrade strata at final grade will include surficial deposits, surficial deposits with caliche zones, and claystone.

Subgrade preparation recommendations for material encountered at finished grade are summarized on Figure 11. Specific recommendations are as follows:

7.1 SURFICIAL DEPOSITS (INCLUDING CALICHE ZONES)

We understand the a B-737-700 with a gross weight of 153,500 lbs and a dual wheel landing system will be the largest projected aircraft. For non-cohesive soils FAA AC 150/5320-6D requires the following compaction requirements below the pavement section:

100% Compaction	95% Compaction	90% Compaction	85% Compaction
0-19 inches	19-32 inches	32-46 inches	46-60 inches

For heavily load pavements designed to serve aircraft weighing 30,000 pounds or more ASTM D-1557 is required for determination of moisture/density relationships (Proctor). Stabilized subbase or imported base with exceptional CBR values are necessary for new pavements designed to accommodate jet aircraft weighing 100,000 pounds or more.

To assess the unit weight of in-place soils, test pits were excavated adjacent to WT-1 and ET-2. The results are summarized in the following table.

Sample	**Maximum dry density (pcf)/ optimum moisture content (%)**	**In-place dry density (pcf)**	**Field measured moisture (%)/ Laboratory measured moisture (%)**	**% Relative Compaction**
TP WT-1 @ 3'	118.0/11.0	96.0	6.4	81%
TP WT-1 @ 5'	118.0/11.0	101.6	7.1/7.8	86%
TP WT-1 @ 8'	118.0/11.0	96.8	7.75/3.2	82%
TP ET-2 @ 2'	128.5/7.5	108.4	4.5/3.0	85%
TP ET-2 @ 5'	128.5/7.5	91.4	5.4/3.3	71%

The sample from TP ET-2 at 5 ft encountered gravel deposits and the nuclear density gauge pin could only be driven 4 inches. This reading is not considered valid.

Based on field measurements, the relative density of in-place soils ranges from about 81-86% of the maximum dry density as determined by ASTM -D1557. Thus, FAA guidelines would require recompaction of the upper 46-inches to achieve required densities.

Where surficial deposits are present, the final grade will either require fill over the surficial deposits or cuts ranging from 0-10 feet. The portion of the project where final grades match existing grades in surficial deposits is minor. Following cutting to final grade additional evaluation of the subgrade will be required. Where caliche deposits or cemented surficial deposits are encountered, we recommend the pavement section

take advantage of cemented soils and that excavation and recompaction be limited to the upper 12-18 inches. Where loose, uncemented deposits are encountered, excavation and recompaction of the upper 32 inches is recommended. The fines content (finer than #200 sieve) in surficial soils is generally in the 15% to 40% range. Compaction of these soils to 100% of ASTM D-1557 will be extremely difficult. Consideration should given to reducing the relative compaction to 95% in the upper 19 inches. Material should be moisture conditioned to the optimum or to +2 percent of the optimum moisture content and compacted in maximum 8-inch thick loose lifts.

Due to caliche cementation and gypsum within the soils, moisture readings in the field should be verified with laboratory analyses during compaction. We estimate a shrinkage loss of approximately 15-18% during compaction of surficial deposits.

For surficial deposits CBR values range from 4.8 to 65 with an average of 32. If the low of 4.8 and the high of 61are eliminated the average is 30.5. As a guideline the design CBR value should be equal to or less than 85% of all subgrade CBR values. We recommend a CBR value of 25 be used for pavement design in surficial deposits.

7.2 MUDSTONE/CLAYSTONE

The percent swell for claystone/mudstone soils based on measurements from the CBR tests (ASTM D-1883) ranged from 4.6 to 12.6 percent and would be classified as having a high swell potential. For swelling soils with a high potential for moisture fluctuation FAA requirements for uniform soils is stabilization to a depth of 36 inches below the pavement section or remove and replace with non-swelling soils. For variable soil deposits the depth of treatment should be increased to 60 inches.

CBR values completed within claystone/mudstone ranged from 1.5 to 2.4. As a general rule a design CBR of 3 is the lowest practical value. Where the CBR value is less than 3, subgrade improvement through stabilization or other means should be initiated.

Methods to improve support characteristics in subgrade soils are presented in Section 6.0. These include soil blending, moisture conditioning, and lime stabilization. It was shown that soil blending increases the maximum dry density, decreases the swell potential, and slightly increases the CBR. Moisture conditioning significantly decreases the swell potential, however, it does not improve the CBR. Lime stabilization may decrease the swell potential and significantly increase the CBR value.

Since all of the three methods will require excavation, conditioning, and recompaction; we recommend that soil blending or lime stabilization be used to increase support capabilities. For soil blending in claystone we recommend a 25% clay 75% soil blend and that the blended material be moisture conditioned to at least +2% of optimum and compacted to a maximum of 90% of the maximum dry density as determined by ASTM D-1557. In claystone we recommend an overexcavation depth of 48-inches below the structural pavement section. In mudstone an overexcavation depth of 30-inches is recommended. A CBR value of 5 is recommended for blended claystone or mudstone. A shrinkage factor of 10% is anticipated for compacted and blended claystone/mudstone.

Where lime stabilization is used, it is estimated that approximately 4-5% lime will be required. When the lime is first mixed into the soil the moisture content should be about 3% above optimum to insure that the chemical reactions proceed as efficiently as possible. The soil should be allowed to mellow for at least 12 hours and then remixed before final placement and compaction. Clays clods should have 100% passing the1-inch screen and 60% passing the #4 sieve. For final placement and compaction the stabilized soil should be moisture conditioned to 1 to 3% above optimum and compacted in 8-inch thick loose lifts to 95% of the maximum dry density as determined by ASTM D-1557. In claystone we recommend an overexcavation depth of 48-inches below the structural pavement section. In mudstone an overexcavation depth of 30-inches is recommended. A CBR value of +20 is expected to be realized with lime stabilization. Additional on-site testing should be completed to evaluate the effectiveness of lime stabilization.

7.3 SANDSTONE BEDROCK

Sandstone bedrock will be encountered at finish grade elevations on the southern portions of the project as shown on Figure 5 through 8. Blasting should be anticipated to achieve desired elevations. To avoid "shoving" or "sliding" of the structural section over competent bedrock, we recommend that the upper 18-inches of bedrock underlying the pavement section be overexcavated, processed, and compacted.

We anticipate that blasting will be required in this section. Our experience with blasting, in conjunction with small excavations at the site in the Shinarump Conglomerate (see Photo 3 of Figure 9), is that material tends to break into 0.5-4 feet sized fragments. We recommend that a portable crusher be established on-site to achieve suitable material. Processed material used in the upper 18-inches below the structural section should be 3-inch minus and well-graded. The material should be placed in maximum 8-inch lifts and moisture conditioned to within 2% of the optimum moisture content. We recommend that the upper 6-inches be compacted to 100% of the maximum dry density and the lower 12 inches to 95% of the maximum dry density as determined by ASTM D-1557. For 18-inches of processed material a CBR value +60 should be achievable.

Bulking on the order of 5-10% should be anticipated for processed sandstone.

7.4 FILL

Fills up to 24 feet in depth may be required on portions of the runway and east taxiway. Preparation of the site prior to fill placement should include the removal of all vegetation, organic material, and deleterious material from areas to receive fills. In areas consisting of native soils, prior to fill placement the soils should be scarified to a depth of 8 inches, moisture conditioned, and compacted to a minimum of 90% of the maximum dry density as determined by ASTM D-1557. Loose or soft areas detected during the scarification and subgrade compaction operation should be recompacted or removed and replaced with structural fill. Where cemented material or bedrock is encountered, scarification will not be required.

Surficial deposits, both cemented and uncemented, claystone, and sandstone will comprise the majority of the material cut from the project and used in fills. We recommend blending of claystone/mudstone and sandstone with surficial deposits when used as fill to achieve a more well-graded fill. Due to the anticipated amount of oversized material consideration should be given to an on-site crushing operation such that cemented deposits or excavated sandstone bedrock can be processed for use as structural fill. Material to be used for fill should be limited to minus 8-inches. Considering the range of material potentially used in fills an initial CBR range of 15 to 20 is recommended. CBR tests should be completed on fills during placement.

The majority of soils encountered during our field investigation will be suitable for use as structural fill. The fill should have the following characteristics:

- Material should be less than 8 inches in maximum size and be free from organic matter, debris or rubble.
- Material should consist of granular soils and contain 10-40% fines (percent passing the No. 200 sieve) and the fines should have a liquid limit of 30% or less and a plasticity index less than 9.
- Cobbles/boulders and sandstone may be used as structural fill provided they are crushed or otherwise screened to remove particles larger than eight inches in diameter and the material is uniformly graded. The maximum particle size for structural fill within 12 inches of structurally loaded elements should be restricted to three inches.
- The existing asphalt fragments and intact asphalt pavement including any underlying base course should be pulverized/rotomilled. Pulverized/rotomilled material will be suitable for use as structural fill.

Structural fill should be placed in maximum 8-inch thick loose lifts at a moisture content within 2 percent of optimum and compacted to at least 95 percent of maximum density (ASTM D 1557).

Excavated caliche and sandstone up to 24-inches in maximum dimension may be utilized in deeper fills (+10 feet) provided the fragments are incorporated into a matrix of finer material and placed in a manner that they do not nest or create voids between adjacent fragments. At least 5 feet of suitable structural fill should overlie any oversized fill.

Material consisting predominantly of claystone/mudstone may be utilized in the bottom of deeper fills provided it is moisture conditioned to at least +2% of the optimum moisture content, compacted to 90% of the maximum dry density as determined by ASTM D-1557, and at least 15 feet of non-swelling, well-graded material is placed over the claystone/mudstone. See Figure 11.

Fill, not restrained by structural retaining systems, should be maintained with slopes of one vertical to two horizontal (1V:2H) or flatter. Grading of both cut and fill slopes should be such that runoff water is not concentrated on slopes or in unprotected channels. Where fills are to be placed on slopes steeper than 20%, the fill should be benched into the slope. The benches should not be more than 3 feet high and should be wide enough to allow for access by construction equipment. The top of the bench should slope back into the cut with a grade of at least 10 percent (see Figure 10).

7.5 STABILIZED OR IMPROVED SUBBASE

We understand that stabilized subbase is required for all new pavements designed to accommodate aircraft weighing 100,000 pounds or more. Several commercial grade gravel pits are located within 2-3 miles of the site where potential aggregate for stabilized subbase may be obtained. Suitable aggregate may be possible by crushing and processing sandstone bedrock, however, we recommend that a test program be initiated well in advance of construction to ensure that a suitable product can be produced on-site. Stabilized subbase should meet all FAA specifications for gradation, content, and compaction.

8.0 LANDSIDE FACILITIES

Landside facilities will include an airport Rescue and Fire Fighting building, a maintenance complex, fuel farms at each end of the runway, and cargo and general/executive hangers. Specific structural details have not been provided, however, general foundation recommendations are subsequently presented.

8.1 RECOMMENDATIONS

A minimum separation of 15 feet between building foundations and the underlying clay/claystone of the Petrified Forest Member is generally sufficient to reduce the potential of clay/claystone saturation due to vertical migration of precipitation or irrigation water. Subsurface conditions within the clay/claystone were generally moist, but saturated conditions were not noted.

For areas with a minimum vertical separation of 15 feet between anticipated foundation depths and clay/claystone conventional shallow foundations are practical. However, strict moisture control measures should be implemented.

Where the depth to clay/claystone is generally less than 15 feet, several options are available.

1. Utilizing the areas overlying shallow clay/claystone for parking or for structures that are not sensitive to differential movement and eliminating buildings or structures that could be damaged if the underlying clay were to become saturated and swell.

2. Elevating the area over the shallow clay/claystone with impervious fill to increase the depth above the clay/claystone and impose stringent moisture controls to minimize potential saturation of the clay/claystone. With this option foundation uplift is still possible if the clay becomes saturated. However, if landscaping can be eliminated or minimized and asphalt or impervious material covers much of the site, the heave potential can be greatly reduced.

3. Establishing any critical structures on drilled piers extending below the zone of significant moisture variation (recommended minimum depth of 15 feet into the clay/claystone) and utilizing grade beams with structural floors or free-floating slabs. Some movement of free-floating slabs may still occur and slab replacement may be required should excessive slab heave occur.

4. Excavating the clay to a minimum depth of 15 feet below foundations and establishing foundations on non-expansive soils. The existing soils above the clay are generally suitable for use as structural fill.

The option chosen will depend on the final product to be constructed, on the degree of risk the owner is willing to accept, and on construction costs for each option. Foundation options for conventional at-grade foundations and deep foundation systems are presented in the following sections.

8.2 FOUNDATIONS

8.2.1 CONVENTIONAL FOUNDATION SYSTEMS

Typically, if there is a +15 feet separation between building foundations and the underlying clay/claystone the potential of saturating the clay due to vertical migration of precipitation or irrigation water through site

soils into the clay is low. Strict moisture control recommendations should also be followed to minimize the potential for saturation of clays encountered at depth.

1. Foundations established on a minimum of 12-inches of properly compacted structural fill or upon at least 12-inches of suitable site soils that have been compacted to structural fill standards may be designed for a maximum allowable soil bearing pressure of 2,000 pounds per square foot based upon dead load plus long term live load. Foundations should be established on a minimum of 12 inches of structurally placed soil, however, deeper fills will be required to achieve final grades in areas of the landside facilities. A one-third increase in allowable bearing pressure may be used for short term transient loads such as wind and seismic events. The bearing capacity may be increased by 500 psf for each additional foot of footing width or depth up to a maximum value of 3,500 psf.

2. The minimum recommended footing width for continuous footings is 18 inches for single story structures and 24 inches for two story structures. A minimum width of 24 inches is recommended for isolated spread footings.

3. Footings should be at established at least 12 inches below the lowest adjacent final grade for confinement purposes.

4. Soils in the area classify as having "negligible" to "severe" sulfate exposure. We recommend that all concrete in contact with native soils contain Type V sulfate-resistant cement. Concrete mixes should be designed in accordance with ACI 318, Section 4.3 for "severe" sulfate exposure. Buried pipes should be plastic (PVC or HDPE) instead of metal, where possible.

5. Lateral loads imposed on foundations may be resisted by the development of passive earth pressures against the sides of footings and friction between the base of the footing and the supporting soils. In determining the frictional resistance a coefficient of friction of 0.34 should be used between supporting soils and foundation concrete. Passive resistance may be calculated using a coefficient of 2.7 and a unit weight of 120 pcf for an equivalent fluid weight of 325 pcf.

8.2.2 DRILLED PIERS WITH ELEVATED FLOOR

Piers should be installed a minimum of 15 feet into the underlying clay/claystone. A minimum pier diameter of 12-inches is recommended to allow for insertion of the re-bar cage and to allow adequate concrete cover. Difficult drilling conditions should be anticipated if caliche cemented surficial deposits overlie the clay/claystone.

1. Piers should be designed for a maximum allowable end bearing pressure of 15,000 psf and an allowable skin friction value of 100 psf or the portion of the pier in surficial deposits and 750 psf for the portion of pier in clay/claystone strata.

2. Piers should be designed and spaced for a minimum deadload pressure of 10,000 psf based on the pier cross-sectional area.

3. Piers should be reinforced the full length to resist tension forces in the event of swelling of adjacent clay/claystone. Potential tension force may be calculated using the portion of the pier in the clay/claystone with a skin friction of 500 psf. The minimum percent of steel should be 1% of the concrete area. Reinforcement should extend into grade beams and foundation walls.

4. Laterally loaded piers should be at least three diameters apart and may be designed utilizing the parameters in the following table.

Soil Type	Total Unit Weight (pcf)	ε_{50} (in/in)	Friction Angle	Cohesion (psf)	Lateral Modulus (pci)	Unconfined Compressive Strength (psf)	Modulus of Elasticity (psi)
Lean to fat clay	130	0.004	NA	4,000	5,000	8,000	14,000

5. Pier excavations should be carefully cleaned prior to placing concrete. Concrete should be poured into the pier excavations immediately after the excavations are cleaned and inspected. Pumping or tremie methods of concrete placement are recommended to minimize segregation of the concrete particularly where perched water is present. The maximum aggregate size should be less than 1/3 of the clearance between rebar ties. Concrete with a slump of 4 to 6 inches is recommended.

6. A 6-inch continuous void beneath all grade beams and foundations walls supported on piers is recommended to concentrate dead loads and to minimize potential uplift pressures.

7. Pier installation should be observed by competent personnel to assure that adequate bearing is achieved, cleanout is performed, and the re-bar cage is properly placed.

8. Mushrooming or enlargement at the top of piers should be avoided during pier drilling and subsequent construction operations.

9. Concrete should be continuously poured to the bottom of the grade beams such that construction joints are not formed.

8.2.3 DRILLED PIERS WITH FLOATING FLOORS

Steel structures tend to exert lateral forces on perimeter footings and the perimeter footings are generally tied into the floor slab to attain lateral restraint. For a building where the foundations are established on drilled piers and the floor slab is free-floating, lateral restraint is obtained by constructing wider footings, adding keyways beneath footings, or restraining the footings with bond-beams extending to the footing on the opposite side of the building. For this scenario we recommend that the perimeter footings, spot footings, and any bond beams be supported on drilled piers. Drilled pier recommendations are as those presented previously.

For the slab we recommend:

1. Slabs should be separated from exterior footings, bond beams, and interior bearing members with a slip joint that allows for free vertical movement of the slabs.

2. Interior columns should not bear on slabs and construction should ensure that slabs are not placed beneath protruding components that may limit free vertical movement of the slab.

3. Underslab plumbing should be avoided where feasible. Utility lines installed through slabs should be isolated from the slabs so that potential slab movement is not transmitted to duct work or lines.

4. A minimum four-inch thick layer of free-draining gravel (containing less than 5% material passing the #200 sieve) should be placed immediately below the floor slabs to help distribute floor loads, break the rise of capillary water, and aid in the concrete curing process.

5. To help control normal shrinkage and stress cracking, the floor slabs should have rebar reinforcement and contain frequent crack control joints. Concrete placement and curing should meet ACI[7] requirements including following hot weather placement recommendations, when appropriate.

9.0 SURFACE DRAINAGE AND MOISTURE PROTECTION

Due to the potentially expansive nature of soils at the site, it is recommended that the following precautions be taken to minimize the potential for soil saturation beneath structural elements:

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[7] American Concrete Institute

(1) The ground surface should be graded to drain surface water away from structures in all directions. We recommend a minimum grade of 5 percent in the first 10 feet for soil areas and 2.0 percent for pavement or hard surface areas.

(2) Landscaping should be avoided within 5 feet of structures. As an alternative sealed bottom planter boxes may be used.

(3) Unless roof overhangs extend +3 feet beyond footings and roof runoff falls on impervious surfaces such as asphalt or concrete, roof runoff should be collected and discharged well outside of the foundation backfill limits. Water should only be allowed to pond in engineered detention basins constructed downgradient of structures or in areas underlain by +15 of surficial deposits or sandstone.

(4) Provide adequate compaction of foundation backfill and utility trench backfill. All utility trenches within the building footprint and extending 5 feet beyond the footprint should be adequately backfilled. Backfill adjacent to structures should be compacted to at least 90 percent of the maximum dry density as determined by ASTM D-1557.

(5) Grading should be such that surface water, particularly that derive from runways, taxiways, and aprons is collected and directed to designed storm-water channels, culverts, and detention structures. Storm-water channels should be lined to minimize infiltration into underlying soils and should be protected against erosion.

(6) Care should be taken to ensure that runoff from adjacent properties is properly channeled away from the project.

10.0 LATERAL EARTH PRESSURES

The lateral earth pressures on retaining walls and the distribution of those pressures depends upon the types of wall, hydrostatic pressures, in-situ soils, backfill, and tolerable wall movements. Walls backfilled with granular soil should be designed assuming an active coefficient of lateral earth pressure of 0.29 and moist unit weight of 120 pcf (equivalent fluid weight of 35 pcf). The recommended increase in the lateral earth pressure coefficient for seismic effects is 0.15 assuming level backfill conditions (total equivalent fluid pressure of 52 pcf).

Where at-rest conditions are desired to limit wall movement, an at-rest coefficient of lateral earth pressure of 0.45 and moist unit weight of 120 pcf (equivalent fluid weight of 55 pcf) are recommended. These

pressures are based on the assumption that backfill soils will be compacted to 95% of the maximum dry density as determined by ASTM D-1557. Compaction of soil against the wall should be completed with hand-operated or other light weight equipment. These lateral earth pressures assume the walls are totally drained with no build-up of hydrostatic pressure. The additional effects of sloping backfill, surcharge, and structural loads should be included in retaining wall design. Clay or claystone should not be used as backfill material.

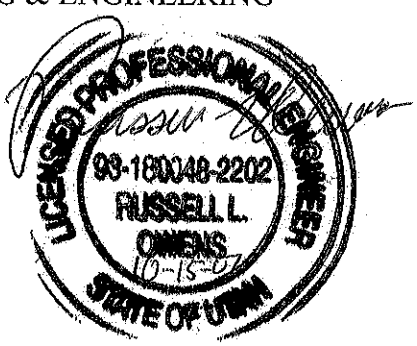
To prevent the buildup of hydrostatic pressure behind retaining walls, we recommend that a drain be installed behind the walls to dissipate hydrostatic pressures. If a drain is not installed, hydrostatic pressures should be considered in the design. The drain should consist of a slotted collection pipe enveloped in gravel and a filter fabric, such as Mirafi 140N or equivalent. The pipe should be graded to a proper outlet or weep holes may be placed in the wall on 10 foot centers. The weep holes should have at least 6 inches of clearance above the low side backfill to keep from being covered and plugged.

11.0 LIMITATIONS

The exploratory data presented in this report were collected to provide geotechnical design recommendations for this project and subsurface site descriptions represent conditions observed at the time and at the locations explored. The borings may not be indicative of subsurface conditions between the points explored or outside the study area, and conditions may change with passage of time. Any information concerning the environmental conditions of the site or subsurface is beyond the scope of this geotechnical study.

LANDMARK TESTING & ENGINEERING

Russell L. Owens, PE
Geotechnical Manager



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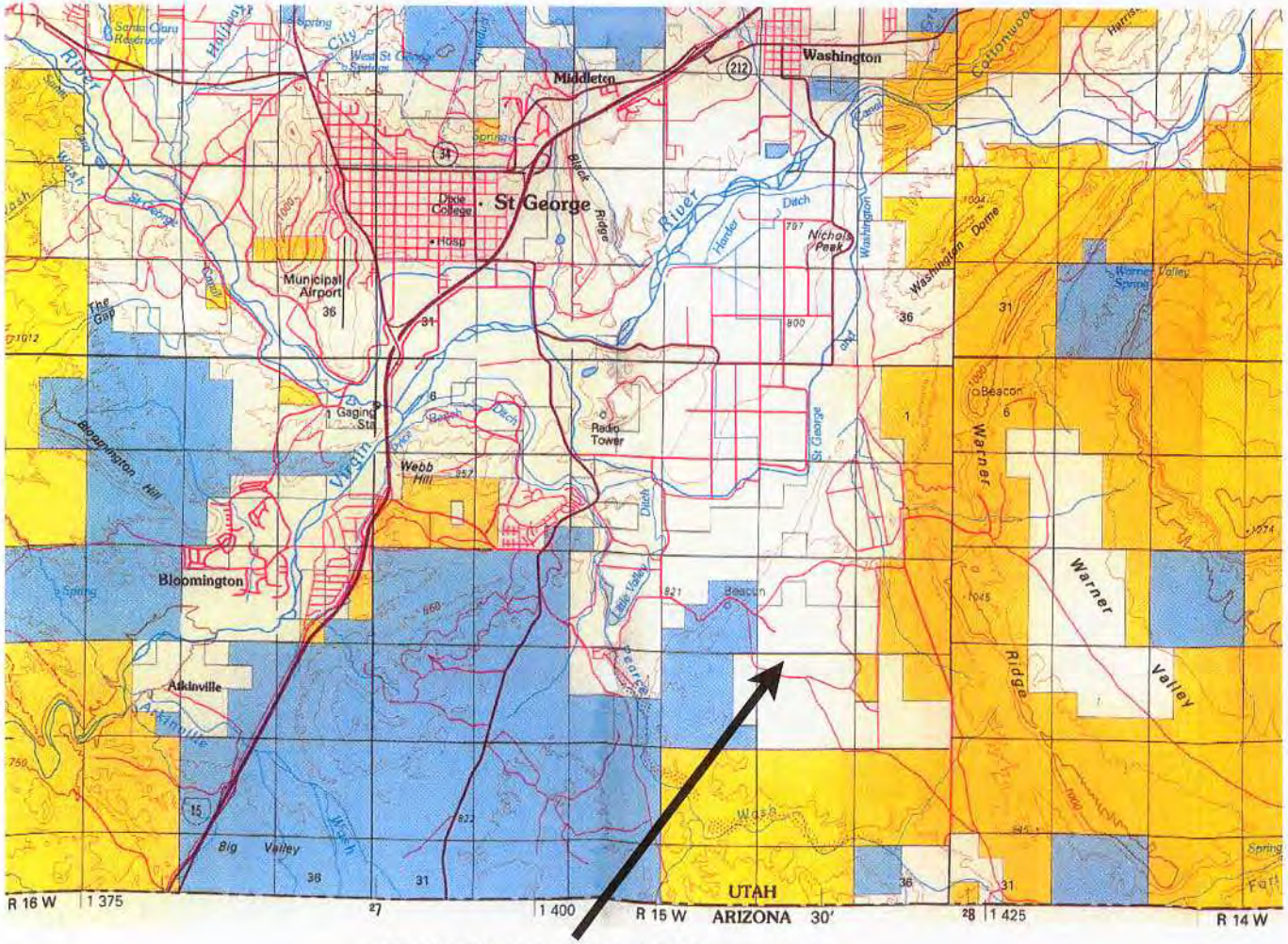

PROJECT LOCATION

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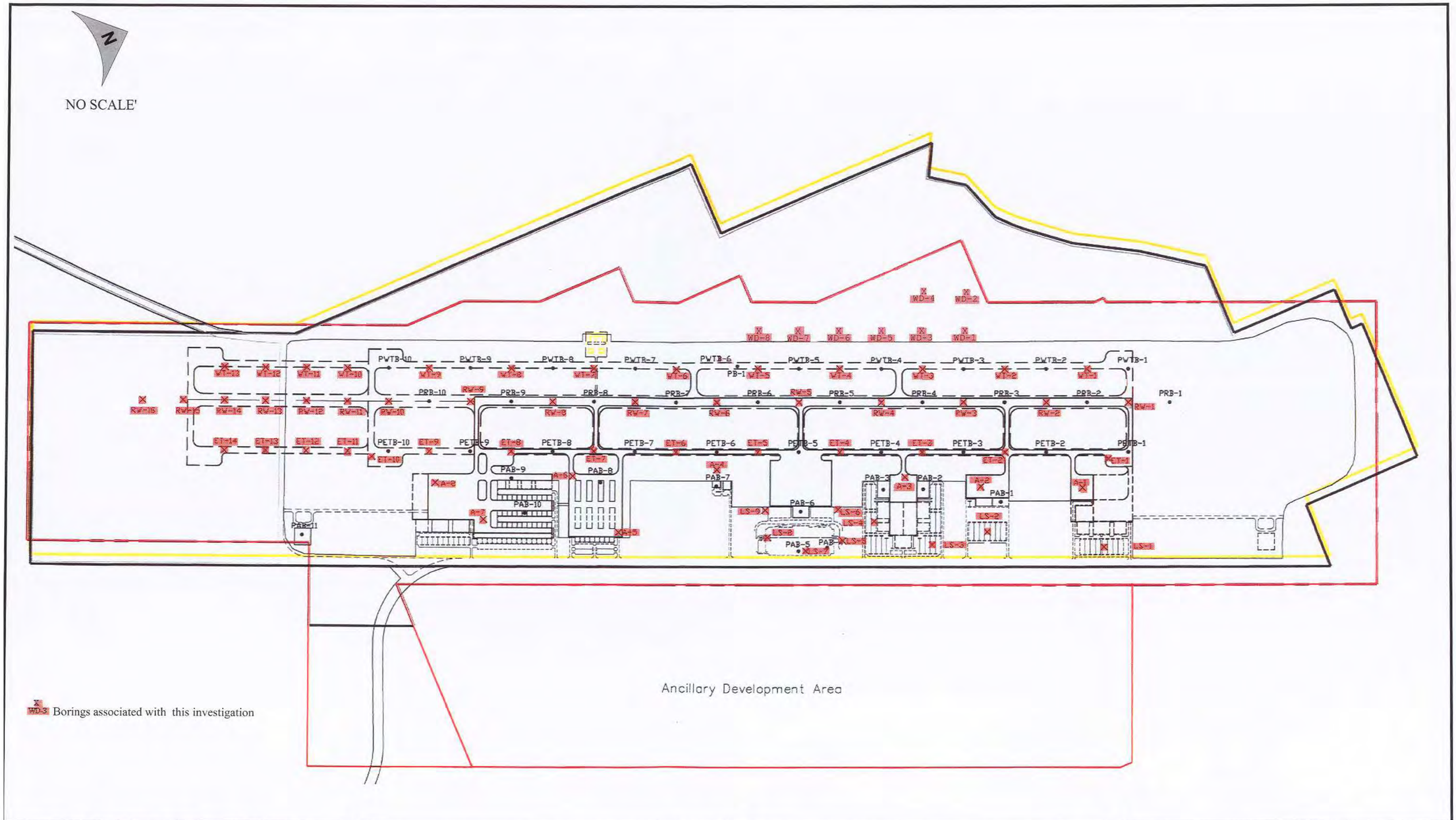
VICINITY MAP - St. George Replacement Airport

LANDMARK PROJECT 07330

FIGURE 1



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SITE PLAN
LANDMARK PROJECT 07330

FIGURE 2

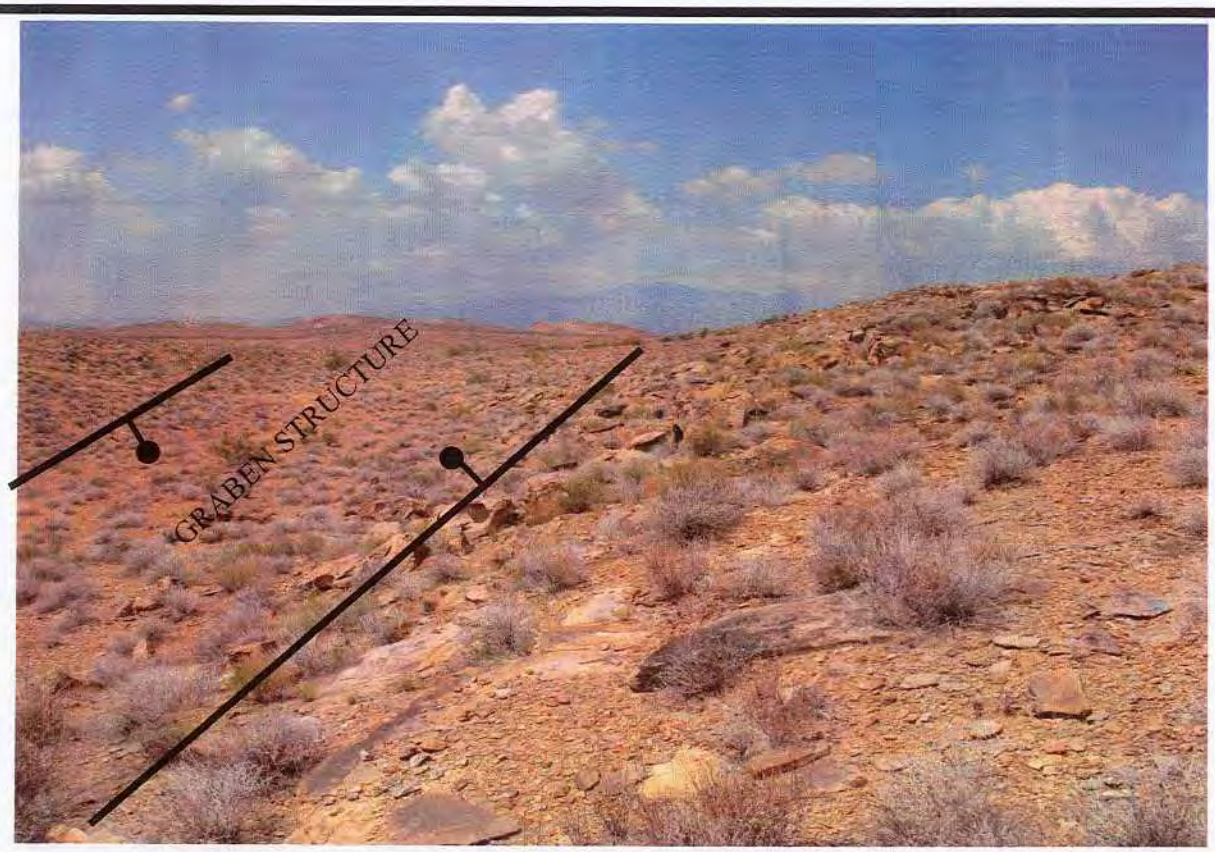
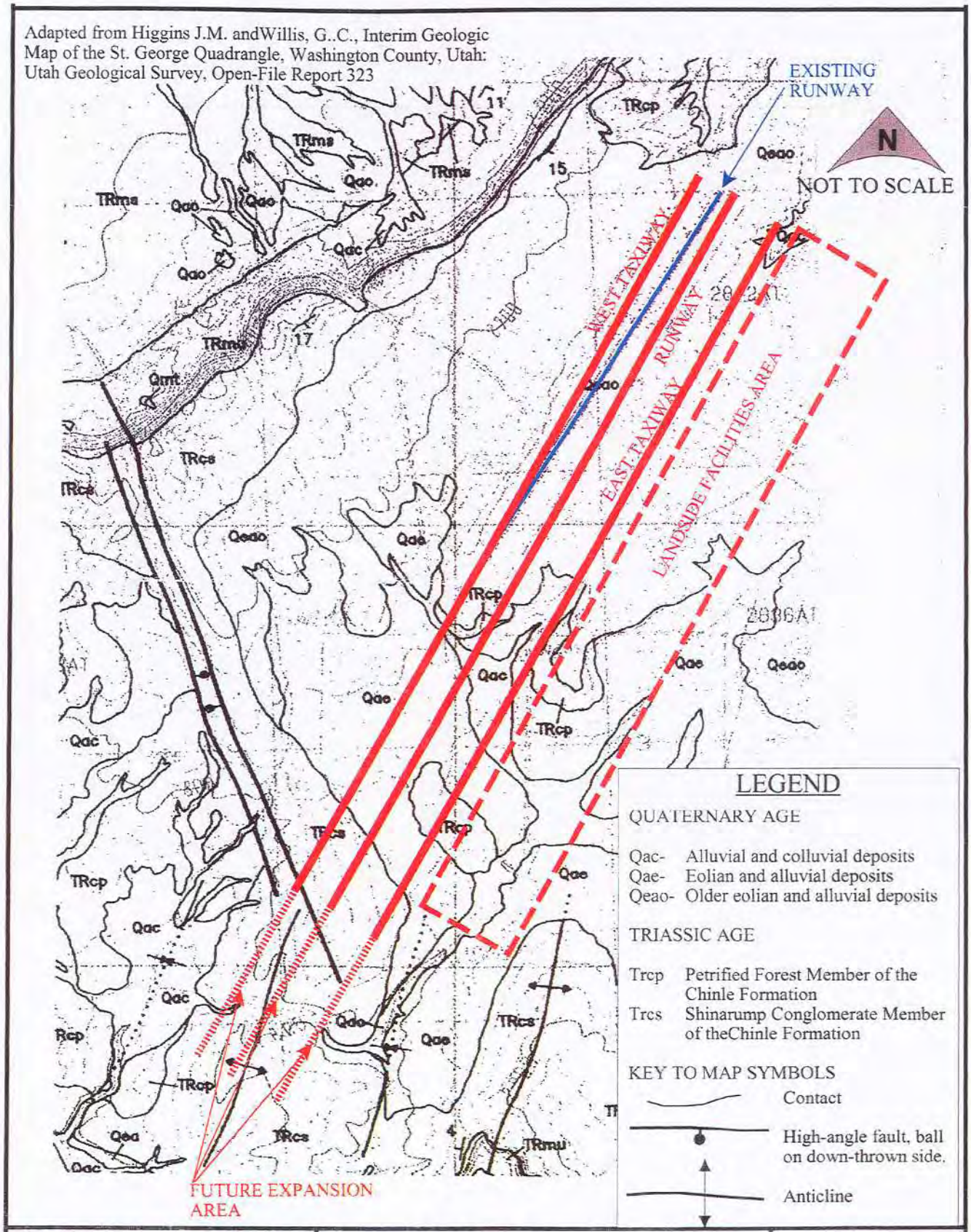


PHOTO 1 - View looking north at graben structure on south end of west taxiway and runway.

PHOTO 2 - Caliche deposits near north end of east taxiway.

LANDMARK TESTING & ENGINEERING	PHOTOGRAPHS LANDMARK PROJECT 07330	FIGURE 3



LANDMARK TESTING & ENGINEERING

GEOLOGIC MAP
LANDMARK PROJECT 07330

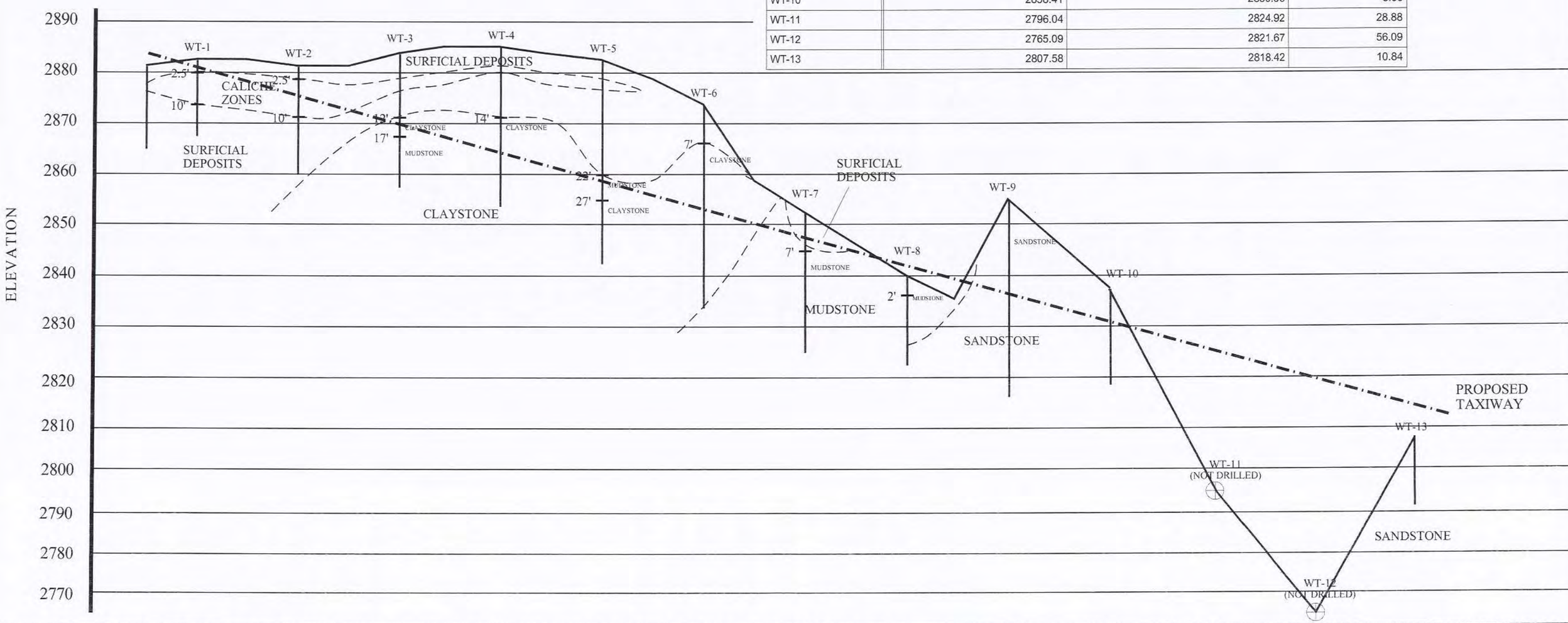
Figure 4

WEST TAXIWAY

HORIZONTAL SCALE: 1"=1000'
VERTICAL SCALE: 1"=20'

NOTE:
Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.

	EXISTING ELEVATION	PROPOSED FINISHED GRADES	PROPOSED CUT/FILL
WT-1	2882.77	2881.4	-1.37
WT-2	2881.55	2877.53	-4.02
WT-3	2883.32	2873.41	-9.91
WT-4	2885.69	2868.11	-17.58
WT-5	2882.64	2861.83	-20.81
WT-6	2873.25	2855.48	-17.77
WT-7	2852.19	2849.13	-3.06
WT-8	2840.12	2842.77	2.65
WT-9	2853.85	2836.42	-17.43
WT-10	2838.41	2830.06	-8.35
WT-11	2796.04	2824.92	28.88
WT-12	2765.09	2821.67	56.09
WT-13	2807.58	2818.42	10.84



LANDMARK TESTING & ENGINEERING

IDEALIZED CROSS SECTION
LANDMARK PROJECT 07330

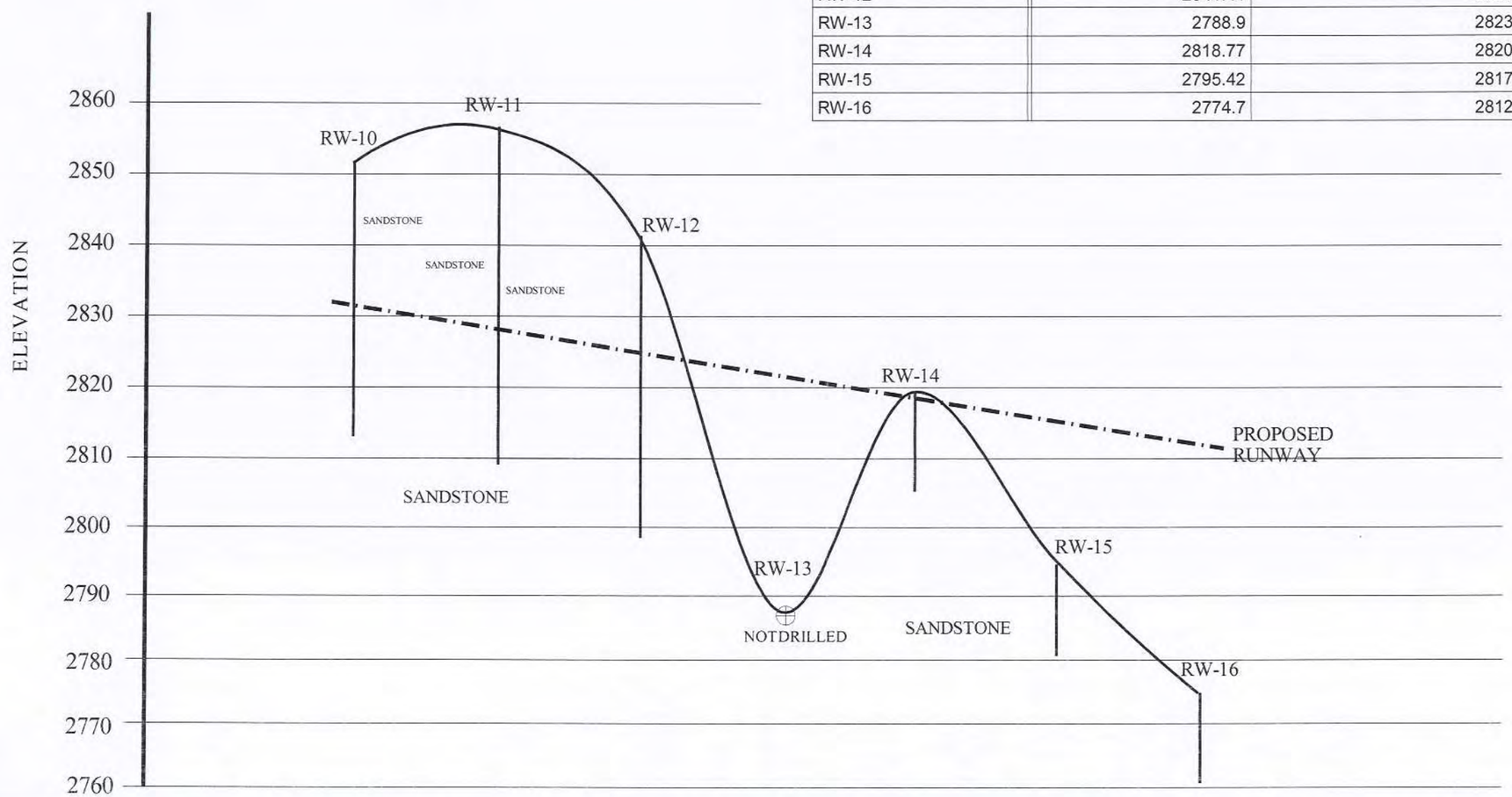
FIGURE 5

RUNWAY

HORIZONTAL SCALE: 1"=1000'
VERTICAL SCALE: 1"=20'

NOTE:
Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.

	EXISTING ELEVATION	PROPOSED FINISHED GRADES	PROPOSED CUT/FILL
RW-1	2874.72	2883.2	8.58
RW-2	2876.85	2879.44	2.59
RW-3	2875.7	2875.57	-0.13
RW-4	2877.04	2870.9	-6.14
RW-5	2872.77	2864.99	-7.78
RW-6	2867.63	2858.64	-8.99
RW-7	2843.8	2852.28	8.48
RW-8	2837.56	2845.93	8.37
RW-9	2829.59	2839.57	9.98
RW-10	2852	2833.22	-18.78
RW-11	2857.43	2830.04	-27.39
RW-12	2841.41	2826.86	-14.55
RW-13	2788.9	2823.69	34.79
RW-14	2818.77	2820.51	1.74
RW-15	2795.42	2817.33	21.91
RW-16	2774.7	2812.13	37.43



LANDMARK TESTING & ENGINEERING

IDEALIZED CROSS SECTION
LANDMARK PROJECT 07330

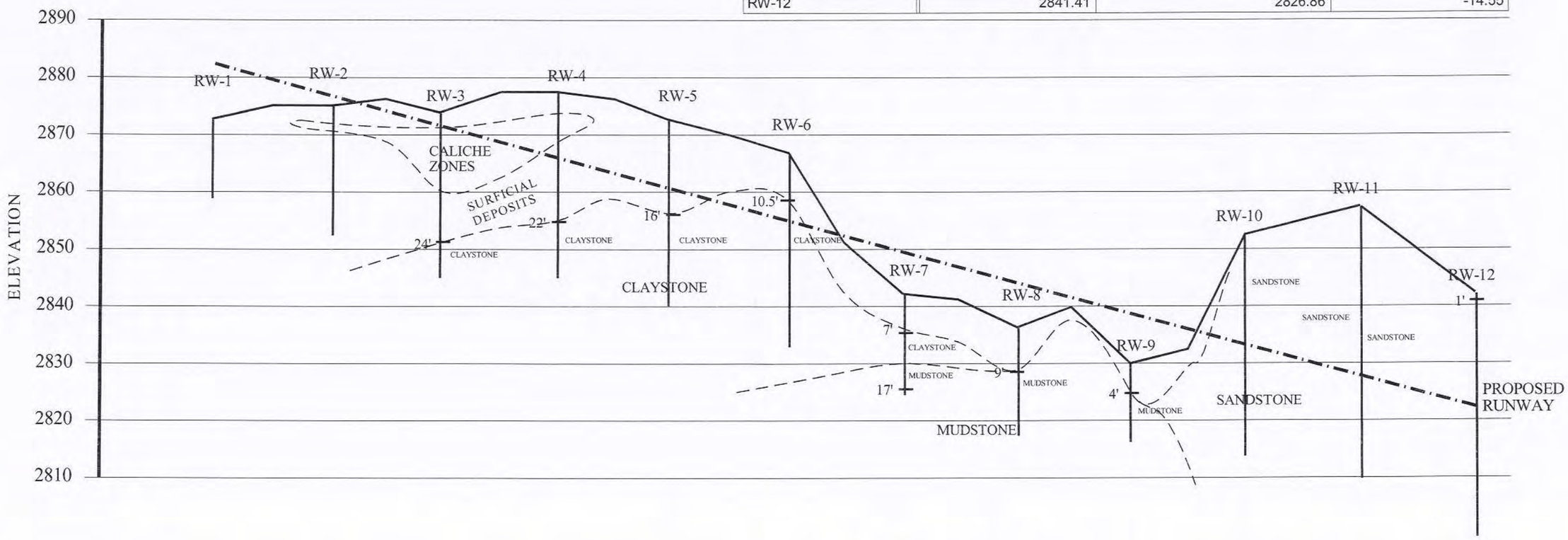
FIGURE 6A

RUNWAY

HORIZONTAL SCALE: 1"=1000'
VERTICAL SCALE: 1"=20'

NOTE:
Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.

	EXISTING ELEVATION	PROPOSED FINISHED GRADES	PROPOSED CUT/FILL
RW-1	2874.72	2883.3	8.58
RW-2	2876.85	2879.44	2.59
RW-3	2875.7	2875.57	-0.13
RW-4	2877.04	2870.9	-6.14
RW-5	2872.77	2864.99	-7.78
RW-6	2867.63	2858.64	-8.99
RW-7	2843.8	2852.28	8.48
RW-8	2837.56	2845.93	8.37
RW-9	2829.59	2839.57	9.98
RW-10	2852	2833.22	-18.78
RW-11	2857.43	2830.04	-27.39
RW-12	2841.41	2826.86	-14.55



LANDMARK TESTING & ENGINEERING

IDEALIZED CROSS SECTION
LANDMARK PROJECT 07330

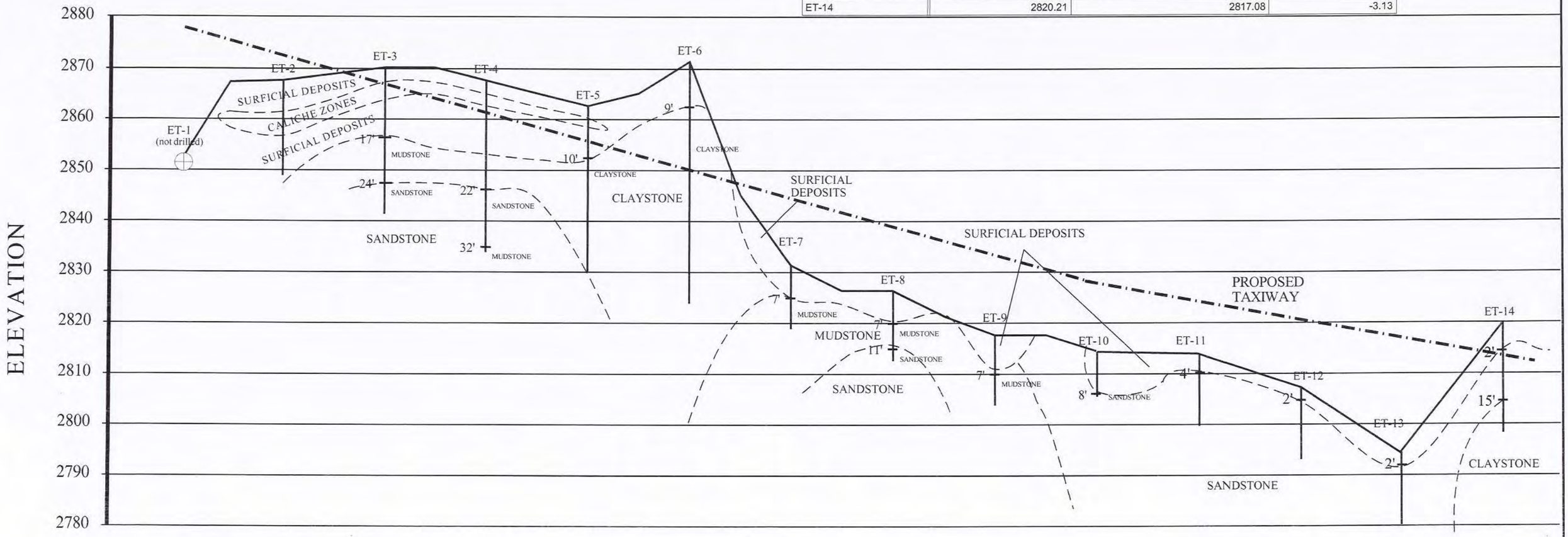
FIGURE 6

EAST TAXIWAY

HORIZONTAL SCALE: 1"=1000'
VERTICAL SCALE: 1"=20'

NOTE:
Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.

	EXISTING ELEVATION	PROPOSED FINISHED GRADES	PROPOSED CUT/FILL
ET-1	2852.83	2878.19	25.36
ET-2	2867.91	2874.08	6.17
ET-3	2870.05	2869.96	-0.09
ET-4	2868.14	2864.66	-3.48
ET-5	2863.76	2858.38	-5.38
ET-6	2872.08	2852.03	-20.05
ET-7	2832.71	2845.68	12.97
ET-8	2827.41	2839.32	11.91
ET-9	2817.57	2832.97	15.4
ET-10	2814.64	2827.89	13.25
ET-11	2814.24	2826.61	12.37
ET-12	2806.79	2823.43	16.64
ET-13	2794.83	2820.26	25.43
ET-14	2820.21	2817.08	-3.13



LANDMARK TESTING & ENGINEERING

IDEALIZED CROSS SECTION
LANDMARK PROJECT 07330

FIGURE 7

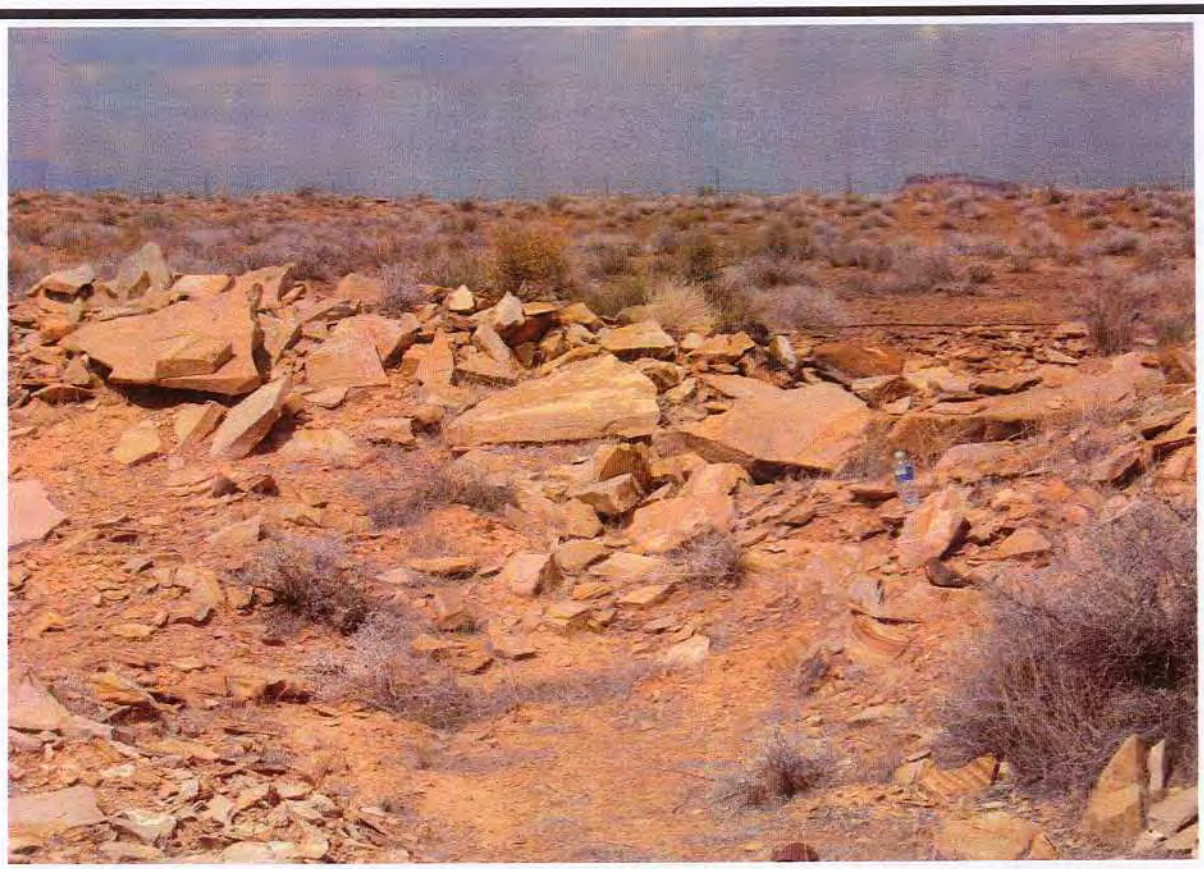


PHOTO 3 - Fractured sandstone in excavation on south end. Note water bottle for scale.

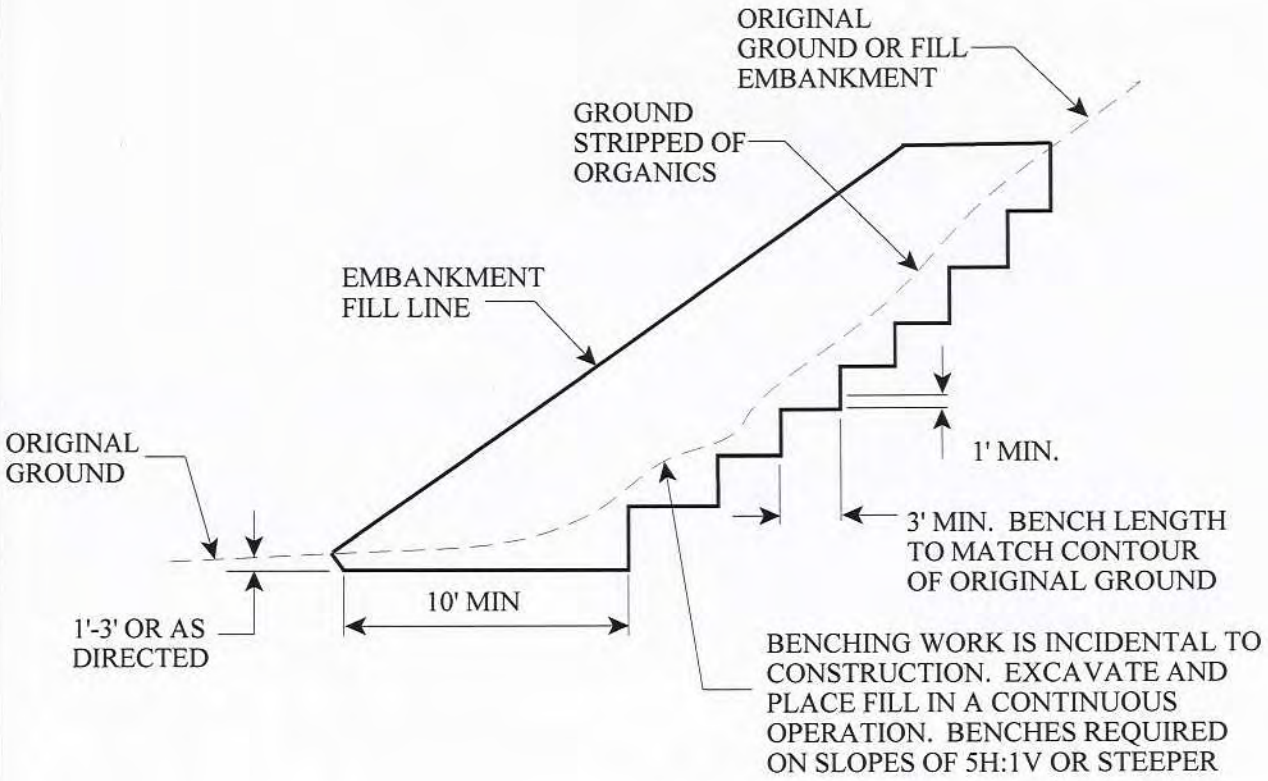
PHOTO 4 - Broken asphalt and asphalt piles present on the existing runway.

LANDMARK TESTING & ENGINEERING	PHOTOGRAPHS LANDMARK PROJECT 07330	FIGURE 9

N

NOT TO SCALE

BENCHED SLOPE DETAIL

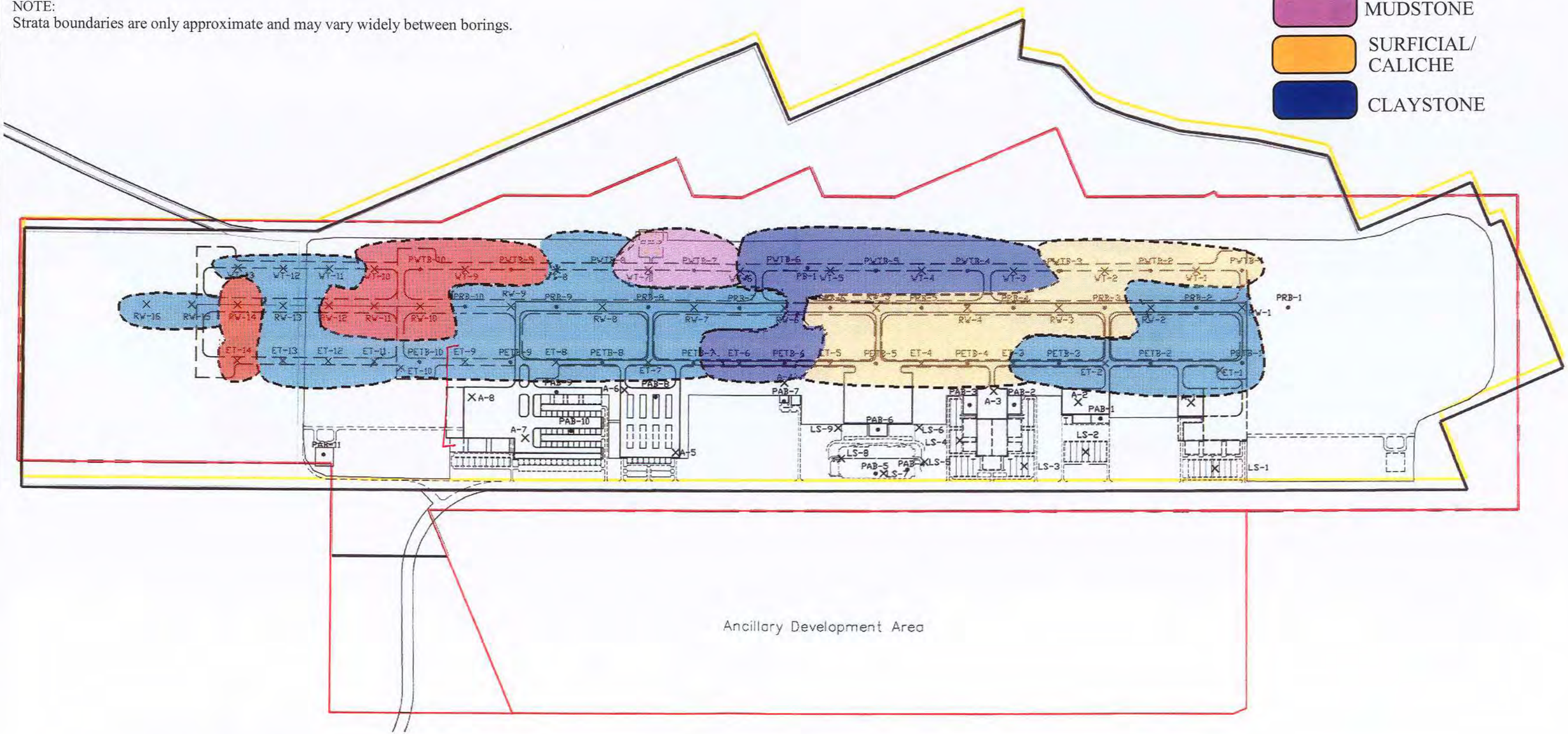


LANDMARK TESTING & ENGINEERING	BENCHED SLOPE DETAIL LANDMARK PROJECT 07330	Figure 10

NO SCALE'

NOTE:
Strata boundaries are only approximate and may vary widely between borings.

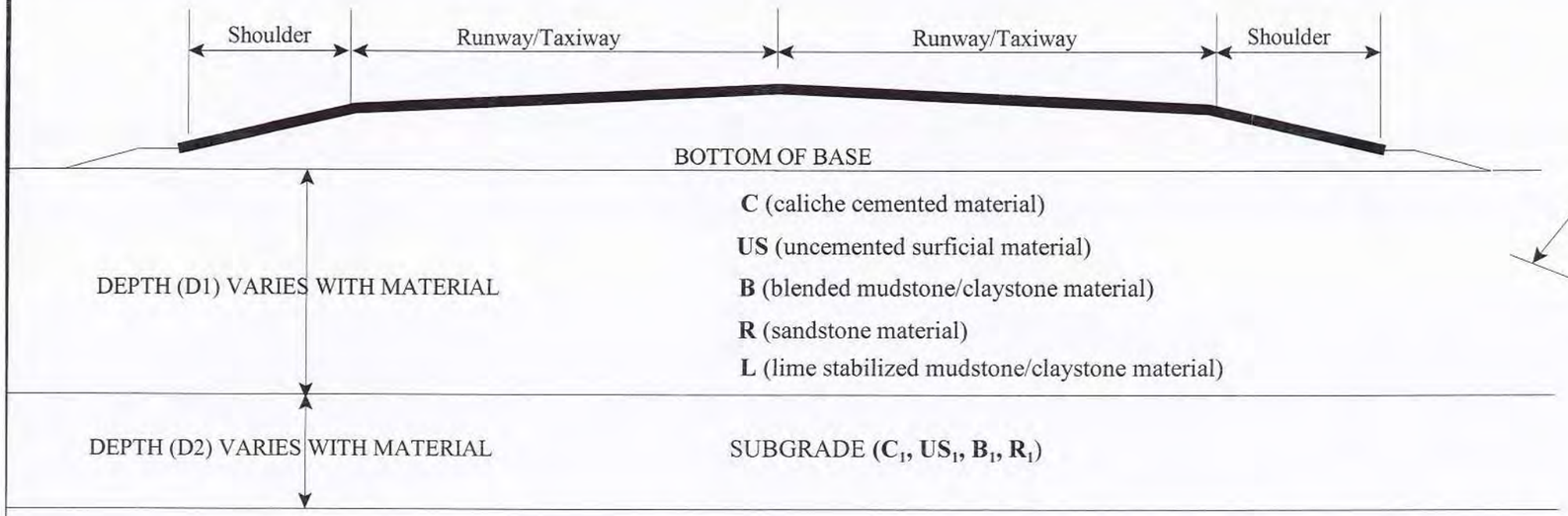
FILL
SANDSTONE
MUDSTONE
SURFICIAL/ CALICHE
CLAYSTONE

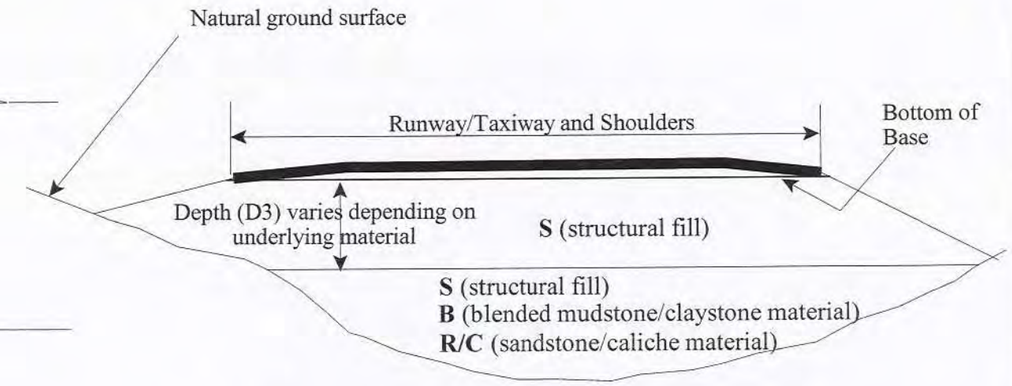


LANDMARK TESTING & ENGINEERING

PROJECTED GEOLOGIC UNITS AT FINISHED GRADE
LANDMARK PROJECT 07330

FIGURE 8





SYMBOL	DESCRIPTION	CLASSIFICATION	EXCAVATION DEPTH (D1) Inch	DEPTH (D2) Inch
C	Caliche cemented material	SM, SC, ML, GM, SP	18	
US	Uncemented surficial material	SM, SC, ML, GM, SP	32	
B	Blended mudstone/claystone material	25% claystone/mudstone and 75% non-swelling soils such as SM, SC, ML, GM, SP, or crushed sandstone.	30 (mudstone) 48 (claystone)	
R	Sandstone material	Well-graded, 3-inch minus	18	
L	Lime stabilized mudstone/claystone	4-5% lime with CL, CH. Clay clods to have 100% passing 1-inch screen and 60% passing #4 sieve.	30 (mudstone) 48 (claystone	
C_1	Caliche cemented deposits	SM, SC, ML, GM, SP		NA
US_1	Uncemented surficial deposits	SM, SC, ML, GM, SP		8
B_1	Mudstone/claystone	CL, CH		8
R_1	Sandstone bedrock			NA

MATERIAL TYPE	COMPACTION REQUIREMENT	MOISTURE REQUIREMENT	MAXIMUM LIFT THICKNESS
C	95% ASTM D-1557	0 to +2% of optimum	8-inches
US	95% ASTM D-1557	0 to +2% of optimum	8-inches
B	90% ASTM D-1557	Min. +2% of optimum	8-inches
R	95% ASTM D-1557	0 to +2% of optimum	8-inches
L	95% ASTM D-1557	1 to +3% of optimum	8-inches
C_1	90% ASTM D-1557	Where cemented, moisture condition and proof-roll subgrade, compact any loose pockets.	
US_1	90% ASTM D-1557	0 to +2% of optimum	Scarify and compact upper 8-inches
B_1	90% ASTM D-1557	2 to +4% of optimum	Scarify and compact upper 8-inches
R_1	90% ASTM D-1557	Proof-roll subgrade, compact any loose pockets.	

SUBGRADE PREPARATION

1. **S** (structural fill) to have the following characteristics:
   - ➢ Fill to be 8-inch minus material and free from organic matter, debris or rubble. The maximum particle size within 12 inches of base should be restricted to 3-inches.
   - ➢ Fill to be granular with 10-40% fines (percent passing No. 200 sieve). Fines to have a liquid limit of 30% or less and a plasticity index less than 9.
   - ➢ Structural fill to be placed in maximum 8-inch thick loose lifts at a moisture content within 2% of optimum and compacted to 95% of the maximum dry density (ASTM D-1557).
2. **B** - material comprised predominantly of mudstone/claystone may be used in the bottom of deeper fills provided it is moisture conditioned to at least +2% of the optimum moisture content and at least 15 feet (D3=15 ft) of structural fill is placed over the mudstone/claystone.

R/C- Excavated caliche and sandstone up to 24-inches in maximum dimension may be used in deeper fills (+10 ft) provided the fragments are incorporated into a matrix of finer material and placed in a manner that they do not nest or create voids between adjacent fragments. At least 5 feet (D3=5 ft) of suitable structural fill shall overlie any oversized material.

FILL UTILIZATION

LANDMARK TESTING & ENGINEERING

SUBGRADE PREPARATION AND FILL UTILIZATION DETAILS
LANDMARK PROJECT 07330

FIGURE 11

WT-1

FIELD DATE: JUNE 7, 2007

SURFACE ELEVATION: 2882.77

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																GM	SILTY GRAVEL (GM), up to 40% gravel, med dense, dry
	PROPOSED FINISHED GRADE 2881.4																
	4.6		13	63	24						50 for 5"					SM	SILTY SAND (SM), gravelly, dense, caliche, cemented, dry
	5.9																
5	7.8		36	44	20	31	21	10			80					SC	CLAYEY SAND WITH GRAVEL (SC) with up to 20% caliche nodules, dense, dry
	3.2																
10											50 for 5"						grades more caliche cementation, less gravel, dense, dry
																	grades difficult drilling, heavy cementation
																SM	SILTY SAND (SM), reddish brown, predominately fine sand, dense, dry
15	2.9		23	54	23						50 for 5.5"						COMPLETE at 16 feet, no groundwater encountered
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - WT-1

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-2

FIELD DATE: JUNE 7, 2007

SURFACE ELEVATION: 2881.55

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry, with gravel
	5		17	65	18						50 for 4"						SILTY SAND (SM), dense, light brown, caliche cemented, dry
	PROPOSED FINISHED GRADE 2877.53																
5	8.5	99.3									38 for 6"sleev					SM-ML	SILTY SAND (SM-ML), buff, mottled caliche nodules, med dense, dry, more clay
10	7.9		11	55	34	43	24	19			72					SC-CL	CLAYEY SAND (SC-CL), dense, mottled with caliche cementation, dry
											50 for 6"						grades, reddish brown, mottled, less cementation, dry
15											50 for 5"						dense, dry
20											50 for 4"						COMPLETE @ 22' - no sample no groundwater encountered
25																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG WT-2

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-3

FIELD DATE: JUNE 7, 2007

SURFACE ELEVATION: 2883.32

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	4.9	109.5									63					SM-ML	SILTY SAND (SM-ML), dry, gravelly, cemented, dense
5																	grades hard for 8"
	8.4		26	44	30						38						SILTY SAND (SM-ML), slightly moist, gravelly
	PROPOSED FINISHED GRADE 2873.41																
10						53	28	25			73					CH	FAT CLAY (CH) CLAYSTONE, dark red, hard, slightly moist, thinly bedded
15											44					CL	LEAN CLAY (CL) MUDSTONE, dark brown to purple, sandy
20						38	22	16			64						LEAN CLAY (CL) MUDSTONE, dark red to dark brown, hard, moist, sand interbeds
25											28 50 / 4"						COMPLETE to 27", no sample no ground water encountered
30																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - WT-3

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.

Core Drilling

Disturbed sample

Sampling attempt with no recovery.

Groundwater depth at time of excavation

WT-4

FIELD DATE: JUNE 26, 28, 2007
SURFACE ELEVATION: 2885.69

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																	USED SPT SAMPLER
	8.1										15 50/0"					SM	SILTY SAND (SM) reddish brown,
											50/0"						no recovery
5	19.7										62						grades reddish brown (SM-ML), buff, slightly moist
	16.8		10	54	36						36					SC	CLAYEY SAND (SC) grades reddish brown, slightly plastic, moist
10	13.7		5	70	25						34						
	10.1										38					SC-CL	SANDY LEAN CLAY (SC-CL), grades, more clay
	20.1					50	21	29			34					CH	gravel in end of sampler FAT CLAY (CH) CLAYSTONE
15	19.7					47	22	25			49						LEAN CLAY (CL) CLAYSTONE
	PROPOSED FINISHED GRADE 2868.11																
20	14.8		9	30	61	45	19	26			57						LEAN CLAY (CL), CLAYSTONE, maroon, dense, 23' to 26' very moist
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT - 4

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-4

FIELD DATE: JUNE 26+28 2007
SURFACE ELEVATION:

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25																CL	CLAYSTONE (CL)
																	grades grey
											84/10"						brown + grey, very wet, hard
30																	
	13.2					46	24	22			50/4"						poor return on clay grades brown + grey, mottled, very moist hard
																	COMPLETE @ 33' sample very moist
35																	
40																	
45																	
50																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG WT - 4

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-5

FIELD DATE: JUNE 8, 2007

SURFACE ELEVATION: 2882.64

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), reddish brown, gravelly
																	grades, less gravel
											50 / 3"						no recovery
5																	grades buff
																	grades buff, gravelly,
																	grades reddish brown
10	8.1		14	66	20						61					SM-ML	SILTY SAND (SM-ML) lightly cemented, slightly moist
15											49					GM	SILTY GRAVEL WITH SAND (GM), fines slightly plastic, reddish brown, moist, gravel up to 1/2"
																	grades purple
20																	grades grey/purple
	PROPOSED FINISHED GRADE 2861.83																
						38	20	18			37					CL	LEAN CLAY (CL) MUDSTONE, gravelly, (gravel is likely from hard cuttings)
25																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - WT-5

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-5

FIELD DATE: JUNE 8, 2007
SURFACE ELEVATION:

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25																CL	LEAN CLAY (CL) MUDSTONE
	26.6	90.1							3.84		42					CH	FAT CLAY (CH) CLAYSTONE, gray + purple, slightly moist, very stiff, cuttings in top of sampler
30																	grades grey
	15.8					70	33	37			41						grades thinly bedded
35																	grades gray, sandy, laminated
	26.3	94.9							4.16		70						grades hard
40																	grades moderately hard
	18.3	104									37 50 / 2"						FAT CLAY (CH) CLAYSTONE, no groundwater encountered, COMPLETE TO 42'
45																	
50																	

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT-5

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-6

FIELD DATE: JUNE 18, 2007
SURFACE ELEVATION: 2873.25

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), reddish brown, with gravel
											77					SM-ML	SILTY SAND (SM-ML), light brown, some gravel, dry, weakly cemented
																	grades, reddish brown, sandy
5																	grades, gray, hard,
	15	103									45					CL	LEAN CLAY (CL) CLAYSTONE, slightly moist, gray/reddish brown, soft
10						49	24	25			30 50 / 5"						LEAN CLAY (CL) CLAYSTONE gypsum crystals, sandy
15											26 50 / 5"						grades minor sandstone lenses, very stiff
	PROPOSED FINISHED GRADE 2855.48																
20									10/250		29 50 / 5"						LEAN CLAY (CL) CLAYSTONE, purple + grey, very stiff, slightly moist,
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT-6

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL /PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25									8.3/500		30 50 / 5"					CL	LEAN CLAY (CL) CLAYSTONE, dark reddish brown, very stiff
																	grades gray
30																	grades reddish brown
						51	20	31			32 50 / 3"					CH	FAT CLAY (CH) CLAYSTONE, gray to purple, very stiff
35											25 50 / 4"						grades sandy
40																	grades with siltstone intervals
											50 / 5"						COMPLETE @ 42', no groundwater encountered
45																	
50																	

WT-6

FIELD DATE: JUNE 18, 2007

SURFACE ELEVATION:

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - WT-6

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-7

FIELD DATE: JUNE 18-19, 2007
SURFACE ELEVATION: 2852.19

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT + CORE	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM-ML	SILTY SAND (SM-ML), light brown
											48						
	PROPOSED FINISHED GRADE 2849.13																
5																SC	CLAYEY SAND (SC), reddish brown and grey
	9.3					24	16	8			35					CL	LEAN CLAY (CL) MUDSTONE, sandy, grey
																	harder drilling
10																	
											50 / 2"						no recovery
											N/A/						
15											MINUTES PER FOOT						
																	no recovery
											STARTED CORING						STARTED CORING
											5						MUDSTONE / SILTSTONE, moderately weathered, laminated, reddish brown
											6						
20										%REC 85 %RQD 5	4	17'-24'					
											5						
											4						intensely fractured LEAN CLAY (CL) MUDSTONE
						24	16	8			6						
											5						lighter color, white grades reddish brown, laminated, fractured
25										%REC 80 %RQD 90	6	24'-29'					
											6						grades to white
											7						
											7						
30																	COMPLETE @ 29' no groundwater

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Landmark Project # 07330

BORING LOG - WT-7

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-8

FIELD DATE: JUNE 19, 2007

SURFACE ELEVATION:2840.12

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM-ML	SILTY SAND (SM-ML), reddish brown, dry
	PROPOSED FINISHED GRADE / FILL AT 2842.77																
	4.5	114.7							2.2		54					CL	LEAN CLAY (CL), MUDSTONE
5											MINUTES PER FOOT						
						30	17	13		BEGAN CORING	50 / 6"					CL	LEAN CLAY (CL) MUDSTONE, reddish brown, slightly moist
										%REC 66 %RQD 0	3						
											7	7.5'-13'					
10											7						intensely fractured
						24	15	9			6						
											6						
											8						LEAN CLAY (CL) MUDSTONE, reddish brown, w/ grey and yellow intervals thinly bedded, closely fractured
											6						
15											11						
										%REC 83 %RQD 40	6	13'-19'					
											6						
											5						
											5						COMPLETE @ 19' no groundwater encountered
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - SAMPLE CORE

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-9

FIELD DATE: JUNE 19, 2007
SURFACE ELEVATION: 2853.85

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0								BEGAN CORING						SM-ML	SILTY SAND (SM-ML), weathered sandstone, light grey to reddish brown SANDSTONE BEDROCK
								%REC 37 %RQD 10		0'-4'					
									6						SANDSTONE, hard, gray, reddish brown thinly bedded, slightly weathered occasional vertical joints
5								%REC 90 %RQD 68	6	4' - 9'					
									4						
									6						
									6						grades yellowish brown, hard, breaks on bedding plane partings
									6						
10								%REC 96 %RQD 90	4	9' - 14'					
									4						
									3						
									4						fractured
									4						
15								%REC 70 %RQD 8%	3	14'-19'					
	PROPOSED FINISHED GRADE 2836.42								4						hard, slightly fractured, fresh
									4						
									5						
									3						
20								%REC 100 %RQD 66	3	19'-24'					SANDSTONE, reddish brown
									4						
									3						
									6						SANDSTONE
									3						
25															

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT-9

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LABORATORY RESULTS							SAMPLE DATA								WT-9
DEPTH (FT)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	FIELD DATE: JUNE 19, 2007 SURFACE ELEVATION: DESCRIPTION
25								CORING CONTINUED	3						SANDSTONE, reddish brown
								%REC 100 %RQD 83	2	24'-29'					
									3						
									3						SANDSTONE
									4						
30								%REC 100 %RQD 90	4	29'-34'					
									3						
									4						
									4						
									3						
35								%REC 93 %RQD 48	4	34'-39'					
									4						
									5						
									4						SANDSTONE, no variation, no groundwater encountered, COMPLETE @ 39'
40															
45															
50															

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Landmark Project # 07330

BORING LOG - WT-9

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WT-10

FIELD DATE: AUG 16, 2007
SURFACE ELEVATION: 2838

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMPRESSIVE STRESTH (PSI)	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, gravelly, loose, dry
																	SANDSTONE, fractured, thinly bedded
										REC% 60	2	4'-9'					grades moderately hard, weathered joints
5									9150	RQD% 32	3						
											4						grades fractured, minor caving of bore hole
											5						
											5						
10										REC% 50	6	9'-14'					occasional vertical fractures, weathered on fractures
										RQD% 28	4						
											3						
											5						
											6						grades slightly fractured, gray, dry
15										REC% 90	5	14'-19'					
										RQD% 58	5						
											4						
											4						
											4						COMPLETE @ 19' no groundwater encountered,
20																	
25																	

PROPOSED FINISHED GRADE: 2830.06

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BORING LOG - WT-10

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

PHOTO - WT-11 Location in sandstone rock.

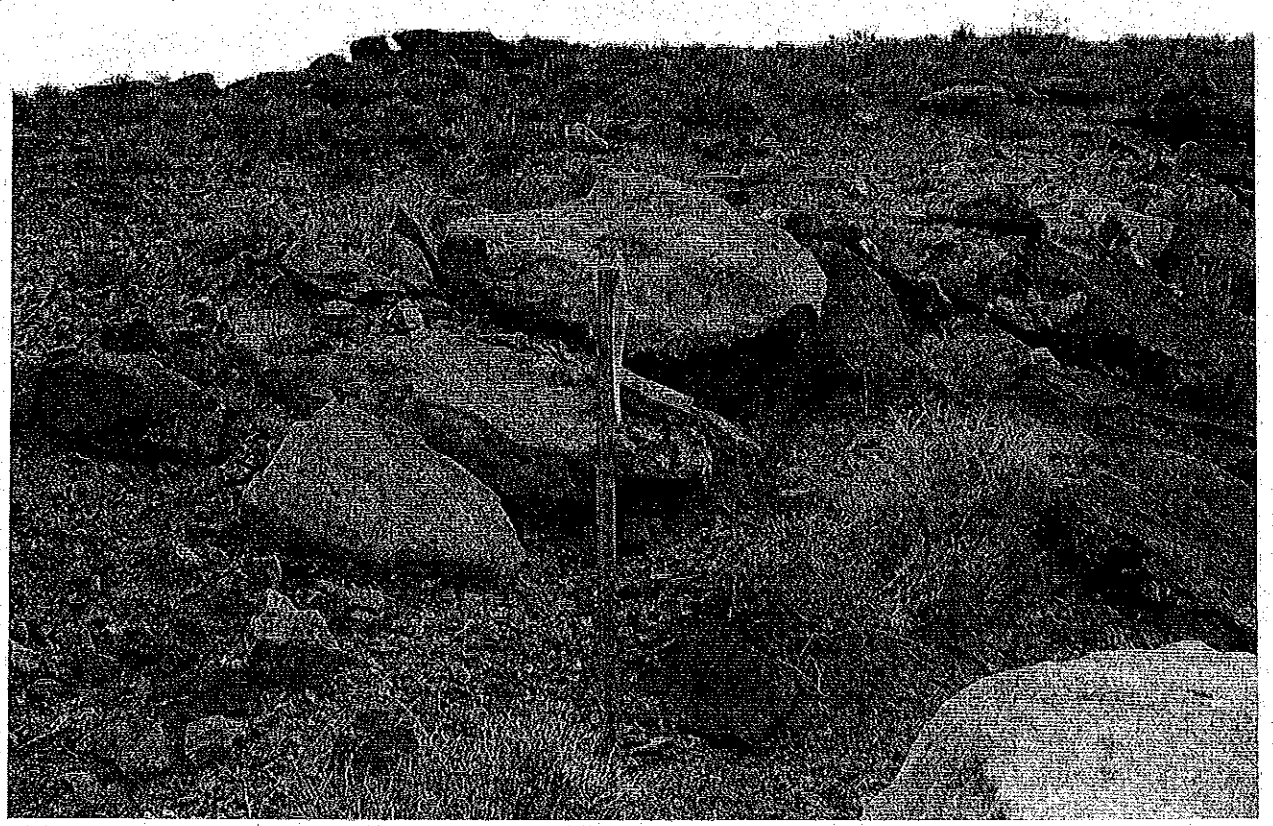

PHOTO - WT-12 Location in sandstone rock.

WT-13

FIELD DATE: AUG 17, 2007
SURFACE ELEVATION: 2807

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMPRESSIVE STRENGTH (PSI)	% RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE/FILL AT 28								8.42	REC% 33 RQD% 12	1	0'-9'				SM	SILTY GRAVEL (SM), brown, dry, sandstone boulders on surface BEGAN CORING @ 0'
											2						
											2						SANDSTONE, mottled, fractured, moderately soft
											3						
											4						
5											5						grades mottled, hard
									7460		6						
											9						
											11						grades gray, dry
10										REC% 100 RQD% 49	7	9'-14'					fractured from 10' to 11', thinly bedded, breaks along bedding plane partings
											4						
											4						
											4						grades slightly to moderately weathered, slight clay infilling of joints
											4						COMPLETE @ 14' no groundwater encountered
15																	
20																	
25																	

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BORING LOG - WT-13

LANDMARK TESTING & ENGINEERING
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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-1

FIELD DATE: JUNE 21, 2007
SURFACE ELEVATION: 2874.72

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2883.30															SM	SILTY SAND SM) brown, dry w/gravel
	1.5	112	11	63	26						85						SILTY SAND (SM), brown, dry with gravel, dense
5																	grades, white gravel,
	5.1	97.1	24	46	30						48 50 / 5"						
																SM	9.0' to 10.5' grades more sandy
10																GM	
											32 50 / 4"						SILTY GRAVEL WITH SAND (GM), brown, slightly moist, dense COMPLETE @ 13' no groundwater encountered
15																	
20																	
25																	

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BORING LOG - RW-1

LANDMARK TESTING & ENGINEERING
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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-2

FIELD DATE: JUNE 21, 2007
SURFACE ELEVATION: 2876.85

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2879.44															SM	SILTY SAND (SM), brown, dry w/gravel
											50 / 4"					GM	SILTY GRAVEL (GM) white brown, dry, very dense, heavy cementation, caliche
																	no recovery
5																	grades, reddish brown
	6.9		8	63	29						31 50 / 5"					SM	SILTY SAND (SM), reddish brown, slightly moist, dense
10																	
	4.3		11	69	20						43 50 / 5"						grades red, slightly moist, very dense
15																	
	6.6	109	0	77	23						70						grades red, moist, dense
20																	
											67						COMPLETE @ 23' no groundwater encountered
25																	

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BORING LOG - RW-2

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-3

FIELD DATE: JUNE 21, 2007
SURFACE ELEVATION: 2875.70

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM) brown, dry with gravel
	PROPOSED FINISHED GRADE 2875.57																
	1.4		16	64	20						9 50 / 5"						SILTY, SAND WITH GRAVEL (SM) brown, dry, dense
																	grades brown + white gravel, caliche
5																SM-GM	
											50 / 5"						SILTY SAND (SM-GM) very little return, white to light brown, dry, dense w/ gravel, caliche cementation
10																	
	7.1	90	20	53	27						43 50 / 3"						SILTY SAND WITH GRAVEL (SM) white + light brown, dry, very dense, caliche cemented
15																SM	15' to 18' LAYER GRADES red/white SILTY SAND (SM)
											N / A						grey, dry, caliche
																SC	grades very red, moist
20																	
	8.9		20	55	25	27	18	9			67						CLAYEY SAND WITH GRAVEL, (SC), reddish/brown, slightly moist, dense
																CL	LEAN CLAY (CL) CLAYSTONE, 24' to 26'
25																	grades maroon
																	grades grey clay
											38						grades (CL), hard nodules, gray, slight moisture, very stiff, COMPLETE @ 28' no groundwater encountered
30																	

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BORING LOG - RW-3

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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-4

FIELD DATE: JUNE 23, 2007
SURFACE ELEVATION: 2877.04

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL/ PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM) reddish brown, dry
	2		8	65	27						50 / 3"						no recovery at 2', SILTY SAND (SM), very dense, brown, dry,
5																	grades white
	PROPOSED FINISHED GRADE 2870.90																
											50 / 2"					SM-GM	no recovery, very dense, caliche SILTY SAND WITH GRAVEL (SM-GM) brownish white, dry,
10																	grades maroon,
	8.3		44	41	15						24 50 / 5"						SILTY SAND WITH GRAVEL (GM) brown with color variations, dry, dense
15																	grades white from 15' to 16.5'
	0.7		27	65	8						61					SP-SM	POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), brown, with color variations, dry, dense
20																	
	14.2					55	23	32			59					CH	FAT CLAY (CH) CLAYSTONE, grey, slight moisture, hard, with gravel
25																	grades purple clay
	14.7	102.6							4.8/500		40 50 / 4"						
30																	
						62	25	37			50 / 5"						FAT CLAY (CH) CLAYSTONE, purple dry, hard COMPLETE @ 33' no groundwater

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BORING LOG - RW-4

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Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

RW-5

FIELD DATE: JUNE 23, 2007

SURFACE ELEVATION: 2872.77

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL/ PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry with gravel
	3.1		26	48	26						46						SILTY SAND WITH GRAVEL (SM) white-light brown, dry, med dense
5																SM-GM	SILTY SAND WITH GRAVEL (SM-GM) grades reddish brown
	4.2	102									36 50 / 5"						SILTY SAND WITH GRAVEL (SM, GM) brown, moist, very dense
	PROPOSED FINISHED GRADE 2864.99																
10																	
	0.9		18	75	7						50 / 4"					SP-SM	POORLY-GRADED SAND WITH SILT AND GRAVEL (SP-SM) brown, dry, very dense,
15																CL	grades maroon
									6.3/500		32 50 / 5"						LEAN CLAY (CL) CLAYSTONE, maroon, moist, hard,
20																	
						47	25	22			50 / 4"						little recovery LEAN CLAY (CL) CLAYSTONE, maroon w / white spots, mostly dry, hard
25																	
											50 / 5"					CH	FAT CLAY (CH) CLAYSTONE, maroon, dry, hard, cemented
30																	
						52	26	26			50 / 5"						FAT CLAY (CH) CLAYSTONE, maroon, dry, hard, cemented COMPLETE @ 33' no groundwater

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BORING LOG - RW-5

LANDMARK TESTING & ENGINEERING

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Core Drilling

Disturbed sample

Sampling attempt with no recovery.

Groundwater depth at time of excavation

RW-6

FIELD DATE: JUNE 20, 2007
SURFACE ELEVATION: 2867.63

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL/ PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), light brown, dry, with gravel variation from small to large, cobbles
											74						SILTY SAND (SM) brown, dry, very low cementation, little gravel
5																	grades purple
											N/A						no return, very dense
	PROPOSED FINISHED GRADE 2858.64																
10																CL	grades LEAN CLAY (CL) CLAYSTONE purple, sandy
	17.1	103.8							9.8/150		48						
15																	grades from 14' to 16' lighter purple white
	15.6	102.9							9.1/500		56						LEAN CLAY (CL) CLAYSTONE, white, slightly moist, traces of sand
20											67						LEAN CLAY (CL) CLAYSTONE, grey, hard, traces of sandstone interbeds + gypsum, slightly moist
25																	grades, yellow clay
	9.8					42	24	18			47 50 / 4"						grades, grey clay
30																	
	9.4					46	22	24			50 / 5"						grades purple, LEAN CLAY (CL) CLAYSTONE, purple, hard COMPLETE @ 33' no groundwater

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BORING LOG - RW-6

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- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-7

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2843.80

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL/ PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2852.28															SM	SILTY SAND (SM), light brown, dry, with loose gravel
	0.8	108.8	1	77	22						53					SM	SILTY SAND (SM), light brown sand, dry
																SC	CLAYEY SAND (SC), grades brown + white, slightly moist, minor cementation
5	10.5	115.3							4/1000		67					CL	grades white LEAN CLAY (CL), CLAYSTONE white and purple, slight moisture, hard
10											50 / 5"						LEAN CLAY (CL) CLAYSTONE, white, very little moisture, hard
15																	grades purple
	8.7					43	24	19			35 50 / 4"						LEAN CLAY (CL) MUDSTONE, purple with white variations COMPLETE @ 18' no groundwater encountered
20																	
25																	

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BORING LOG - RW-7

LANDMARK TESTING & ENGINEERING
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KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-8

FIELD DATE: JUNE 20, 2007

SURFACE ELEVATION: 2837.56

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	0.9	PROPOSED FINISHED GRADE / FILL AT 2845.93														SM	SILTY SAND (SM) light brown, dry, sparse gravel
	2	106	2	62	36					70							SILTY SAND (SM), light brown, slightly moist, slight cementation
										BEGAN CORING	5						SILTSTONE, grades white, hard, fractured
5										%REC 10 %RQD 0	4	4' - 9'					grades tan
											4						
											3						
											5					CL	LEAN CLAY (CL) MUDSTONE, purple + white with yellow variations, dry, hard
10										%REC 90 %RQD 14	5	9' - 14'					at 10' grades white + gray,
						24	16	8			4						
											5						
											5						
											5						LEAN CLAY (CL) MUDSTONE, reddish brown with white, heavy cementation
15						26	17	9		%REC 100 %RQD 0%	4	14'-19'					grades white, fractured
											4						
											4						
											4						LEAN CLAY (CL) MUDSTONE, reddish brown, hard, COMPLETE @ 19' no groundwater encountered
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - RW-8

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 Inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-9

FIELD DATE: JUNE 27, 2007
SURFACE ELEVATION: 2829.59

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0		PROPOSED FINISHED GRADE / FILL AT 2839.57														SM	SILTY SAND (SM), tan, dry
	2.8	100	7	55	38												SILTY SAND (SM), brown, dry, weakly cemented
										BEGAN CORING	5					CL	LEAN CLAY (CL) MUDSTONE, purple, mottled, stiff, laminated, fractured, grades very hard
5										%REC 0 %RQD 0	7	4' - 9'					
											7						grades white
											11						grades whiter
											9						
10										%REC 40 %RQD 0	12	9' - 14'					
											14						
											12						grades white + tan
					33	17	16										LEAN CLAY (CL) MUDSTONE grades tan
											9						
											10						
15																	COMPLETE @ 14'
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-9

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-10

FIELD DATE: JUNE 27, 2007
SURFACE ELEVATION: 2852.00

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0								BEGAN CORING							WEATHERED SANDSTONE, brown, dry
								%REC 40 %RQD 0	3 3 3 3 3	0'-5'					
5								% REC 20 %RQD 0	4 3 2 5 7	5'-9'					SANDSTONE BEDROCK, yellowish grey moderately hard, slightly weathered
10								% REC 100 %RQD 80	6 4 4 3 6	9'-14'					SANDSTONE, moderately hard, slightly fractured
															grades hard,
15								% REC 100 %RQD 90	3 4 3 4 3	14'-19'					
	PROPOSED FINISHED GRADE 2833.22														
20								% REC 100 %RQD 82%	3 4 3 3 3	19'-24'					SANDSTONE, hard, thickly bedded
25															

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW - 10

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25								CONTINUED CORING							SANDSTONE, hard
								%REC 100	3	24'-29'					
								%RQD 66	2						
									3						
									3						
									3						
30								% REC 100	3	29'-34'					SANDSTONE, hard
								%RQD 89	3						
									3						
									3						
									3						
35								% REC 90	3	34'-39'					SANDSTONE, hard
								%RQD 46	3						
									3						
									3						No variations encountered COMPLETE AT 39'
40															
45															
50															

RW-10

FIELD DATE: JUNE 27 2007

SURFACE ELEVATION:

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - RW - 10

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-11

FIELD DATE: JUNE 27, 2007
SURFACE ELEVATION: 2857.43

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0								BEGAN CORING							SANDSTONE, moderately weathered sandstone, brown, dry grades hard 1.5' to 6.5' SANDSTONE, tan color, weathered, fractured, hard
								%REC 40 %RQD 0	5	0'-9'					
									7						
									6						
									6						
									7						
5									5						
									4						SANDSTONE, hard
									3						
									3						
									3						
10								%REC 100 %RQD 48	3	9'-14'					
									4						
									3						
									3						
									3						
15								%REC 90 %RQD 44%	3	14'-19'					
									3						16 to 17' small layer of shale
									3						SANDSTONE, hard
									4						
									3						
20								%REC 100 %RQD 11	3	19'-24'					SANDSTONE, fractured, hard
									3						
									3						
									3						SANDSTONE, hard
25									5						

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW - 11

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-11

FIELD DATE: JUNE 27, 2007
SURFACE ELEVATION:

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25								CONTINUED CORING							SANDSTONE BEDROCK
									4						
	PROPOSED FINISHED GRADE 2830.04							%REC 80	5	24'-29'					
								%RQD 68	4						
									3						
30									4						
								%REC 100	4	29'-33'					SANDSTONE, 5' core, unbroken
								%RQD 100	4						
									4						
									3						
35									4						
								%REC 96	4	33'-38'					SANDSTONE, very widely fractured
								%RQD 96	4						
									4						
									5						
								%REC 100	4	38'-43'					SANDSTONE, moderately hard
40								%RQD 92	3						
									4						
									4						
									3						
								%REC 90	3	43'-48'					SANDSTONE, slightly fractured
45								%RQD 50	3						grades, grey layer
									3						
									3						COMPLETE @ 48' no groundwater encountered
50															

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-11

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-12

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2841.41

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0								BEGAN CORING						SM	SILTY SAND (SM) moderately weathered, dry, dark purple
								%REC 16	3	0'-9'					SANDSTONE BEDROCK, fractured
								%RQD 5	4						
									4						
									3						
									3						
5									3						SANDSTONE, grades yellow, fractured
									4						
									4						
									4						SANDSTONE, yellow, dry, very widely fractured
									3						
10								%REC 100	4	9'-14'					
								%RQD 80	3						
									3						
									3						
	PROPOSED FINISHED GRADE 2826.86								4						
15								%REC 100	8	14'-19'					
								%RQD 56%	3						
									3						
									3						
									6						
20								%REC 100	6	19'-24'					
								%RQD 86	4						
									4						
									4						
25									4						

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW - 12

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-12

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION:

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25								CONTINUED CORING							SANDSTONE BEDROCK, moderately weathered, dry, dark purple,
								%REC 50	8	24'-27'					
								%RQD 0	5						
								%REC 100	6	27'-29'					
								%RQD 69	5						SANDSTONE, yellow, dry, hard, moderately fractured
									5						
30								%REC 90	4	29'-34'					
								%RQD 63	4						
									4						
									4						
									4						MUDSTONE, yellow, dry, cemented, hard
35								%REC 90	4	34'-39'					SANDSTONE BEDROCK, hard, slightly fractured
								%RQD 60	4						
									4						
									3						
															MUDSTONE, grey, moderately hard
40								%REC 100	3	39'-42'					grades, sandstone, yellow, hard
								%RQD 55	4						
									3						COMPLETE AT 42'
45															
50															

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW - 12

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

PHOTO - RW-13 Location in sandstone rock.

RW-14

FIELD DATE: AUG 17, 2007
SURFACE ELEVATION: 2819

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMRESSIVE STRENGTH (PSI)	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE/ FILL AT 2820.51																
										REC% 33	4	1'-4'				SM	SILTY SAND (SM), brown, sandstone boulders on surface
										RQD% 0	2						SANDSTONE, slightly weathered, gypsum infilling of joints, moderately fractured, dry
											6						
											7						
5										REC% 90	3	4'-9'					grades intensely fractured, slightly weathered
									9360	RQD% 34	3						
											4						
											3						
										REC% 16	7	9'-11'					occasional gypsum infilling to 1/4" on joints
10										RQD% 0	24						
										REC% 100	8	11'-13'					grades hard, slightly fractured
										RQD% 52	16						
																	COMPLETE to 13' no groundwater encountered
15																	
20																	
25																	

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-14

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-15

FIELD DATE: AUG 20, 2007
SURFACE ELEVATION: 2795

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMPRESSIVE STRENGTH (PSI)	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE/FILL AT 2817.33									REC% 40 RQD% 14	2	0'-4'					SANDSTONE, weathered thinly to thickly bedded, fractured, dry
											3						
											2						
											2						
5										REC% 100 RQD% 68	3	4'-9'					grades slightly fractured, less weathered, moderately hard to hard
									6330		2						
											3						
											3						
10										REC% 100 RQD% 75	2	9'-14'					grades gray with brownish striations, dry, lightly fractured
											2						
											2						
											2						
											2						COMPLETE @ 14' no groundwater encountered
15																	
20																	
25																	

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-15

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

RW-16

FIELD DATE: AUG 20, 2007
SURFACE ELEVATION: 2775

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMPRESSIVE STRENGTH (PSI)	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry
	PROPOSED FINISHED GRADE/FILL AT 2812.13																
																	SANDSTONE, weathered, fractured, moderatley hard, dry
																	grades less weathered, thinly bedded
5									4550	REC% 90	3	4'-9'					
										RQD% 46	3						
											3						
											3						
											3						
10										REC% 90	3	9'-14'					grades with gypsum infilling, slightly fractured
										RQD% 77	2						
											2						
											2						
											2						grades hard, gray, lightly fractured
																	COMPLETE @ 14'
																	no groundwater encountered
15																	
20																	
25																	

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-16

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-2

FIELD DATE: JUNE 21, 2007
SURFACE ELEVATION: 2867.91

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2872.92															SM	SILTY SAND (SM), brown, dry
	3		9	63	28						50 / 5"		1				SILTY SAND WITH GRAVEL (SM), brown, dry, dense
																	grades red + white
5	3.3															GM	SILTY GRAVEL (GM) dense, dry
																	grades hard from 6' to 7.5'
	0.1		50	43	7						N / A		2			GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM) white, dry, very dense, caliche cemented, grades reddish white @ 8'
10																	
											50 / 5"		3			GM	SILTY GRAVEL (GM), maroon, dry,
15																	
											50 / 4"		4			SM	SILTY SAND (SM) brown + maroon, dry, no return, COMPLETE @ 18' no groundwater
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - E-2

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-3

FIELD DATE: JUNE 22, 2007
SURFACE ELEVATION: 2870.05

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES / FOOT	BLOWS PER FOOT	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE 2869.96															SM	SILTY SAND (SM) brown, dry, gravel
																	grades hard
												50 / 5"	1			SM-GM	SILTY SAND WITH GRAVEL (SM-GM), white, dry, caliche cemented.
																	caliche ends grades, white/red
5																	
												50 / 5"	2			SM	SILTY SAND WITH GRAVEL (SM), reddish brown, moist, med dense light cementation
																	grades red
10																	
																	grades maroon
	7.2		1	62	37	32	17	15				38.0 50 / 6"	3			SC	CLAYEY SAND (SC), red and maroon w/ white variations, moist, very dense
15																	
						29	18	11				50 / 5"	4			CL	LEAN CLAY (CL) MUDSTONE, grey, dry, hard
																	grades, (CL), white + grey
20																	
												50 / 2"	5				
											3						grades hard, started coring SANDSTONE BEDROCK
25										% REC 90 %RQD 37	3 3 3 3	24'-29'					
																	SANDSTONE maroon, dry, hard COMPLETE @ 29' no groundwater
30																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - ET-3

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-4

FIELD DATE: JUNE 22, 2007

SURFACE ELEVATION: 2868.14

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), reddish brown, dry with gravel
	1		4	70	26						66						SILTY SAND (SM) brown, dry, dense, very fine sand
	PROPOSED FINISHED GRADE 2864.66																3.5' to 4.5' very dense, grades white, light brown, heavy caliche
5	4.1	95.4	7	44	49						62						SILTY SAND (SM), light brown, dry, with minor gravel, dense
10																	grades reddish brown
	8.8		32	53	15						50 / 5"					SM-GM	SILTY SAND WITH GRAVEL (SM-GM), reddish brown, moist, weak cementation, dense
15											50 / 5"						SILTY SAND WITH GRAVEL (SM-GM), red/brown, dry, slightly more cementation, dense grades reddish/purple
20																	grades purple grades grey, white
											BEGAN CORING @ 22'						grades hard, SANDSTONE BEDROCK
25																	CONTINUE CORING

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - ET-4

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-4

FIELD DATE: JUNE 22, 2007
SURFACE ELEVATION:

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25										CONTINUE CORING	3						SANDSTONE, continue coring
										%REC 78 %RQD 37	3	22'-29'					
											3						
											3						SANDSTONE, grey, dry, hard
											3						
30										%REC 90 %RQD 48	3	29'-33.5'					
											3						
						31	19	12			4						LEAN CLAY (CL) MUDSTONE, brown, moist, cemented, COMPLETE @ 33.5' no groundwater encountered
											4						
35																	
40																	
45																	
50																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - ET-4

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-5

FIELD DATE: JUNE 23, 2007

SURFACE ELEVATION: 2863.76

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry, with gravel
	8.9										40						SILTY SAND (SM), brown + white, dry minor gravel, med dense, weak cementation
5																	
	PROPOSED FINISHED GRADE 2858.38																
	3.5	105	9	63	28						22 50 / 5"						SILTY SAND (SM), reddish brown, moist, dense grades cemented
10																CL	LEAN CLAY (CL) CLAYSTONE, grades tan color,
											N / A						
15						45	24	21			50 / 6"						LEAN CLAY (CL) CLAYSTONE, grey, moist, hard
20						40	22	18			50 / 4"						LEAN CLAY (CL) MUDSTONE, gray, slightly moist, hard,
25											50 / 3"						LEAN CLAY (CL) CLAYSTONE grey, slightly moist, hard
30											50 / 4"						LEAN CLAY (CL) CLAYSTONE maroon, slightly moist, hard, COMPLETE @ 33' no groundwater

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - ET-5

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.

Core Drilling

Disturbed sample

Sampling attempt with no recovery.

Groundwater depth at time of excavation

ET-6

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2872.08

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM) light brown, dry, gravelly, dense
	4.1										74		1			SM-GM	SILTY SAND WITH GRAVEL (SM-GM) white / light brown, dry, dense,
5																	grades red
	3.4	106	1	72	27						66		2			SM	SILTY SAND (SM) redish-brown, moist, dense, low cementation
																CL	grades, grey + purp
10	22	95									78		3				LEAN CLAY (CL) CLAYSTONE, purple / grey, dry, soft, mottled
15	20.1					54	27	27			67		4			CH	FAT CLAY (CH) CLAYSTONE, purple + grey, dry,
	PROPOSED FINISHED GRADE 2852.03																
20											67		5				FAT CLAY (CH) CLAYSTONE, purple + grey, dry,
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG ET-6

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-6

FIELD DATE: JUNE 25, 2007

SURFACE ELEVATION: 2872.08

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25																CH	
						57	27	30			26 55/5"						FAT CLAY (CH) CLAYSTONE, grey, dry, moderately hard, gypsum stringers
30																	
	21.3	96.6									37 50 / 4"						
35																	
						57	27	30			31 50 / 4"						FAT CLAY (CH) CLAYSTONE, grey, dry, moderately hard, contains gypsum
40																	
											36 50 / 4"						
45																	
											31 50/ 4"						FAT CLAY (CH) CLAYSTONE, purple-grey, dry, moderately hard, contains traces of gypsum COMPLETE at 48' no groundwater
50																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG ET-6

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-7

FIELD DATE: JUNE 25, 2007

SURFACE ELEVATION: 2832.71

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	1															SM	SILTY SAND (SM) light brown, dry, light gravel,
		PROPOSED FINISHED GRADE / FILL AT 2845.68															
	15		0	29	71						39					ML-SM	SILT WITH SAND (ML-SM) brown, slight moisture, weakly cemented med dense, grades purple - brown
5	18.3																
											83					CL	LEAN CLAY (CL) MUDSTONE, dark brown, moist, hard
10																	
						37	22	15			50 / 6"						LEAN CLAY (CL) MUDSTONE, dark brown, moist, hard COMPLETE at 13' no groundwater
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG ET-7

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET - 8

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2827.41

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2839.32															SM	SILTY SAND (SM) brown, dry, with gravel
											50/6"						no return at 2', sample taken from auger (SM) brown, dry,
5																	grades, grey
						30	18	12			50/5"						LEAN CLAY (CL) MUDSTONE varying colors, red brown with yellow striations, moist, hard
10																	grades hard. SANDSTONE BEDROCK
											N/A						SANDSTONE gray / brown, dry, hard.
																	COMPLETE @ 13' no groundwater
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - ET - 8

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-9

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2817.57

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2832.97															SM	SILTY SAND (SM) brown, dry with gravel
	2		0	11	89						61					CL-ML	SILTY CLAY (CL-ML) brown, dry, hard no cementation,
																	grades purple
5						33	18	15			50/6"					CL	grades grey / maroon LEAN CLAY (CL) MUDSTONE grey + yellow + maroon, moist, low cementation, soft
10																	10' to 11.5' grades slight yellow
											99/11"						LEAN CLAY (CL) MUDSTONE, very yellow with slight grey and maroon, dry, hard. COMPLETE AT 13' no groundwater,
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - ET-9

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-10

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2814.64

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2827.89															SM-GM	SILTY SAND (SM-GM) brown, dry, with gravel
	3.3		21	51	28						50/6"						SILTY SAND WITH GRAVEL (SM-GM) brown, moist, with gravel, medium dense
5	4.2	114.5	7	69	24						66					SM	SILTY SAND (SM) brown, moist, minor gravel, dense, slightly cemented.
																	grades hard, SANDSTONE BEDROCK
											N/A						SANDSTONE, tan, dry, hard.
10																	COMPLETE @ 9' no groundwater
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - ET-10

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-11

FIELD DATE: AUG 16, 2007
SURFACE ELEVATION: 2814

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMPRESSIVE STRENGTH (PSI)	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, with weathered sandstone cobbles, dry.
	PROPOSED FINISHED GRADE/ FILL AT 2826.61																
									4,080	REC% 60 RQD% 37	2	4'-9'					SANDSTONE, moderately hard, slightly weathered
5											3						
											6						
											6						
											5						occasional healed vertical joints, gypsum infilling grades hard, fresh
10										REC% 100 RQD% 83	4	9'-14'					
											4						
											4						
											3						
											3						
15																	COMPLETE @ 14' no groundwater encountered
20																	
25																	

ST. GEORGE REPLACEMENT AIRPORT
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BORING LOG - ET-11

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-12

FIELD DATE: AUG 16, 2007

SURFACE ELEVATION: 2807

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNCONFINED COMPRESSIVE STRENGTH (PSI)	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown with weathered sandstone fragments, dry.
	PROPOSED FINISHED GRADE/ FILL AT 2823.43																
																	SANDSTONE, fractured, moderately hard
										REC% 20	3	4'-9'					grades slightly weathered, fractured from 4-0' to 9-0'
5										RQD% 8	4						
											4						
											3						
											3						grades gray, hard
10									15720	REC% 100	3	9'-14'					
										RQD% 65	4						siltstone lense at 11', gray, weathered on joint surfaces
											4						
											4						grades yellowish gray
											4						COMPLETE @ 14' no groundwater encountered
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT

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BORING LOG - ET-12

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-13

FIELD DATE: AUG 16, 2007
SURFACE ELEVATION: 2795

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry with weathered sandstone boulders on surface
PROPOSED FINISHED GRADE/ FILL AT 2820.26																	
																	SANDSTONE, intensely weathered, fractured
										REC% 80	3	4'-9'					
5										RQD% 20	4						grades hard, moderately fractured, thinly bedded
											3						grades intensely weathered along joints
											4						
											5						
10										REC% 100	7	9'-14'					grades to siltstone, gray, moderately hard, thinly bedded, breaks along bedding plane partings
										RQD% 31	4						
											8						grades laminated, breaks along bedding plane partings into 1/4 inch chips.
											3						
											3						COMPLETE @ 14' no groundwater encountered
15																	
20																	
25																	

ST. GEORGE REPLACEMENT AIRPORT
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BORING LOG - ET-13

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

ET-14

FIELD DATE: AUG 20, 2007
SURFACE ELEVATION: 2820

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	MINUTES PER FOOT	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	NOTE - hole was drilled 50' SW from stake SILTY SAND (SM), brown, gravelly, loose, moist.
	PROPOSED FINISHED GRADE: 2817.08											(BLOWS PER FOOT)					
	15.1		19	41	40						8 15	8/15	1				grades with gypsum stringers, gravelly
5										REC% 0 RQD% 0	1 2 2 3	5'-9'					SILTY GRAVEL and fractured sandstone, very poor recovery. SANDSTONE, weathered, intensely fractured grades slightly harder, tan, dry no core recovery from 5' to 9'
10										REC% 3 RQD% 0	12 6 10 13 9	9'-14'					grades tan, slightly weathered, occasional clayey interbeds, moderately hard, intense weathering on joints
15						45	19	26		REC% 5 RQD% 0	6 16 12 20 16	14'-19'					CLAYSTONE, brown, fractured, moderately soft, dry grades intensely fractured, moderately soft
20										REC% 50 RQD% 0	10 15 16	19'-22'					grades gray COMPLETE @ 22' no groundwater encountered
25																	

ST. GEORGE REPLACEMENT AIRPORT
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BORING LOG - ET-14

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-1

FIELD DATE: JUNE 26, 2007

SURFACE ELEVATION: 2861.45

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2872.59													SM	SILTY SAND (SM), brown, dry,
									50/4"			O			no recovery
5									50/5"			■		SM-ML	poor recovery SILTY SAND (SM-ML) caliche, light brown, dense
10									90/11"			O			no recovery, COMPLETE TO 10' no groundwater
15															
20															
25															

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - A-1

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- ■ Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- O Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-2

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2865.89

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2871.22															SM	SILTY SAND (SM), reddish brown
											50 / 3"						cemented, gravelly, caliche, dense very little recovery
5		57	25	43	32	37	28	9			30 50 / 4"					SC	CLAYEY SAND WITH GRAVEL (SC) cemented, dry
10	7.5		8	70	22						50 / 4"					SC-SM	SILTY / CLAYEY SAND (SC-SM) grades darker, more cemented, occ pinholes, dry
15	7.3		3	64	33						50 / 4"					SM	SILTY SAND (SM) WITH GRAVEL reddish brown, slightly cemented, dense, COMPLETE at 15' no groundwater encountered
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-2

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-3

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2867.45

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), reddish brown, dry
	PROPOSED FINISHED GRADE : 2866.40																
5											50 / 2"						no recovery, caliche
10											50 / 3"					SC-SM	CLAYEY SAND (SC-SM), reddish brown, cemented, minor pinholes, gravelly
15	55.8	1	62	37	33	22	11				50/4.5"						CLAYEY SAND (SC) reddish brown, slightly cemented, dry
																CL	grades purple
20											40 50 / 4"						LEAN CLAY (CL) CLAYSTONE, purple, slightly moist, stiff, hard COMPLETE to 20' no groundwater
25																	

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation.

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-3

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SC-SM	CLAYEY SANDS (SC-SM), gravelly, dense
5	12.2		54	35	11						10					GP-GM	POORLY-GRADED GRAVEL WITH SILT AND SAND (GP-GM) reddish brown, fine gravel
																	grades hard
10						NP	NP	NP			64						SILTSTONE / MUDSTONE, small amounts of gypsum, purple, hard, silty
15						NP	NP	NP			50 / 4"						SILTSTONE / MUDSTONE, grades, with more sand, dark grey to purple, hard, silty
	PROPOSED FINISHED GRADE 2851.41																
20											50 / 1"						no recovery, hard
25																	

A-4

FIELD DATE: JUNE 25, 2007

SURFACE ELEVATION: 2870.90

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - A-4

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-4

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION:

DEPTH (FT)	LABORATORY RESULTS: % GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25				NP	NP	NP			50/2.5"			O			SILTSTONE / MUDSTONE, hard
30				NP	NP	NP			50 / 2"			■			SILTSTONE / MUDSTONE, reddish brown - purple, hard
35									50 / 2.5"			O			no recovery, very dense
40									50/2"			O			no recovery, very dense COMPLETE to 40.0' no groundwater
45															
50															

ST GEORGE REPLACEMENT AIRPORT
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BORING LOG - A-4

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- ■ Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- ☒ Disturbed sample
- O Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-5

FIELD DATE: JUNE 25 2007
SURFACE ELEVATION: 2831.42

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL / PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0		PROPOSED FINISHED GRADE / FILL AT 2836.33														SC-SM	SILTY TO CLAYEY SAND (SC-SM), dry, loose
											57						CLAYSTONE, reddish brown, occasional silty intervals
5									2.27/2000		41 50 / 5"					CH	FAT CLAY (CH) CLAYSTONE, purple, abundant gypsum crystals, hard, slightly moist
10	20.1					56	23	33			40 50 / 5"						FAT CLAY (CH) CLAYSTONE, grades, w/ gypsum lenses, sandy COMPLETE at 10' no groundwater encountered
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
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BORING LOG - A-5

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-6

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2828.98

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2839.54															SM	SILTY SAND (SM), reddish brown, dry, with gypsum
	5.8		0	71	29						66					SC-SM	SILTY / CLAYEY SAND (SC-SM), medium dense, dry
5											70					CL	LEAN CLAY (CL) MUDSTONE, silty pockets, dark red, dry
10						39	22	17			30 50 / 6"						LEAN CLAY (CL) MUDSTONE, some gypsum crystals, slightly moist COMPLETE at 10' no groundwater encountered
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-6

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	A-7 DESCRIPTION
0		PROPOSED FINISHED GRADE / FILL AT 2827.70														SC-SM	SILTY / CLAYEY SAND (SC-SM), reddish brown, dry
	3.3	120.7	0	72	28						50						SILTY / CLAYEY SAND (SC-SM), med dense
5						29	13	16			33 50 / 3"						LEAN CLAY (CL) MUDSTONE, grey, hard
10											50 / 3"						COMPLETE @ 10' no groundwater encountered
15																	
20																	
25																	

FIELD DATE: JUNE 25, 2007

SURFACE ELEVATION: 2817.79

ST GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - A-7

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

A-8

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2812.53

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2828.43															SC-SM	CLAYEY SAND (SC-SM), reddish brown, dry
	5.4	116.1	0	44	56						44 50 / 5"					CL-ML	SILTY CLAY WITH SAND (CL-ML), hard, dry
5											43 50 / 5"						
10	7.3		12	71	17						43 50 / 5"					SM	SILTY SAND (SM) gravelly reddish brown COMPLETE @ 10' no groundwater encountered
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-8

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-1

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2858.37

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2866.18															SM	SILTY SAND (SM), reddish brown, with gravel
											52 / 5"						cemented, very dense
5	4.9		20	49	31						40 50 / 5"					SC	CLAYEY SAND WITH GRAVEL (SC) caliche cementation
10											30 50 / 3"						SILTY / CLAYEY SAND (SC-SM), reddish brown, moderate cementation COMPLETE at 10' no groundwater
15																	
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - LS-1

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-2

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2861.78

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2866																
											73/6"					SM	(SM), reddish brown, gravel at surface, loose
																	caliche, poor recovery,
																	grades, easier to drill
5	8.6	107.6	32	44	24						45 50 / 3"					SM-ML	SILTY SAND WITH GRAVEL (SM-ML), occasional pinhole, medium cemented, dry
10						29	20	9			50 / 5"						LEAN CLAY (CL) less pinholes, hard, dry,
15	5.3		3	39	58						50 / 5"					CL-ML	SANDY SILTY CLAY (CL-ML), reddish brown, dense COMPLETE to 15', no groundwater
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
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BORING LOG - LS-2

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-3

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2859.05

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2862.11															SM	SILTY SAND (SM) brown
											50 / 2"					SM GM	SILTY SAND TO SILTY GRAVEL (SM-GM), caliche, very dense, dry
5											50 / 4"					SM	no recovery, caliche, very dense
10	6.8		33	50	17						40 50 / 3"						SILTY SAND WITH GRAVEL (SM), reddish brown, cemented, slightly moist
15	4.4		14	62	24						50 / 5"						SILTY SAND (SM) minor pinholes, well cemented COMPLETE to 15.0' no groundwater
20																	
25																	

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - LS-3

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-4

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2863.90

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), reddish brown, dry
																	grades hard
											50 / 3"						SILTY SAND WITH GRAVEL (SM-GM), cemented
5	9.4		16	54	30						42 50 / 4"						SILTY SAND WITH GRAVEL, buff / reddish brown, caliche cemented
10	9.3	103	4	46	50						50 50 / 4"					CL-ML	SANDY SILT / CLAY (CL-ML), cemented, reddish brown, dry
15											50 / 5"						no recovery, cuttings reddish brown
20											34 50 / 3"					SM-SP	SILTY TO POORLY GRADED SAND (SM-SP), reddish brown, grades purple at end of sampler, COMPLETE to 20', no groundwater encountered
25																	

PROPOSED FINISHED GRADE 2863.38

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - LS-4

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-5

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2858.60

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry, with gravel
	PROPOSED FINISHED GRADE 2857.46										50 / 1"						grades, cemented, no recovery
5	15.4		39	40	21						22 50 / 6"					SM	SILTY SAND WITH GRAVEL (SM), reddish brown/buff, cemented pinholes, dry
10						42	19	23			27 50 / 6"					CL	LEAN CLAY (CL) CLAYSTONE, dark red/purple, dry, some sand, dry
15						37	17	15			50 / 5"						LEAN CLAY (CL) MUDSTONE, dry
20											50 / 1"						grades white, COMPLETE at 20' no groundwater encountered
25																	

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BORING LOG - LS-5

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-6

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2860.51

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2862.63															SM	SILTY SAND (SM), dry, brown
											50 / 5"			○			no recovery, caliche cemented
5	8.7	98.3	11	57	32						71						SILTY SAND (SM), reddish brown/buff, cemented, dry
																	grades less dense
10											55						SILTY SAND (SM), reddish brown, coarse sand, slightly moist
15						50	27	23			23 50 / 4"					CH	FAT CLAY (CH) CLAYSTONE, grey
																	grades purple
20						44	26.0	18			30 50 / 5"						(CL) CLAYSTONE, gray / purple, slightly moist. COMPLETE @ 20' no groundwater encountered
25																	

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BORING LOG - LS-6

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- ○ Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-7

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2847.98

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0	PROPOSED FINISHED GRADE / FILL AT 2852.82															SM	SILTY SAND (SM), reddish brown, loose, dry
	6	97.8	10	47	43						22 50 / 6"					SC-SM	SILTY / CLAYEY SAND (SC - SM) cemented, some gravel, small pinholes, dry
5						34	23	11			43 50 / 3"					CL	LEAN CLAY (CL) MUDSTONE purple, hard, dry,
10											50 / 5"						no recovery grades white
15											50 / 2"						no recovery COMPLETE @ 15', no groundwater encountered
20																	
25																	

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Landmark Project # 07330

BORING LOG - LS-7

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), reddish brown, dry
	PROPOSED FINISHED GRADE 2850.88																
	2.9		3	71	26						36						SILTY SAND (SM), intervals of coarse sand, reddish brown, buff, small yellowish / brown layer, dry, minor cementation
5											59						grades buff
10											50 / 4"						MUDSTONE / SILTSTONE, sandy gray, cemented
																	grades buff
15											50 / 0"						no recovery COMPLETE to 15' no groundwater
20																	
25																	

LS-8

FIELD DATE: JUNE 26, 2007

SURFACE ELEVATION: 2852.53

ST GEORGE REPLACEMENT AIRPORT

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BORING LOG - LS-8

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

LS-9

FIELD DATE: JUNE 28, 2007
SURFACE ELEVATION: 2868.38

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM) brown, dry, with gravel
											50/4"						grades white buff (SM-ML) dry, with gravel caliche
5																	
	5.7		1	61	38	39	18	21			59					SC	CLAYEY SAND (SC) yellow + grey slightly moist, gravel
																CL	grades grey - LEAN CLAY (CL) CLAYSTONE
10																	
	PROPOSED FINISHED GRADE 2856.99																grades very hard
											83/11"						LEAN CLAY (CL) CLAYSTONE, grey with yellow spots, dry; hard
15																	
						44	23	21			78/9"						LEAN CLAY (CL) CLAYSTONE, grey, slightly moist, hard
																	19' - 21' grades hard, maroon color
20																	
											50/4"						LEAN CLAY (CL) CLAYSTONE, maroon/grey, slightly moist, soft, traces of gypsum
25																	

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BORING LOG - LS - 9

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL / PRESSURE (PSF)	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
25						49	25	24			50/4"						LEAN CLAY (CL) CLAYSTONE maroon with grey variations, dry, soft, very minor gypsum
30									1.77/2000		50/5"						LEAN CLAY (CL) CLAYSTONE gray + yellow tint, dry, hard
35											N/A						grades purple, COMPLETE @ 37' no groundwater encountered
40																	
45																	
50																	

LS-9

FIELD DATE: JUNE 28, 2007

SURFACE ELEVATION:

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BORING LOG - LS - 9

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WD-1

FIELD DATE: August 9, 2007
SURFACE ELEVATION: 2891

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, loose to medium dense, dry
5											50/4"	5.0	1				NO RECOVERY, caliche cemented
	6.7		22	54	24						50/6"	7.0	2				caliche, reddish brown, dense, dry
10																	
PROPOSED FINISHED GRADE: 2880.37																	
	2.7	105	10	78	12						46 50-5"	12.0	3				grades slightly moist, less cementation, dense
15																	
											45 21/6"	17.0	4				grades, more gravel, courser
																CH	FAT CLAY(CH), CLAYSTONE purple, slightly moist, medium stiff
20						51	21	28			30 26/6"	22.0	5				grades hard
25																	
											40 50/3"	27.0	6				grades brownish purple, dry, hard
																	COMPLETE TO 27' no groundwater encountered
30																	

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BORING LOG - WD-1

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

WD-2

FIELD DATE: August 9, 2007
SURFACE ELEVATION: 2905

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	USCS	DESCRIPTION
0															SM	SILTY SAND(SM), gravelly, buff, medium dense, dry
	1.2		8	56	36						33 50/4"	4.0	1			grades reddish brown, abundant silt, dense
5											50/6"	7.0	2			grades gravelly, caliche cemented
10						33	16	17			50/5"	12.0	3		CL	LEAN CLAY(CL), MUDSTONE, dark reddish brown, hard, dry
15						24	15	9			50/2"	17.0	4			poor recovery
										BEGAN CORING						
										%REC 25%	6					
20										%RQD 0%	3					MUDSTONE, (CL) grades brown, moderately soft
											4	19'-24'				
											4					
											3					
										%REC 25%	6					grades with siltstone interbeds, siltstone is moderately hard
25										%RQD 0%	5					
											5	24'-29'				
											5					mudstone carved by knife with difficulty
											5					
										%REC 33%	5					
30										%RQD 0%	5					
											5	29'-34'				
											5					
											5					
																COMPLETE TO 34', no groundwater

PROPOSED FINISHED GRADE: 2887.69

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BORING LOG - WD-2

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

WD-3

FIELD DATE: August 10, 2007
SURFACE ELEVATION: 2892

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), gravelly, reddish brown, dry grades caliche cemented
											47 49	4.0	1				grades with trace of gravel, lightly cemented
5																GM	SILTY GRAVEL WITH SAND (GM)
	3.1		45	40	15						33 44	7.0	2				reddish brown, dry, lightly cemented
10																	
	8.7	105	53	35	12						32 50/2"	12.0	3			SM	SILTY SAND (SM) reddish brown, slightly moist, trace of gravel, lightly cemented
	PROPOSED FINISHED GRADE: 2878.19																
15																	grades grey
											35/6"	17.0	4				no recovery
																CH	FAT CLAY(CH), maroon, very stiff, dry
20						52	25	27			27 33	22.0	5				
25																	grades grey
	3.1		77	15	8						50/5"	27.0	6			GM	SILTY GRAVEL(GM), white, dry, trace of clay interbeds
																SM	
30																	grades possible weathered sandstone
											43 50/3"	32.0	7				no recovery COMPLETE to 32' no groundwater encountered

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BORING LOG - WD-3

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

WD-4

FIELD DATE: Aug. 13-14, 2007
SURFACE ELEVATION: 2903

DEPTH (FT)	MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	% RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), gravelly, dry
											37 50/6"	2.0	1				grades predominately silt, medium dense no cementation
5																	grades white
	6.8		24	60	16						15 48	7.0	2				grades white/light brown, dry, gravelly, caliche cemented
10																	
											50/5"	12.0	3				grades very dense
																	grades reddish brown
15																	
						27	22	5			50/4"	17.0	4			CL	LEAN CLAY(CL), MUDSTONE WITH SILTSTONE INTERBEDS, moderately hard, dry
PROPOSED FINISHED GRADE: 2885.55																	
20																	grades yellowish / brown
	5.8		41	38	21	27	17	10			50/6"	22.0	5				
																	grades reddish brown / maroon
25																	
																	grades light reddish brown
						22	16	6		MINUTES PER FOOT %REC 57 %RQD 0	11 10 5						MUDSTONE, mottled, moderately soft, dry grades with siltstone interbeds, fractured, slightly weathered, not rippable
30																	
											4 4 4 5	27'-34'					COMPLETE at 34', no groundwater encountered

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-4

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

WD-5

FIELD DATE: August 13-15, 2007
SURFACE ELEVATION: 2892

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 250 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND(SM), trace of gravel, dry
											3 4	2.0	1			ML	SILT(ML), brown, loose, dry
																SM-GM	SILTY SAND AND GRAVEL, white, caliche cemented, very dense, dry
5	4.7	88	16	59	25						35 50/4"	7.0	2				dry, white, caliche, with gravel
10											50/4"	12.0	3				poor return, brown / white, dry, gravelly, very dense
15	PROPOSED FINISHED GRADE: 2875.70																
	16.6	108							9		24 22	17.0	4			CH	FAT CLAY(CL), CLAYSTONE, maroon grey, very stiff, dry
20											29 50/6"	22.0	5				grades grey to purple, slightly moist
25						61	25	36			33 50/5"	27.0	6				grades grey, slightly moist, trace of siltstone interbeds
30												32.0	7				grades more plastic
																	COMPLETE @ 32' no groundwater

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-5

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

WD-6

FIELD DATE: Aug. 13 - 15, 2007
SURFACE ELEVATION: 2894

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 1000 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND(SM), trace of gravel
											50/2"	2.0	1				grades hard, caliche gravel, well cemented no recovery.
5																	continues caliche cemented
																	grades more gravel
	4.6		23	65	12						50/5"	7.0	2				grades brown / white, dry, with gravel, slight cementation
																	grades grey
10											23 29	12.0	3			CL	CLAYSTONE (CL) maroon to grey, moderately soft, dry
15																	grades reddish
											50/6"	17.0	4				
20																	
	PROPOSED FINISHED GRADE: 2872.89										47 50/2"	22.0	5				grades dark maroon, with white striations, slightly moist, moderately soft
25						39	22	17			50/6"	27.0	6				
30	14.5	104							4.8		50/5"	32.0	7				grades with sandy lenses

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-6

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 1000 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	WD-6 DESCRIPTION
35																	grades grey @ 34
						51	24	27			41 50/3"	37.0	8				grades dark grey / dark maroon, slightly moist
40																	
											50/2"	42.0	9				COMPLETE to 43' no groundwater encountered
45																	
50																	
55																	
60																	

FIELD DATE: August 13, 2007
SURFACE ELEVATION: 2894

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-6

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WD-7

FIELD DATE: August 14, 2007
SURFACE ELEVATION: 2896

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 1000 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, dry
											30 50/4"	2.0	1				grades hard, white, dry, caliche cementation
5																	
																	grades sandy
	5.4	92	12	70	18						50 50/4"	7.0	2				grades reddish / brown, slightly moist, moderate cementation
10																	
						59	26	33			23 29	12.0	3			CH	FAT CLAY(CH) CLAYSTONE, slightly moist, traces of sand, moderately soft
15																	
											25 40	17.0	4				grades grey, slightly moist
20																	
						67	32	35			25 40	22.0	5				FAT CLAY
25																	
	PROPOSED FINISHED GRADE: 2869.79										21 33	27.0	6				
30																	grades lighter grey
											44 50/2"	32.0	7				

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-7

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 Inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 1000 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
35																	grades yellow / light grey, less plastic
											50/3"	37.0	8	○			grades yellow no recovery
40						40	19	21			50/4"	42.0	9				CLAYSTONE (CL), yellowish grey, dry
45											50/6"	49.0	10				poor recovery COMPLETE @ 48' no groundwater encountered
50																	
55																	
60																	

WD-7

FIELD DATE: AUG 14, 2007

SURFACE ELEVATION: 2896

ST. GEORGE REPLACEMENT AIRPORT

Landmark Project # 07330

BORING LOG - WD-7

LANDMARK TESTING & ENGINEERING

525 N. 3050 E. #3, St. George, UT 84790

KEY

- Relatively undisturbed sample obtained with 3.25 Inch O.D. sampler driven with a 140 pound hammer falling 30 Inches.
- Core Drilling
- Disturbed sample
- ○ Sampling attempt with no recovery.
- Groundwater depth at time of excavation

WD-8

FIELD DATE: AUG 15, 2007
SURFACE ELEVATION: 2891

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 250 PSF	SAMPLE DATA: % RECOVERY AND RQD	BLOWS PER FOOT	SAMPLE DEPTH (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
0																SM	SILTY SAND (SM), brown, gravelly, dry
											50/5"	2.0	1				grades cemented
5																CH	FAT CLAY (CH), CLAYSTONE, white, plastic
						60	26	34			24 25	7.0	2				grades grey slightly moist, moderately soft
																	grades harder
10											26 29	12.0	3				grades maroon to grey, slightly moist
15											19 50/5"	17.0	4				grades slightly moist, traces of gypsum
20	14.2	112							7.4		39 48	22.0	5				
25	PROPOSED FINISHED GRADE: 2866.61																
						33	17	16			50/5"	27.0	6			CL	MUDSTONE, yellowish, gray, hard, dry. grades yellowish / grey
30						35	19	16		REC% 71 RQD% 11	MINUTES PER FOOT 50/4" 9 8	32'-39'					BEGAN CORING @ 32' grades brownish grey, MUDSTONE

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-8

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Drilling
Disturbed sample
Sampling attempt with no recovery.
Groundwater depth at time of excavation

WD-8

FIELD DATE: AUG 15, 2007
SURFACE ELEVATION: 2891

DEPTH (FT)	LABORATORY RESULTS: MOISTURE CONTENT	UNIT WEIGHT (PCF)	% GRAVEL	% SAND	% FINES	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% SWELL AT 60 PSF	SAMPLE DATA: % RECOVERY AND RQD	MINUTES PER FOOT (CORING)	CORE INTERVAL (FT)	SAMPLE NUMBER	SAMPLE TYPE	LITHOLOGY	USCS	DESCRIPTION
33										CONTINUED CORE	8					CL	MUDSTONE
											8						
35											7						SANDSTONE WITH MUDSTONE INTERBEDS, slightly weathered, moderately soft, fractured
											6						
											6						grades mottled
										%REC 80	6	39'-44'					grades heavily fractured
40										%RQD 0	5						
											4						grades reddish brown, fractured along bedding planes
						25	20	5			7						
											6						grades moist
											6						COMPLETE @ 44, groundwater not encountered
45																	
50																	

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-8

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3, St. George, UT 84790

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

MAJOR DIVISIONS			GRAPH SYMBOLS	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVEL AND GRAVELLY SANDS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 200 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING THE NO. 4 SIEVE AND RETAINED ON THE NO. 200 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SAND, ROCK FLOUR, SILTY FINE SAND OR CLAYEY SILTS
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY OR SANDY OR SILTY CLAY, LEAN CLAY
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATONS

UNIFIED SOIL CLASSIFICATION SYSTEM

LANDMARK TESTING & ENGINEERING

CORE DESCRIPTION DEFINITIONS

ROCK HARDNESS

DESCRIPTOR	CRITERIA
Hard	Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break core specimen.
Moderately Hard	Can be scratched with knife or sharp pick with light to moderate pressure. Core or fragment breaks with moderate hammer blow.
Moderately Soft	Can be grooved 1/16 inch deep by knife or sharp pick with moderate to heavy pressure. Core or fragment breaks with light hammer or heavy manual pressure.
Soft	Can be grooved or gouged easily with knife or sharp pick with light pressure, can be scratched with fingernail. Breaks with light to moderate manual pressure.
Very Soft	Can be readily indented, grooved, or gouged with fingernail or carved with a knife. Breaks with light manual pressure.

ROCK WEATHERING

DESCRIPTOR	CRITERIA
Fresh	No visible sign of decomposition or discoloration. Rings under hammer impact.
Slightly Weathered	Slight discoloration inwards from open fractures, otherwise similar to fresh.
Moderately Weathered	Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife. Texture preserved.
Highly Weathered	Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Texture becoming indistinct but fabric preserved.
Completely Weathered	Minerals decomposed to soil but fabric and structure preserved. Specimens easily crumbled or penetrated.

BEDDING SPACING

DESCRIPTOR	CRITERIA
Very Thickly	3 to 10 feet
Thickly	1-3 feet
Medium	0.3 to 1 ft
Thinly	0.1 to 0.3 ft
Very thinly	0.03 to 0.1 ft
Laminated	Less than 0.03 ft

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #3 Drive #10, St. George, UT 84790

Table 1
LABORATORY TEST SUMMARY

PROJECT ST. GEORGE REPLACEMENT AIRPORT **PROJECT NO.** 07330

CLIENT CREAMER & NOBLE ENGINEERS

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
WT-1	2	4.6		13	63	24								.01/.12%			SILTY SAND (SM)
	3.5	5.9															SILTY SAND (SM)
	5	7.8		36	44	20	31	21	10								CLAYEY SAND (SC)
	8	3.2															CLAYEY SAND (SC)
	15	2.9		23	54	23											SILTY SAND (SM)
WT-2	2	5		17	65												SILTY SAND (SM)
	5	8.5	99.3														SILTY SAND (SM)
	10	7.9		11	55	34	43	24	19								CLAYEY SAND (SC)
WT-3	2	4.9	110														SILTY SAND (SM-ML)
	7	8.4		26	44	30											SILTY SAND (SM-ML)
	12			53	28	25											CLAYSTONE (CH)
	17													.01/.30%			MUDSTONE (CL)
	22			38	22	16											MUDSTONE (CL)
WT-4	1	8.1															SILTY SAND (SM)
	6	19.7															SILTY SAND (SM-ML)
	8	16.8		10	54	36											CLAYEY SAND (SC)
	10	13.7		5	70	25											CLAYEY SAND (SC)
	12	10.1															CLAYEY SAND (SC-CL)
	14	20.1					50	21	29								CLAYSTONE (CH)
	16	19.7					47	22	25								CLAYSTONE (CL)
	22	14.8		9	30	61	45	19	26								CLAYSTONE (CL)
	27																CLAYSTONE (CL)
	32	13.2					46	24	22								CLAYSTONE (CL)
WT-5	7													.02/.36%			SILTY SAND (SM)
	12	8.1		14	66	20											SILTY SAND (SM)
	22						38	20	18								MUDSTONE (CL)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	27	26.6	90.1									3.84/150					CLAYSTONE (CH)
	32	15.8					70	33	37								CLAYSTONE (CH)
	37	26.3	94.9									4.16/1000					CLAYSTONE (CH)
	42	18.3	104														CLAYSTONE (CH)
WT-6	7	15	103														CLAYSTONE (CL)
	12						49	24	25								CLAYSTONE (CL)
	22											9.95/150					CLAYSTONE (CL)
	27											8.34/500					CLAYSTONE (CH)
	37						51	20	31								CLAYSTONE (CL)
WT-7	7	9.3					24	16	8								LEAN CLAY (CL)
	19																MUDSTONE (CL)
	23						24	16	8								MUDSTONE (CL)
WT-8	2	4.5										2.2/250					CLAYSTONE (CL)
	7						30	17	13								CLAYSTONE (CL)
	11						24	15	9								MUDSTONE (CL)
WT-9	6															7350	SANDSTONE BEDROCK
	14															7120	SANDSTONE BEDROCK
	22															7120	SANDSTONE BEDROCK
	35															5840	SANDSTONE BEDROCK
WT-10	6															9150	SANDSTONE BEDROCK
WT-13	7															7460	SANDSTONE BEDROCK
RW-1	2	1.5	112	11	63	26											SILTY SAND (SM)
	7	5.1	97.1	24	46	30											SILTY SAND (SM)
RW-2	2													.01/.06%			SILTY GRAVEL (GM)
	7	6.9		8	63	29											SILTY SAND (SM)
	12	4.3		11	69	20											SILTY SAND (SM)
	17	6.6	109	0	77	23											SILTY SAND (SM)
RW-3	2	1.4		16	64	20											SILTY SAND (SM)
	12	7.1	90	20	53	27											SILTY SAND (SM)
	22	8.9		20	55	25	27	18	9								CLAYEY SAND (SC)
RW-4	2	2		8	65	27											SILTY SAND (SM)
	7													.03/.44%			SILTY GRAVEL (SM-GM)
	12	8.3		44	41	15											SILTY SAND (SM)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	17	0.7		27	65	8											GRAVELLY SAND (SP-SM)
	22	14.2					55	23	32								CLAYSTONE (CH)
	27	14.7	103									4.87/500					CLAYSTONE (CL)
	32						62	25	37								CLAYSTONE (CH)
RW-5	2	3.1		26	48	26											SILTY SAND (SM)
	7	4.2	102														SILTY GRAVEL (GM)
	12	.9		18	75	7											GRAVELLY SAND (SP-SM)
	17											6.32/500					CLAYSTONE (CL)
	22						47	25	22								CLAYSTONE (CL)
	32						52	26	26								CLAYSTONE (CH)
RW-6	12	17.1	104														CLAYSTONE (CL)
	17	15.6	103									9.1/500					CLAYSTONE (CL)
	27	9.8					42	24	18								CLAYSTONE (CL)
	32	9.4					46	22	24								CLAYSTONE (CL)
RW-7	2	0.8	109	1	77	22											SILTY SAND (SM)
	7	10.5	115.3									4.01/1000					CLAYSTONE (CL)
	17	8.7					43	24	19								MUDSTONE (CL)
RW-8	0	0.9															SILTY SAND (SM)
	2	2	106	2	62	36											SILTY SAND (SM)
	11						24	16	8								MUDSTONE (CL)
	15						26	17	9								MUDSTONE (CL)
RW-9	4	2.8	100	7	55	38											SILTY SAND (SM)
	10																MUDSTONE (CL)
	13						33	17	16								MUDSTONE (CL)
RW-10	12															8620	SANDSTONE BEDROCK
	20															7060	SANDSTONE BEDROCK
RW-11	11															6750	SANDSTONE BEDROCK
	19															5780	SANDSTONE BEDROCK
	29															8310	SANDSTONE BEDROCK
RW-12	9															8770	SANDSTONE BEDROCK
	23															8840	SANDSTONE BEDROCK
RW-14	6															9360	SANDSTONE BEDROCK
RW-15	7															6330	SANDSTONE BEDROCK
RW-16	5															4550	SANDSTONE BEDROCK

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
ET-2	2	3		9	63	28								.01/.04%			SILTY SAND (SM)
	5.5-7.5	3.3		43	7												SILTY GRAVEL (GM)
ET-3	2													.01/.1%			SILTY GRAVEL (GM)
	7	11.6		29	55	16											SILTY SAND (SM)
	12	7.2		2	61	37	32	17	15								CLAYEY SAND (SC)
	17						29	18	11								MUDSTONE (CL)
ET-4	2	1		4	70	26											SILTY SAND (SM)
	7	4.1	95.4	7	44	49											SILTY SAND (SM)
	12	8.8		32	53	15											SILTY SAND (SM)
	32.5						31	19	12								MUDSTONE (CL)
ET-5	2	8.9															SILTY SAND (SM)
	7	3.5	105	9	63	28											SILTY SAND (SM)
	17						45	24	21								CLAYSTONE (CL)
	22						40	22	18								MUDSTONE (CL)
ET-6	2	4.1															SILTY SAND (SM-GM)
	7	3.4	106	1	72	27											SILTY SAND (SM)
	12	22	95														CLAYSTONE (CL)
	17	20.1					54	27	27								CLAYSTONE (CH)
	22											9.63/250					CLAYSTONE (CH)
	27						57	27	30								CLAYSTONE (CH)
	32	21.3	96.6														CLAYSTONE (CH)
	37						57	27	30								CLAYSTONE (CH)
ET-7	0	1															SILTY SAND (SM)
	2	15		0	29	71											SILT WITH SAND (ML-SM)
	7	15.7	100.1									1.3/2000					MUDSTONE (CL)
	12			37	22	15											MUDSTONE (CL)
ET-8	2													.02/.25%			SILTY SAND (SM)
	7			30	18	12											MUDSTONE (CL)
ET-9	2	2		0	11	89											SILTY CLAY (CL-ML)
	7			33	18	15											MUDSTONE (CL)
ET-10	2	3		21	51	28											SILTY SAND (SM-GM)
	5	11.5		7	69	24											SILTY SAND (SM)
ET-11	5															4,080	SANDSTONE
ET-12	10															15,720	SANDSTONE

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
ET-14	4	15.1		19	41	40											SILTY SAND (SM)
	17						45	19	26								CLAYSTONE (CL)
A-1	5													.01/.24%			SILTY SAND (SM)
A-2	5			25	43	32	37	28	9								SILTY CLAY (SC)
	10	7.5		8	70	22											CLAYEY SAND (SC)
	15	7.3		3	64	33											SILTY SAND (SM)
A-3	15			62	37	33	22	11									CLAYEY SAND (SC)
	20																CLAYSTONE (CL)
A-4	5	12.2		54	35	11											SILTY GRAVEL (GM)
	10						NP	NP	NP								SILTSTONE
	15						NP	NP	NP								SILTSTONE
	28-30						NP	NP	NP								SILTSTONE
	33-35						NP	NP	NP								SILTSTONE
A-5	2														5154		CLAYSTONE (CH)
	5											2.27/2000					CLAYSTONE (CH)
	10	20.1					56	23	33								CLAYSTONE (CH)
A-6	2	5.8		0	71	29											SILTY SAND (SM)
	5														9225		MUDSTONE (CL)
	10						39	22	17								MUDSTONE (CL)
A-7	2	3.3		0	72	28											SILTY CLAY (CL)
	5						29	13	16								MUDSTONE (CL)
A-8	2	5.4	116	0	44	56											SILTY CLAY (CL)
	10	7.3		12	71	17											SILTY SAND (SM)
LS-1	5	4.9		20	49	31											CLAYEY SAND (SC)
LS-2	5	8.6	108	32	44	24											SILTY SAND (SC-ML)
	10						29	20	9								LEAN CLAY (CL)
	15	5.3		3	39	58											SILTY CLAY (CL)
LS-3	10	6.8		33	50	17											SILTY SAND (SM)
	15	4.4		14	62	24											SILTY SAND (SM)
LS-4	5	9.4		16	54	30											SILTY SAND (SM)
	10	9.3	103	4	46	50											SILTY CLAY (CL-ML)
LS-5	5	15.4	83	39	40	21											SILTY SAND (SM)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	10						42	19	23								CLAYSTONE (CL)
	15						37	17	15								MUDSTONE (CL)
LS-6	5	8.7	98.3	11	57	32											SILTY SAND (SM)
	10													.01/.20%			SILTY SAND (SM)
	15			50	27	23											CLAYSTONE (CH)
	20						44	26	18								CLAYSTONE (CL)
LS-7	2	6	97.8	10	47	43											CLAYEY SAND (SC-SM)
	5						34	23	11								MUDSTONE (CL)
LS-8	2	2.9		3	71	26											SILTY SAND (SM)
	5													.01/.30%			SILTY SAND (SM)
LS-9	7	5.7		1	61	38	39	18	21								CLAYEY SAND (SC)
	17						44	23	21								CLAYSTONE (CL)
	27						49	25	24								CLAYSTONE (CL)
WD-1	7.0	6.7		22	54	24								0.01/.2%			SILTY SAND (SM)
	12.0	2.7	105	10	78	12											SILTY SAND (SM)
	22.0						51	23	28								FAT CLAY (CH)
WD-2	4.0	1.2		8	56	36								.02/.32%			SILTY SAND (SM)
	12.0						33	16	17								LEAN CLAY (CL)
	17.0						24	15	9								LEAN CLAY (CL)
WD-3	7.0	3.1		45	40	15											SILTY GRAVEL (GM)
	12.0	8.7	105	53	35	12											SILTY GRAVEL (GM)
	22.0						52	25	27								FAT CLAY (CH)
	27.0	3.1		77	15	8											SILTY GRAVEL (GM)
WD-4	2.0													.01/.03%			SILTY SAND (SM)
	7.0	6.8		24	60	16											SILTY SAND (SM)
	17.0						27	22	5								LEAN CLAY (CL)
	22.0	5.8		41	38	21	27	17	10								MUDSTONE/SILTSTONE
	27.0						22	16	6								MUDSTONE (CL)
WD-5	7.0	4.7		16	59	25											SILTY SAND (SM)
	17.0	16.6	108									9.0/250					FAT CLAY (CH)
	27.0						61	25	36								FAT CLAY (CH)
WD-6	7.0	4.6		23	65	12											SILTY SAND (SM)
	27.0						39	22	17								CLAYSTONE (CL)
	32.0	14.5	104									4.8/1000					CLAYSTONE (CL)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	37.0						51	24	27								CLAYSTONE (CL)
WD-7	7.0	5.4	92	12	70	18											SILTY SAND (SM)
	12.0						59	26	33								CLAYSTONE (CH)
	22.0						67	32	35								CLAYSTONE (CH)
	42.0						40	19	21								CLAYSTONE (CL)
WD-8	7.0						60	26	34								CLAYSTONE (CH)
	22.0	14.2	112									7.4/250					CLAYSTONE (CH)
	27.0						33	17	16								MUDSTONE (CL)
	32.0						35	19	16								MUDSTONE (CL)
	43.0						25	20	5								MUDSTONE (CL-ML)
TP WT-1	2	3.7		22	54	24				118	11.0	3.2	4.8				SILTY SAND (SM)
TP WT-3	15	6.0		28	61	11				125	8.5	1.7	19				POORLY GRADED (SP)
TP WT-8	3	4.6		1	24	75				134	7	4.6	2.4				LEAN CLAY (CL)
TP RW-2	2	7.1		33	52	15				130.5	7.5	0	65.1				SILTY SAND (SM)
TP RW-6	10.5									112	16	12.5	1.5				LEAN CLAY
TP RW-6	10.5									118	14	6.5	2.2				BLEND
TP RW-6	10.5									123	10.5	2.4	4.7				BLEND
TP ET-2	5	4.1		29	45	26				128.5	7.5	0	37.5				SILTY SAND (SM)
TP ET-5	7	6.2		4	38	58				109	19	10.3	1.5				SANDY CLAY (CL)
TP A-3	5	1.8		34	47	19				124	10.5	.2	34.8				SILTY SAND (SM)

GEOTECHNICAL INVESTIGATION REPORT

ST. GEORGE REPLACEMENT AIRPORT

St. George, Utah

VOLUME 2 - LABORATORY TEST DATA

Landmark Project No. 07330

October 15, 2007

Submitted to:

PBS&J
c/o Creamer & Noble Engineers
Attention: Dan Weiss
435 E. Tabernacle
St. George, Utah 84770

LANDMARK
TESTING & ENGINEERING

525 N. 3050 E., #3, ST. GEORGE, UT 84790
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Table 1
LABORATORY TEST SUMMARY

PROJECT ST. GEORGE REPLACEMENT AIRPORT **PROJECT NO.** 07330

CLIENT CREAMER & NOBLE ENGINEERS

BORING NO.	DEPTH BELOW GROUND SURFACE (FT)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
WT-1	2	4.6		13	63	24								.01/.12%			SILTY SAND (SM)
	3.5	5.9															SILTY SAND (SM)
	5	7.8		36	44	20	31	21	10								CLAYEY SAND (SC)
	8	3.2															CLAYEY SAND (SC)
	15	2.9		23	54	23											SILTY SAND (SM)
WT-2	2	5		17	65												SILTY SAND (SM)
	5	8.5	99.3														SILTY SAND (SM)
	10	7.9		11	55	34	43	24	19								CLAYEY SAND (SC)
WT-3	2	4.9	110														SILTY SAND (SM-ML)
	7	8.4		26	44	30											SILTY SAND (SM-ML)
	12			53	28	25											CLAYSTONE (CH)
	17													.01/.30%			MUDSTONE (CL)
	22			38	22	16											MUDSTONE (CL)
WT-4	1	8.1															SILTY SAND (SM)
	6	19.7															SILTY SAND (SM-ML)
	8	16.8		10	54	36											CLAYEY SAND (SC)
	10	13.7		5	70	25											CLAYEY SAND (SC)
	12	10.1															CLAYEY SAND (SC-CL)
	14	20.1					50	21	29								CLAYSTONE (CH)
	16	19.7					47	22	25								CLAYSTONE (CL)
	22	14.8		9	30	61	45	19	26								CLAYSTONE (CL)
	27																CLAYSTONE (CL)
	32	13.2					46	24	22								CLAYSTONE (CL)
WT-5	7													.02/.36%			SILTY SAND (SM)
	12	8.1		14	66	20											SILTY SAND (SM)
	22						38	20	18								MUDSTONE (CL)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	27	26.6	90.1									3.84/150					CLAYSTONE (CH)
	32	15.8					70	33	37								CLAYSTONE (CH)
	37	26.3	94.9									4.16/1000					CLAYSTONE (CH)
	42	18.3	104														CLAYSTONE (CH)
WT-6	7	15	103														CLAYSTONE (CL)
	12						49	24	25								CLAYSTONE (CL)
	22											9.95/150					CLAYSTONE (CL)
	27											8.34/500					CLAYSTONE (CH)
	37						51	20	31								CLAYSTONE (CL)
WT-7	7	9.3					24	16	8								LEAN CLAY (CL)
	19																MUDSTONE (CL)
	23						24	16	8								MUDSTONE (CL)
WT-8	2	4.5										2.2/250					CLAYSTONE (CL)
	7						30	17	13								CLAYSTONE (CL)
	11						24	15	9								MUDSTONE (CL)
WT-9	6															7350	SANDSTONE BEDROCK
	14															7120	SANDSTONE BEDROCK
	22															7120	SANDSTONE BEDROCK
	35															5840	SANDSTONE BEDROCK
WT-10	6															9150	SANDSTONE BEDROCK
WT-13	7															7460	SANDSTONE BEDROCK
RW-1	2	1.5	112	11	63	26											SILTY SAND (SM)
	7	5.1	97.1	24	46	30											SILTY SAND (SM)
RW-2	2													.01/.06%			SILTY GRAVEL (GM)
	7	6.9		8	63	29											SILTY SAND (SM)
	12	4.3		11	69	20											SILTY SAND (SM)
	17	6.6	109	0	77	23											SILTY SAND (SM)
RW-3	2	1.4		16	64	20											SILTY SAND (SM)
	12	7.1	90	20	53	27											SILTY SAND (SM)
	22	8.9		20	55	25	27	18	9								CLAYEY SAND (SC)
RW-4	2	2		8	65	27											SILTY SAND (SM)
	7													.03/.44%			SILTY GRAVEL (SM-GM)
	12	8.3		44	41	15											SILTY SAND (SM)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	17	0.7		27	65	8											GRAVELLY SAND (SP-SM)
	22	14.2					55	23	32								CLAYSTONE (CH)
	27	14.7	103									4.87/500					CLAYSTONE (CL)
	32						62	25	37								CLAYSTONE (CH)
RW-5	2	3.1		26	48	26											SILTY SAND (SM)
	7	4.2	102														SILTY GRAVEL (GM)
	12	.9		18	75	7											GRAVELLY SAND (SP-SM)
	17											6.32/500					CLAYSTONE (CL)
	22						47	25	22								CLAYSTONE (CL)
	32						52	26	26								CLAYSTONE (CH)
RW-6	12	17.1	104														CLAYSTONE (CL)
	17	15.6	103									9.1/500					CLAYSTONE (CL)
	27	9.8					42	24	18								CLAYSTONE (CL)
	32	9.4					46	22	24								CLAYSTONE (CL)
RW-7	2	0.8	109	1	77	22											SILTY SAND (SM)
	7	10.5	115.3									4.01/1000					CLAYSTONE (CL)
	17	8.7					43	24	19								MUDSTONE (CL)
RW-8	0	0.9															SILTY SAND (SM)
	2	2	106	2	62	36											SILTY SAND (SM)
	11						24	16	8								MUDSTONE (CL)
	15						26	17	9								MUDSTONE (CL)
RW-9	4	2.8	100	7	55	38											SILTY SAND (SM)
	10																MUDSTONE (CL)
	13						33	17	16								MUDSTONE (CL)
RW-10	12															8620	SANDSTONE BEDROCK
	20															7060	SANDSTONE BEDROCK
RW-11	11															6750	SANDSTONE BEDROCK
	19															5780	SANDSTONE BEDROCK
	29															8310	SANDSTONE BEDROCK
RW-12	9															8770	SANDSTONE BEDROCK
	23															8840	SANDSTONE BEDROCK
RW-14	6															9360	SANDSTONE BEDROCK
RW-15	7															6330	SANDSTONE BEDROCK
RW-16	5															4550	SANDSTONE BEDROCK

BORING NO.	DEPTH BELOW GROUND SURFACE (FT)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
ET-2	2	3		9	63	28								.01/.04%			SILTY SAND (SM)
	5.5-7.5	3.3		43	7												SILTY GRAVEL (GM)
ET-3	2													.01/.1%			SILTY GRAVEL (GM)
	7	11.6		29	55	16											SILTY SAND (SM)
	12	7.2		2	61	37	32	17	15								CLAYEY SAND (SC)
	17						29	18	11								MUDSTONE (CL)
ET-4	2	1		4	70	26											SILTY SAND (SM)
	7	4.1	95.4	7	44	49											SILTY SAND (SM)
	12	8.8		32	53	15											SILTY SAND (SM)
	32.5						31	19	12								MUDSTONE (CL)
ET-5	2	8.9															SILTY SAND (SM)
	7	3.5	105	9	63	28											SILTY SAND (SM)
	17						45	24	21								CLAYSTONE (CL)
	22						40	22	18								MUDSTONE (CL)
ET-6	2	4.1															SILTY SAND (SM-GM)
	7	3.4	106	1	72	27											SILTY SAND (SM)
	12	22	95														CLAYSTONE (CL)
	17	20.1					54	27	27								CLAYSTONE (CH)
	22											9.63/250					CLAYSTONE (CH)
	27						57	27	30								CLAYSTONE (CH)
	32	21.3	96.6														CLAYSTONE (CH)
	37						57	27	30								CLAYSTONE (CH)
ET-7	0	1															SILTY SAND (SM)
	2	15		0	29	71											SILT WITH SAND (ML-SM)
	7	15.7	100.1									1.3/2000					MUDSTONE (CL)
	12			37	22	15											MUDSTONE (CL)
ET-8	2													.02/.25%			SILTY SAND (SM)
	7			30	18	12											MUDSTONE (CL)
ET-9	2	2		0	11	89											SILTY CLAY (CL-ML)
	7			33	18	15											MUDSTONE (CL)
ET-10	2	3		21	51	28											SILTY SAND (SM-GM)
	5	11.5		7	69	24											SILTY SAND (SM)
ET-11	5															4,080	SANDSTONE
ET-12	10															15,720	SANDSTONE

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
ET-14	4	15.1		19	41	40											SILTY SAND (SM)
	17						45	19	26								CLAYSTONE (CL)
A-1	5													.01/.24%			SILTY SAND (SM)
A-2	5			25	43	32	37	28	9								SILTY CLAY (SC)
	10	7.5		8	70	22											CLAYEY SAND (SC)
	15	7.3		3	64	33											SILTY SAND (SM)
A-3	15			62	37	33	22	11									CLAYEY SAND (SC)
	20																CLAYSTONE (CL)
A-4	5	12.2		54	35	11											SILTY GRAVEL (GM)
	10						NP	NP	NP								SILTSTONE
	15						NP	NP	NP								SILTSTONE
	28-30						NP	NP	NP								SILTSTONE
	33-35						NP	NP	NP								SILTSTONE
A-5	2														5154		CLAYSTONE (CH)
	5											2.27/2000					CLAYSTONE (CH)
	10	20.1					56	23	33								CLAYSTONE (CH)
A-6	2	5.8		0	71	29											SILTY SAND (SM)
	5														9225		MUDSTONE (CL)
	10						39	22	17								MUDSTONE (CL)
A-7	2	3.3		0	72	28											SILTY CLAY (CL)
	5						29	13	16								MUDSTONE (CL)
A-8	2	5.4	116	0	44	56											SILTY CLAY (CL)
	10	7.3		12	71	17											SILTY SAND (SM)
LS-1	5	4.9		20	49	31											CLAYEY SAND (SC)
LS-2	5	8.6	108	32	44	24											SILTY SAND (SC-ML)
	10						29	20	9								LEAN CLAY (CL)
	15	5.3		3	39	58											SILTY CLAY (CL)
LS-3	10	6.8		33	50	17											SILTY SAND (SM)
	15	4.4		14	62	24											SILTY SAND (SM)
LS-4	5	9.4		16	54	30											SILTY SAND (SM)
	10	9.3	103	4	46	50											SILTY CLAY (CL-ML)
LS-5	5	15.4	83	39	40	21											SILTY SAND (SM)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	10						42	19	23								CLAYSTONE (CL)
	15						37	17	15								MUDSTONE (CL)
LS-6	5	8.7	98.3	11	57	32											SILTY SAND (SM)
	10													.01/.20%			SILTY SAND (SM)
	15			50	27	23											CLAYSTONE (CH)
	20						44	26	18								CLAYSTONE (CL)
LS-7	2	6	97.8	10	47	43											CLAYEY SAND (SC-SM)
	5						34	23	11								MUDSTONE (CL)
LS-8	2	2.9		3	71	26											SILTY SAND (SM)
	5													.01/.30%			SILTY SAND (SM)
LS-9	7	5.7		1	61	38	39	18	21								CLAYEY SAND (SC)
	17						44	23	21								CLAYSTONE (CL)
	27						49	25	24								CLAYSTONE (CL)
WD-1	7.0	6.7		22	54	24								0.01/.2%			SILTY SAND (SM)
	12.0	2.7	105	10	78	12											SILTY SAND (SM)
	22.0						51	23	28								FAT CLAY (CH)
WD-2	4.0	1.2		8	56	36								.02/.32%			SILTY SAND (SM)
	12.0						33	16	17								LEAN CLAY (CL)
	17.0						24	15	9								LEAN CLAY (CL)
WD-3	7.0	3.1		45	40	15											SILTY GRAVEL (GM)
	12.0	8.7	105	53	35	12											SILTY GRAVEL (GM)
	22.0						52	25	27								FAT CLAY (CH)
	27.0	3.1		77	15	8											SILTY GRAVEL (GM)
WD-4	2.0													.01/.03%			SILTY SAND (SM)
	7.0	6.8		24	60	16											SILTY SAND (SM)
	17.0						27	22	5								LEAN CLAY (CL)
	22.0	5.8		41	38	21	27	17	10								MUDSTONE/SILTSTONE
	27.0						22	16	6								MUDSTONE (CL)
WD-5	7.0	4.7		16	59	25											SILTY SAND (SM)
	17.0	16.6	108									9.0/250					FAT CLAY (CH)
	27.0						61	25	36								FAT CLAY (CH)
WD-6	7.0	4.6		23	65	12											SILTY SAND (SM)
	27.0						39	22	17								CLAYSTONE (CL)
	32.0	14.5	104									4.8/1000					CLAYSTONE (CL)

BORING NO.	DEPTH BELOW GROUND SURFACE (FT')	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (PCF)	MECHANICAL			ATTERBERG LIMITS			MOISTURE-DENSITY RELATIONSHIP		% SWELL / OVERBURDEN PRESSURE (PSF)	CBR (%)	WATER SOLUBLE SULFATES % SOLUBILITY	TRIAXIAL SHEAR STRENGTH (PSF)	UNCONFINED COMPRESSIVE STRENGTH (PSI)	USCS GROUP SYMBOL
				GRAVEL (%)	SAND (%)	SILT / CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTIC-ITY INDEX (%)	MAXIMUM DRY DENSITY	OPTIMUM MOISTURE CONTENT (%)						
	37.0						51	24	27								CLAYSTONE (CL)
WD-7	7.0	5.4	92	12	70	18											SILTY SAND (SM)
	12.0						59	26	33								CLAYSTONE (CH)
	22.0						67	32	35								CLAYSTONE (CH)
	42.0						40	19	21								CLAYSTONE (CL)
WD-8	7.0						60	26	34								CLAYSTONE (CH)
	22.0	14.2	112									7.4/250					CLAYSTONE (CH)
	27.0						33	17	16								MUDSTONE (CL)
	32.0						35	19	16								MUDSTONE (CL)
	43.0						25	20	5								MUDSTONE (CL-ML)
TP WT-1	2	3.7		22	54	24				118	11.0	3.2	4.8				SILTY SAND (SM)
TP WT-3	15	6.0		28	61	11				125	8.5	1.7	19				POORLY GRADED (SP)
TP WT-8	3	4.6		1	24	75				134	7	4.6	2.4				LEAN CLAY (CL)
TP RW-2	2	7.1		33	52	15				130.5	7.5	0	65.1				SILTY SAND (SM)
TP RW-6	10.5									112	16	12.5	1.5				LEAN CLAY
TP RW-6	10.5									118	14	6.5	2.2				BLEND
TP RW-6	10.5									123	10.5	2.4	4.7				BLEND
TP ET-2	5	4.1		29	45	26				128.5	7.5	0	37.5				SILTY SAND (SM)
TP ET-5	7	6.2		4	38	58				109	19	10.3	1.5				SANDY CLAY (CL)
TP A-3	5	1.8		34	47	19				124	10.5	.2	34.8				SILTY SAND (SM)

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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2041

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 2' **Authorized By:** Client **Date:** 6/29/2007

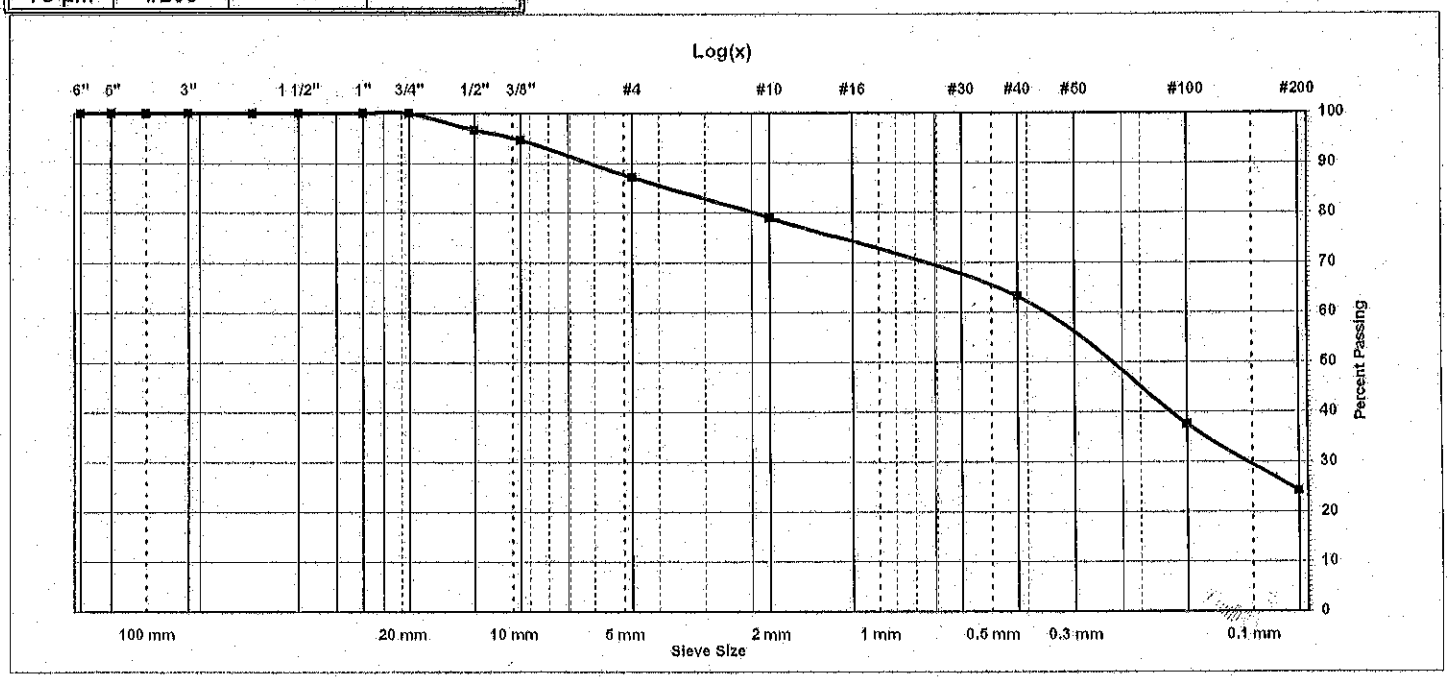
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	97	
9.5 mm	3/8"	95	
4.75 mm	#4	87	
2.00 mm	#10	79	
425 µm	#40	63	
150 µm	#100	38	
75 µm	#200	24.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.6		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	12.9	63.0	24.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2191

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 3.5' **Authorized By:** Client **Date:** 6/29/2007

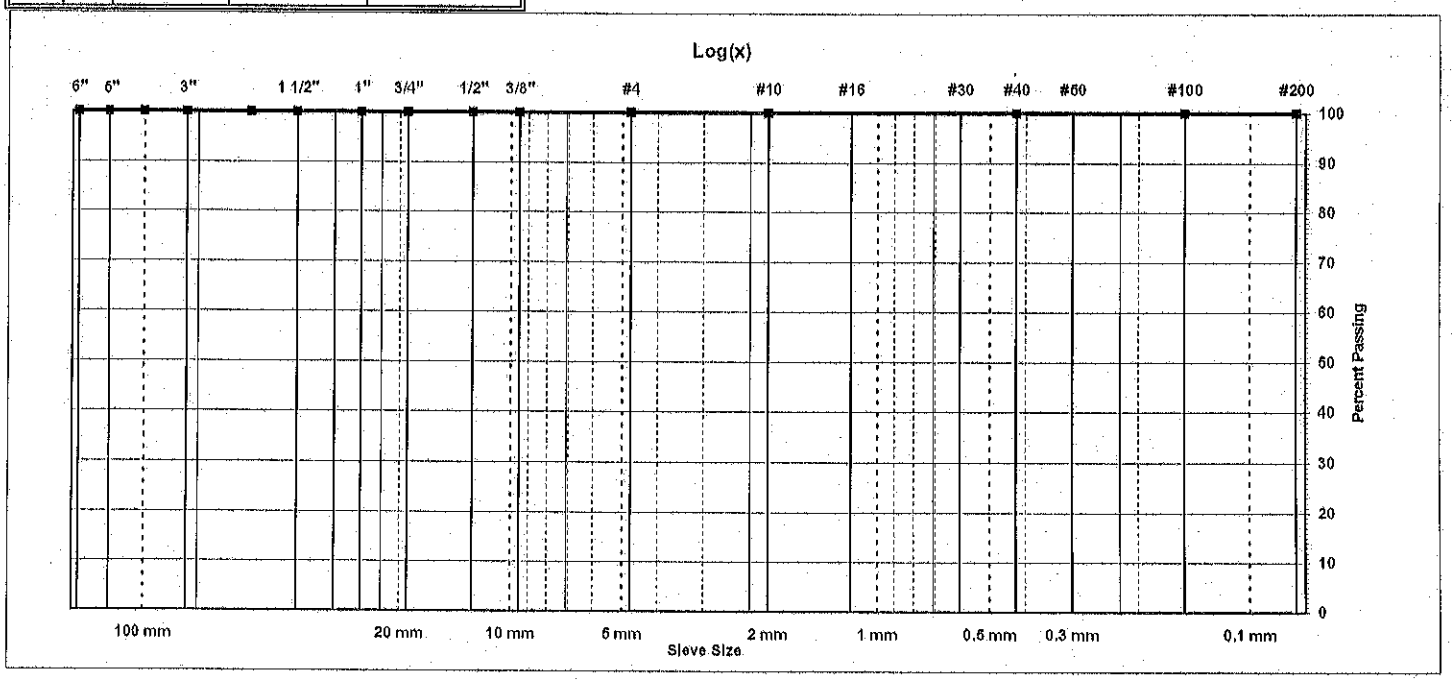
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2042

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 5' **Authorized By:** Client **Date:** 6/29/2007

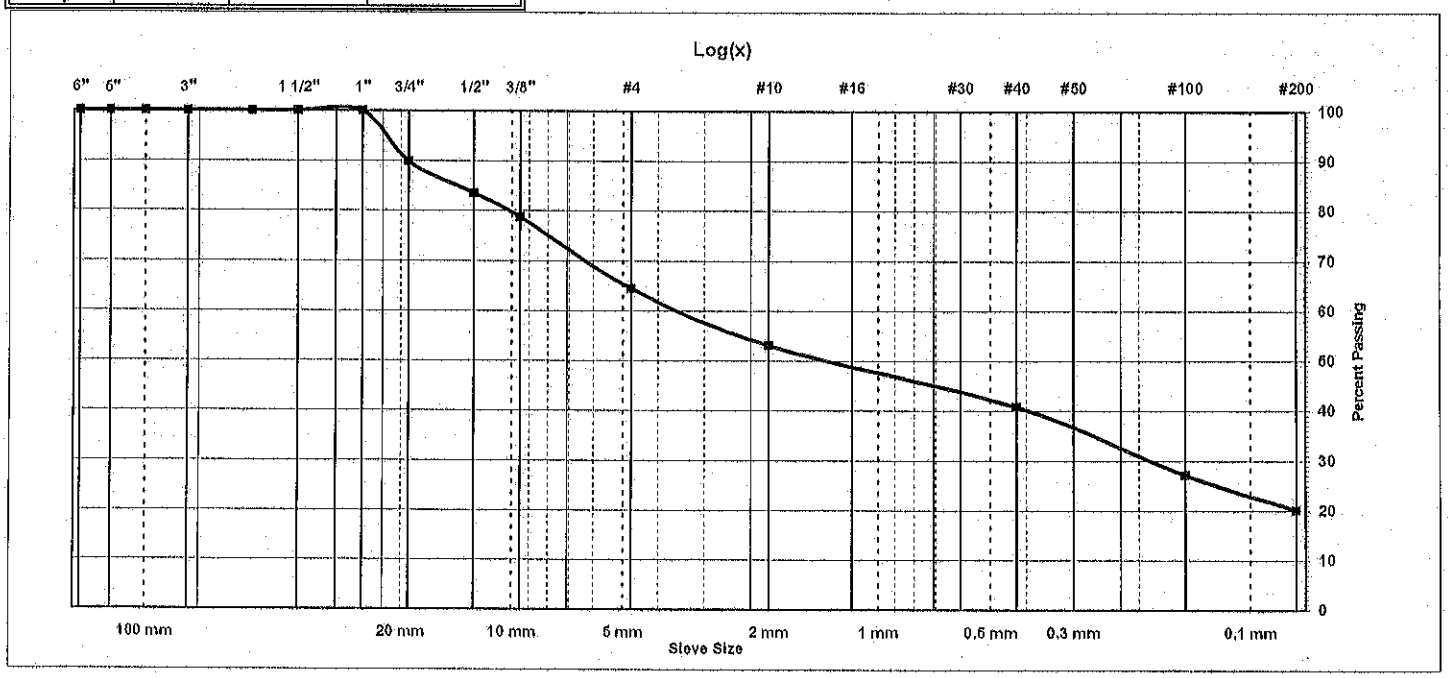
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	90	
12.5 mm	1/2"	84	
9.5 mm	3/8"	79	
4.75 mm	#4	64	
2.00 mm	#10	53	
425 µm	#40	41	
150 µm	#100	27	
75 µm	#200	20.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.4		D2216
Liquid Limit	31		D 4318
Plasticity Index	10		D 4318
Unified Classification System	SC		D 2487
AASHTO Classification System	A-2-4(0)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	35.5	44.4	20.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2043

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 15' **Authorized By:** Client **Date:** 6/29/2007

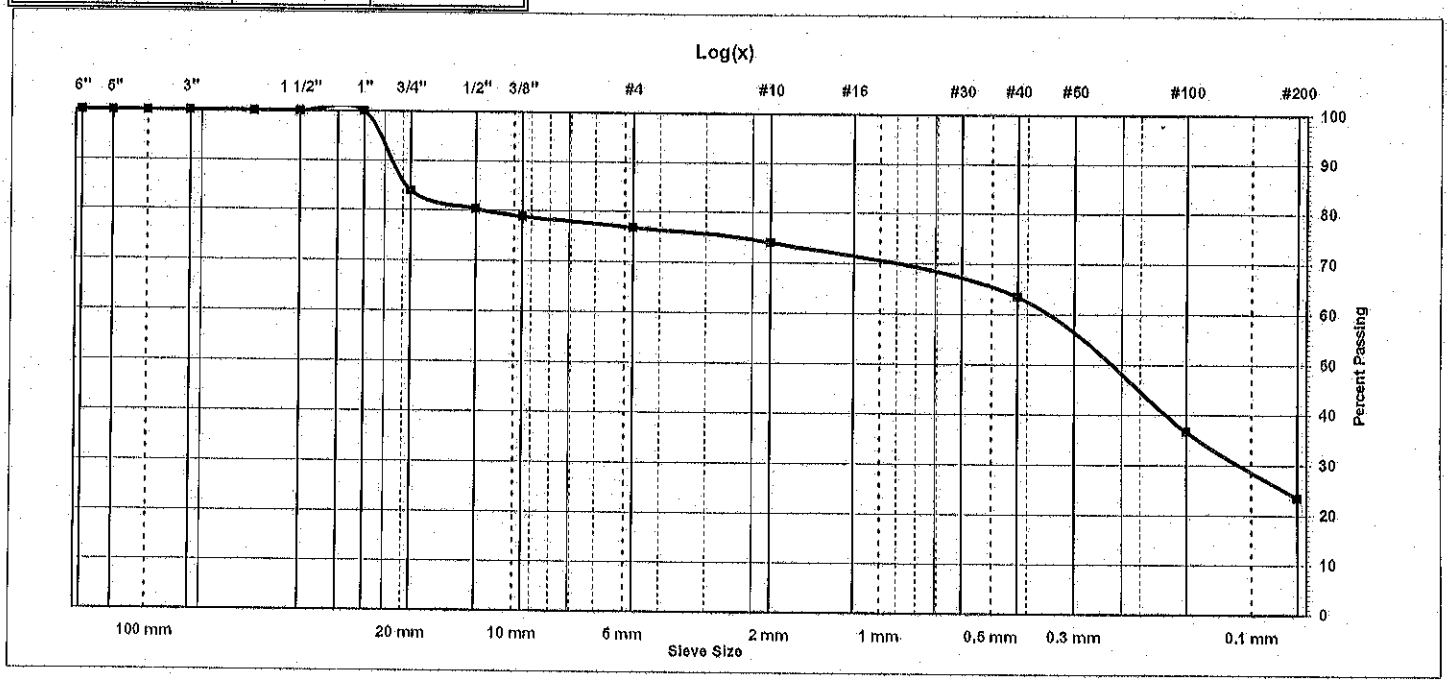
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	84	
12.5 mm	1/2"	80	
9.5 mm	3/8"	79	
4.75 mm	#4	77	
2.00 mm	#10	74	
425 µm	#40	63	
150 µm	#100	37	
75 µm	#200	23.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	23.2	53.5	23.4



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2044

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-2 @ 2' **Authorized By:** Client **Date:** 6/29/2007

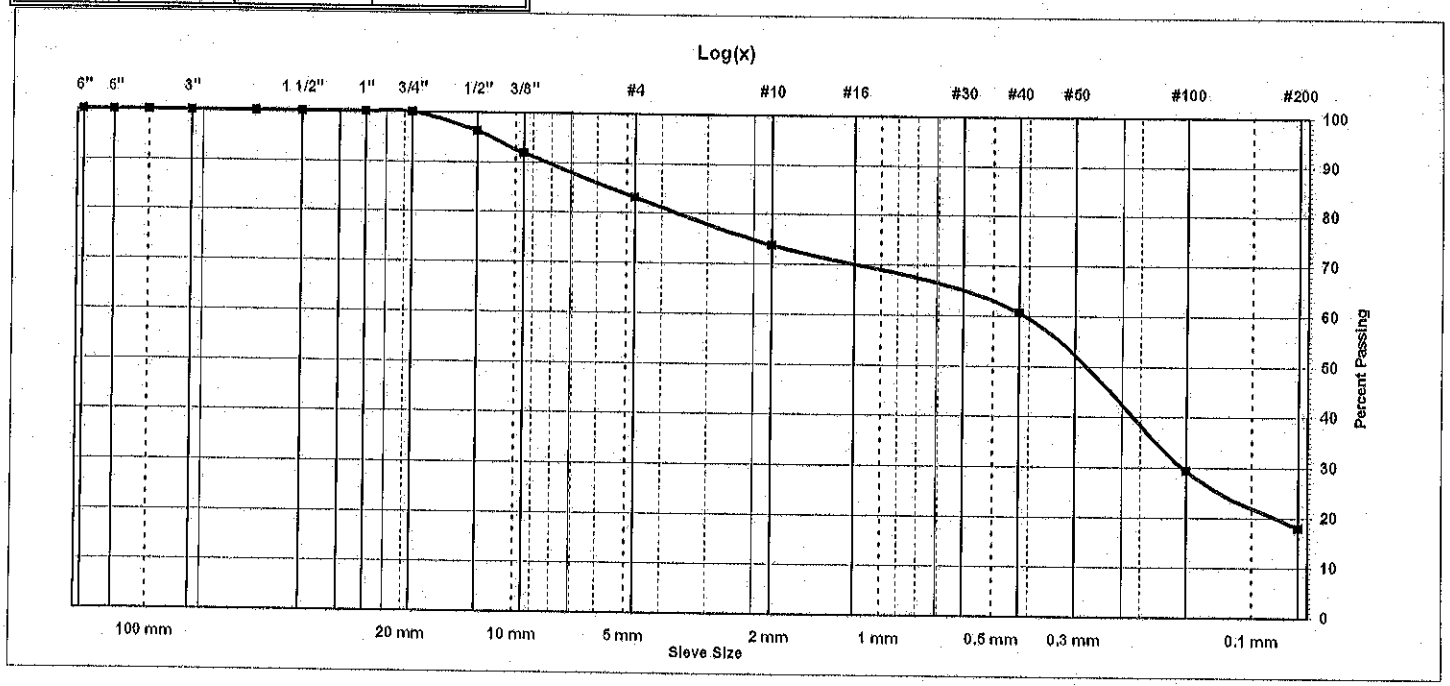
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	96	
9.5 mm	3/8"	92	
4.75 mm	#4	83	
2.00 mm	#10	74	
425 µm	#40	61	
150 µm	#100	29	
75 µm	#200	17.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	16.9	65.3	17.9



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2046

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-2 @ 10' **Authorized By:** Client **Date:** 6/29/2007

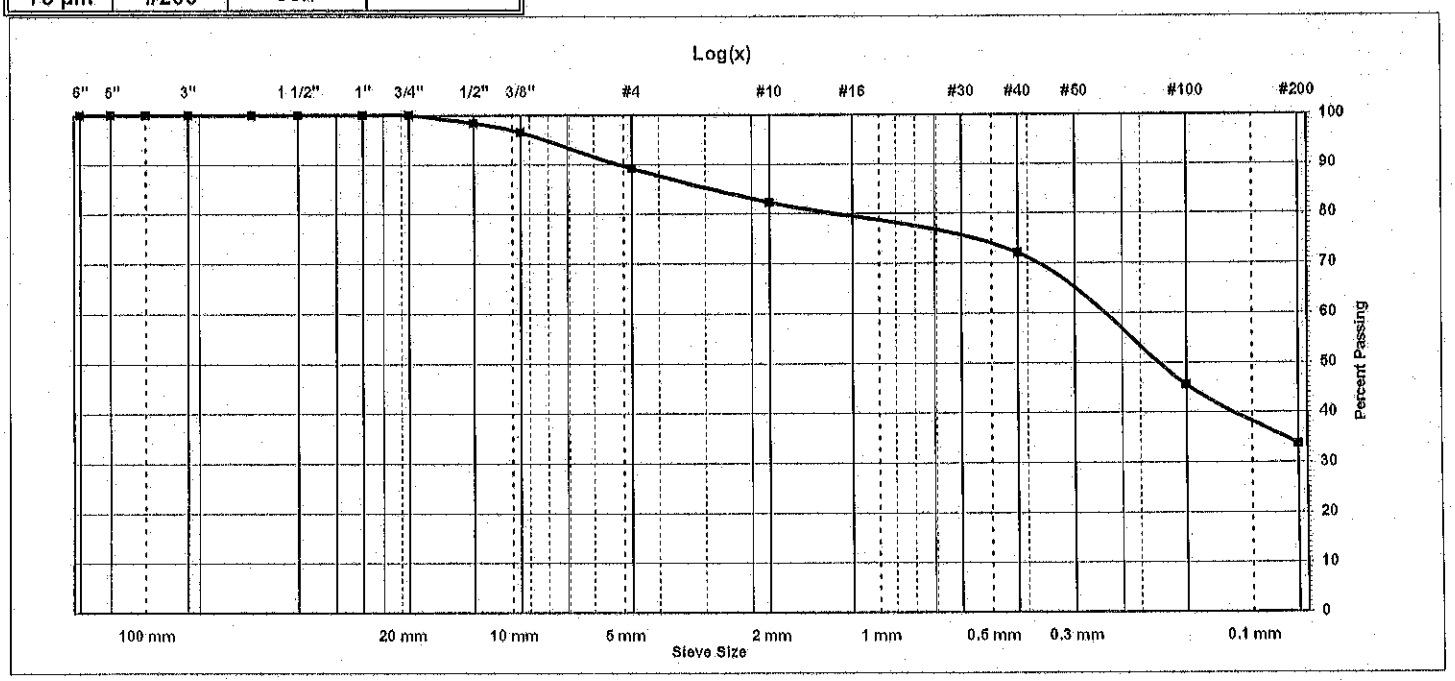
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	98	
9.5 mm	3/8"	96	
4.75 mm	#4	89	
2.00 mm	#10	82	
425 µm	#40	72	
150 µm	#100	46	
75 µm	#200	33.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.9		D2216
Liquid Limit	43		D 4318
Plasticity Index	19		D 4318
Unified Classification System	SC		D 2487
AASHTO Classification System	A-2-7(1)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	10.8	55.5	33.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2048

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-3 @ 7' **Authorized By:** Client **Date:** 6/29/2007

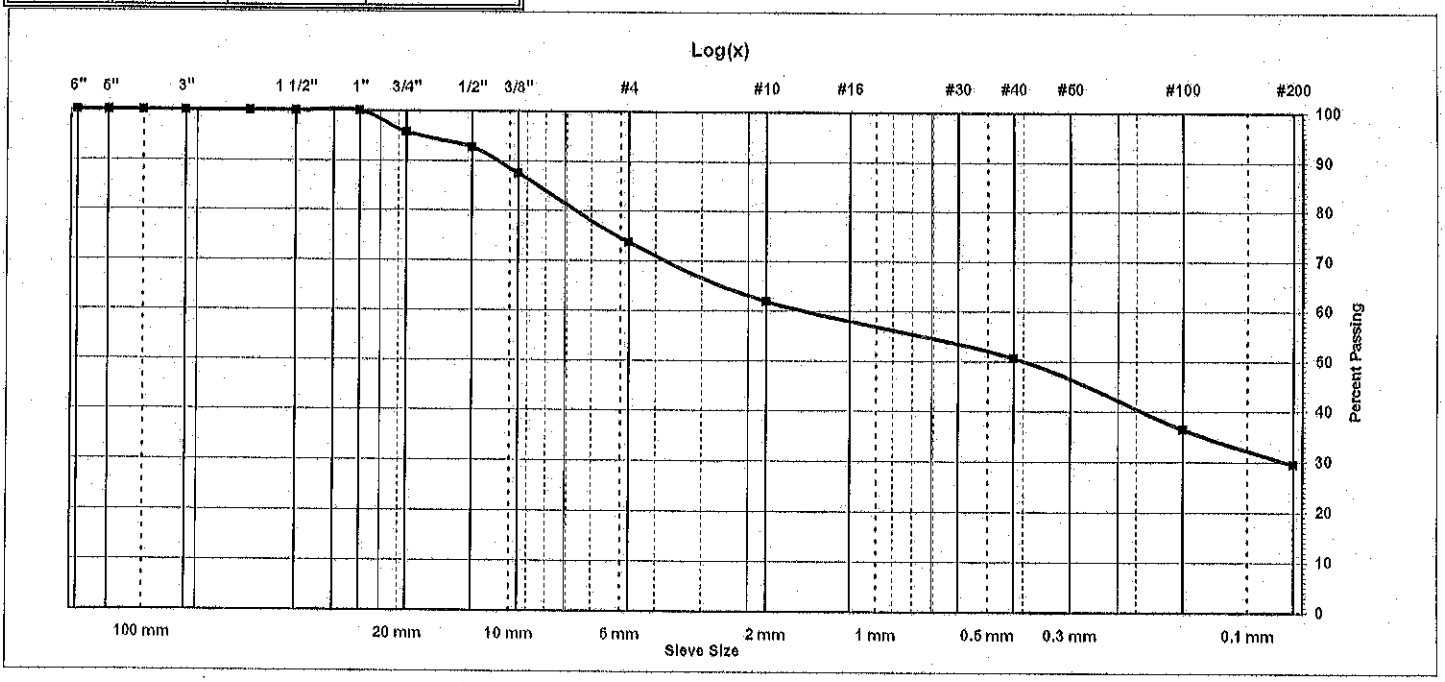
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	96	
12.5 mm	1/2"	93	
9.5 mm	3/8"	87	
4.75 mm	#4	74	
2.00 mm	#10	62	
425 µm	#40	51	
150 µm	#100	36	
75 µm	#200	29.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	26.2	44.3	29.4



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2287

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 8' **Authorized By:** Client **Date:** 6/29/2007

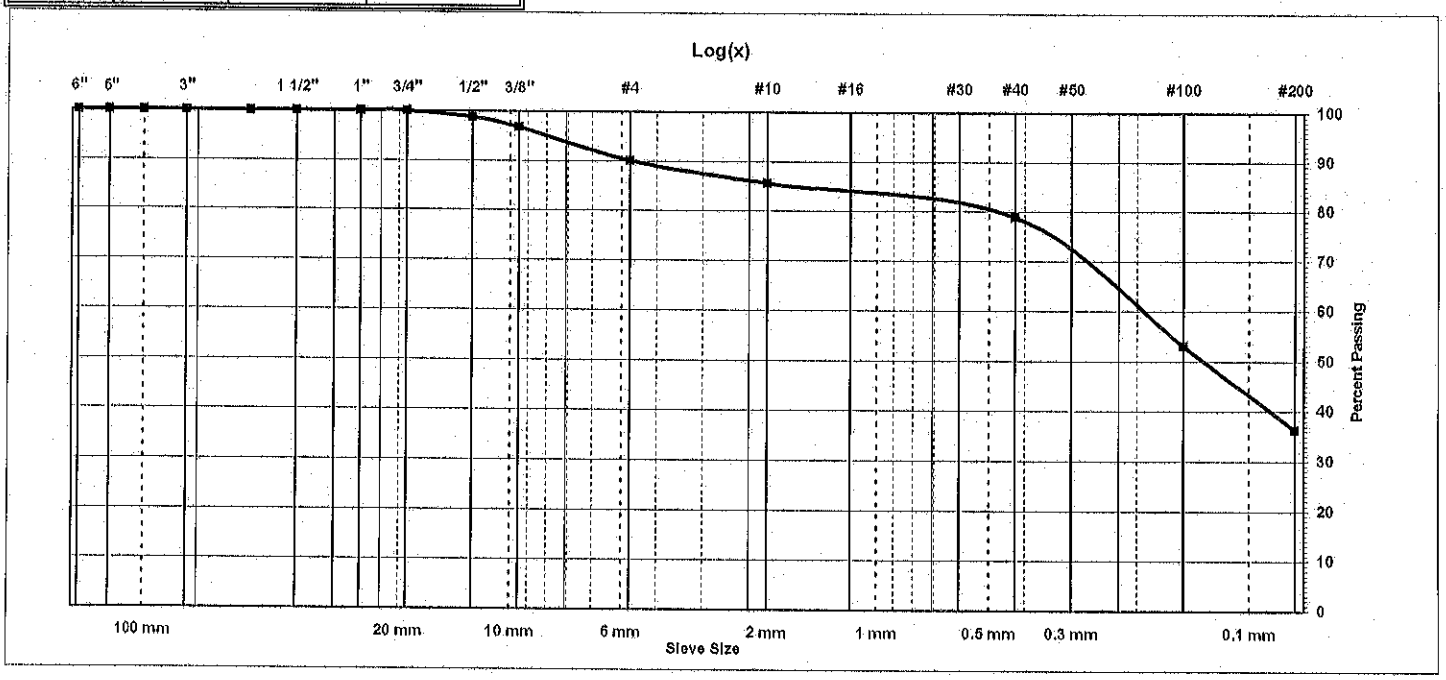
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	97	
4.75 mm	#4	90	
2.00 mm	#10	86	
425 µm	#40	79	
150 µm	#100	53	
75 µm	#200	36.3	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	16.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	9.9	53.8	36.3



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2288

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 10' **Authorized By:** Client **Date:** 6/29/2007

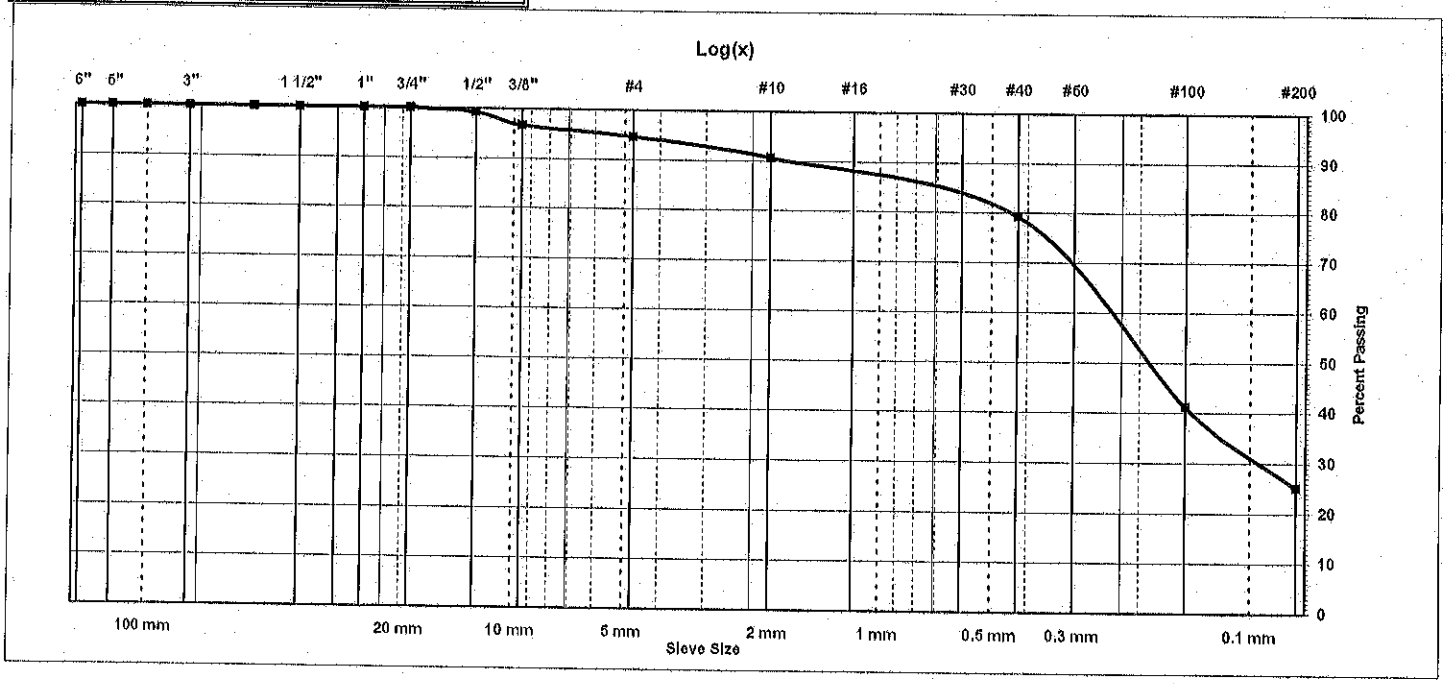
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	97	
4.75 mm	#4	95	
2.00 mm	#10	91	
425 µm	#40	79	
150 µm	#100	41	
75 µm	#200	25.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	13.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	5.4	69.5	25.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2292

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Sandy lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 22' **Authorized By:** Client **Date:** 6/29/2007

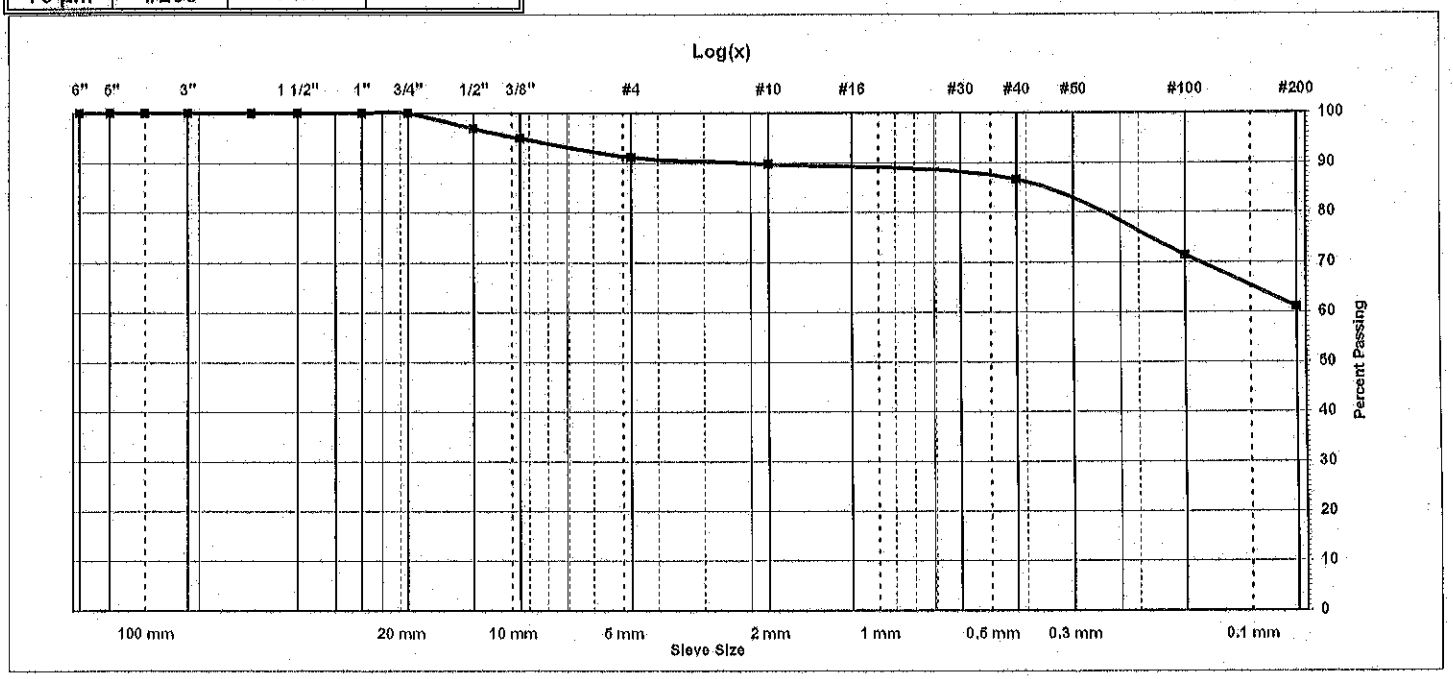
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	97	
9.5 mm	3/8"	95	
4.75 mm	#4	91	
2.00 mm	#10	90	
425 µm	#40	87	
150 µm	#100	71	
75 µm	#200	61.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	14.8		D2216
Liquid Limit	45		D 4318
Plasticity Index	26		D 4318
Unified Classification System	CL		D 2487
AASHTO Classification System	A-7-6(13)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	8.9	30.0	61.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2053

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-5 @ 12' **Authorized By:** Client **Date:** 6/29/2007

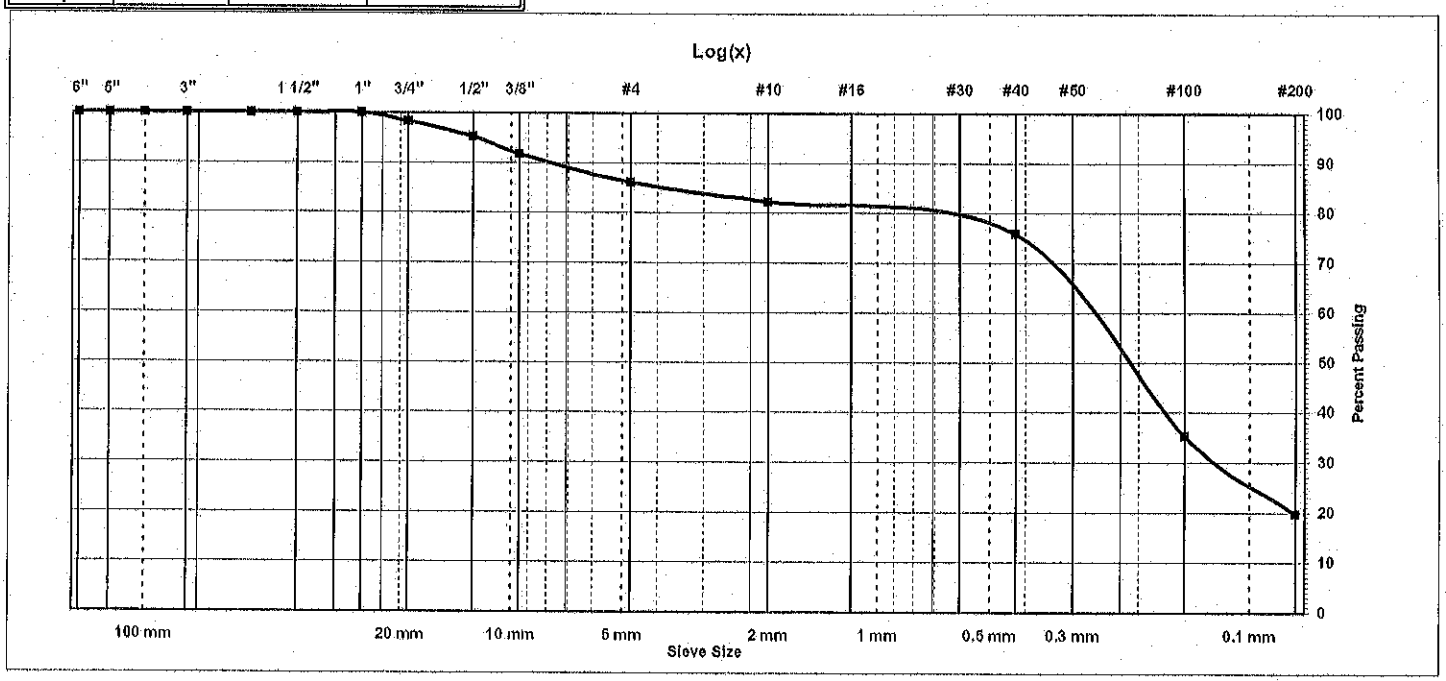
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	95	
9.5 mm	3/8"	92	
4.75 mm	#4	86	
2.00 mm	#10	82	
425 µm	#40	76	
150 µm	#100	35	
75 µm	#200	19.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	13.9	66.4	19.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2056

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-5 @ 32' **Authorized By:** Client **Date:** 6/29/2007

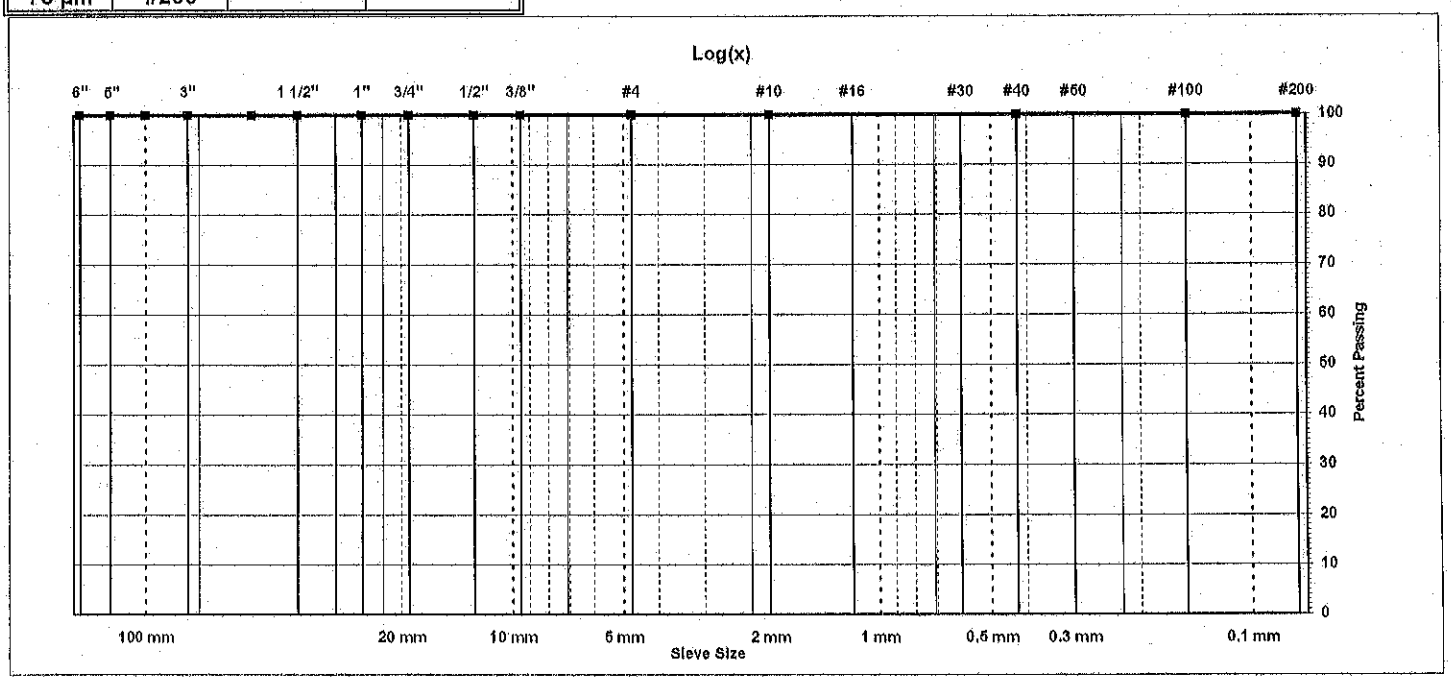
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	15.8		D2216
Liquid Limit	70		D 4318
Plasticity Index	37		D 4318
Dry Unit Weight, pcf	54.3		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2074

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-1 @ 2' **Authorized By:** Client **Date:** 6/29/2007

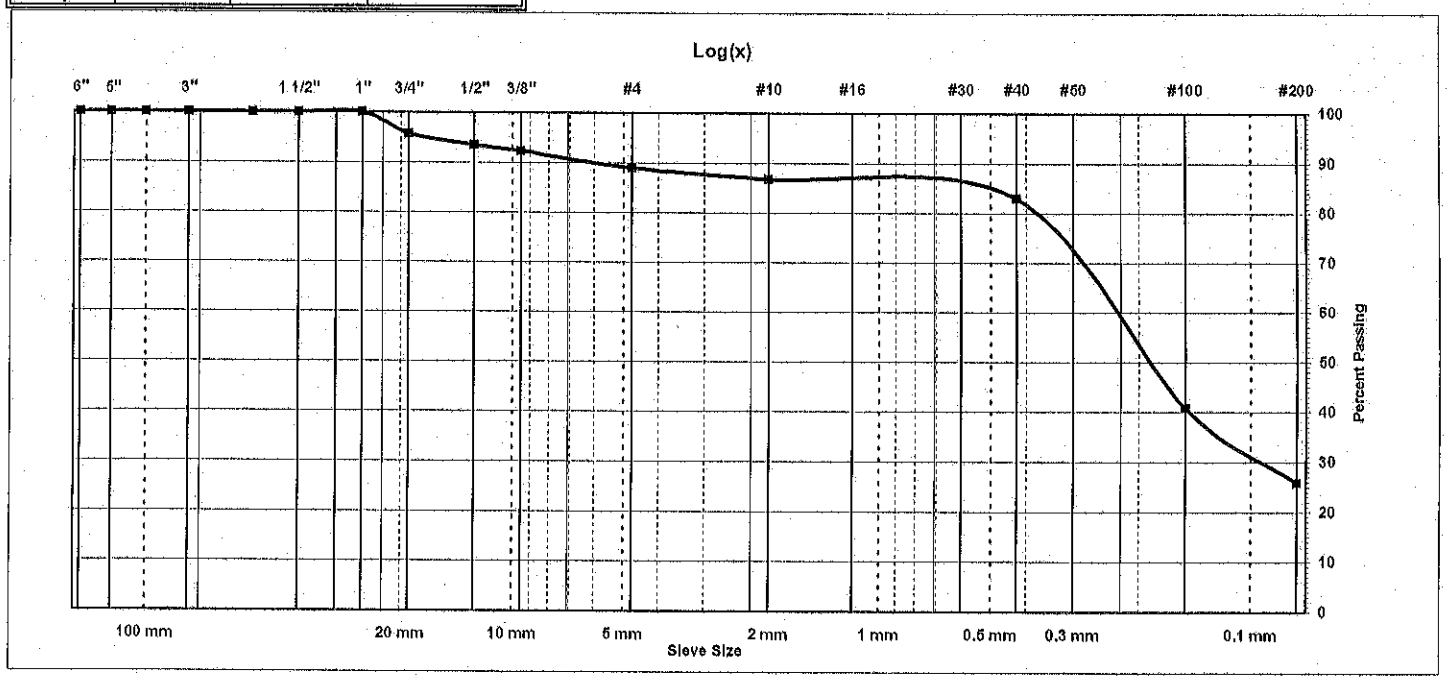
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	96	
12.5 mm	1/2"	93	
9.5 mm	3/8"	92	
4.75 mm	#4	89	
2.00 mm	#10	87	
425 µm	#40	83	
150 µm	#100	41	
75 µm	#200	25.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	1.5		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	111.9		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	11.1	63.0	25.9



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2075

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-1 @ 7' **Authorized By:** Client **Date:** 6/29/2007

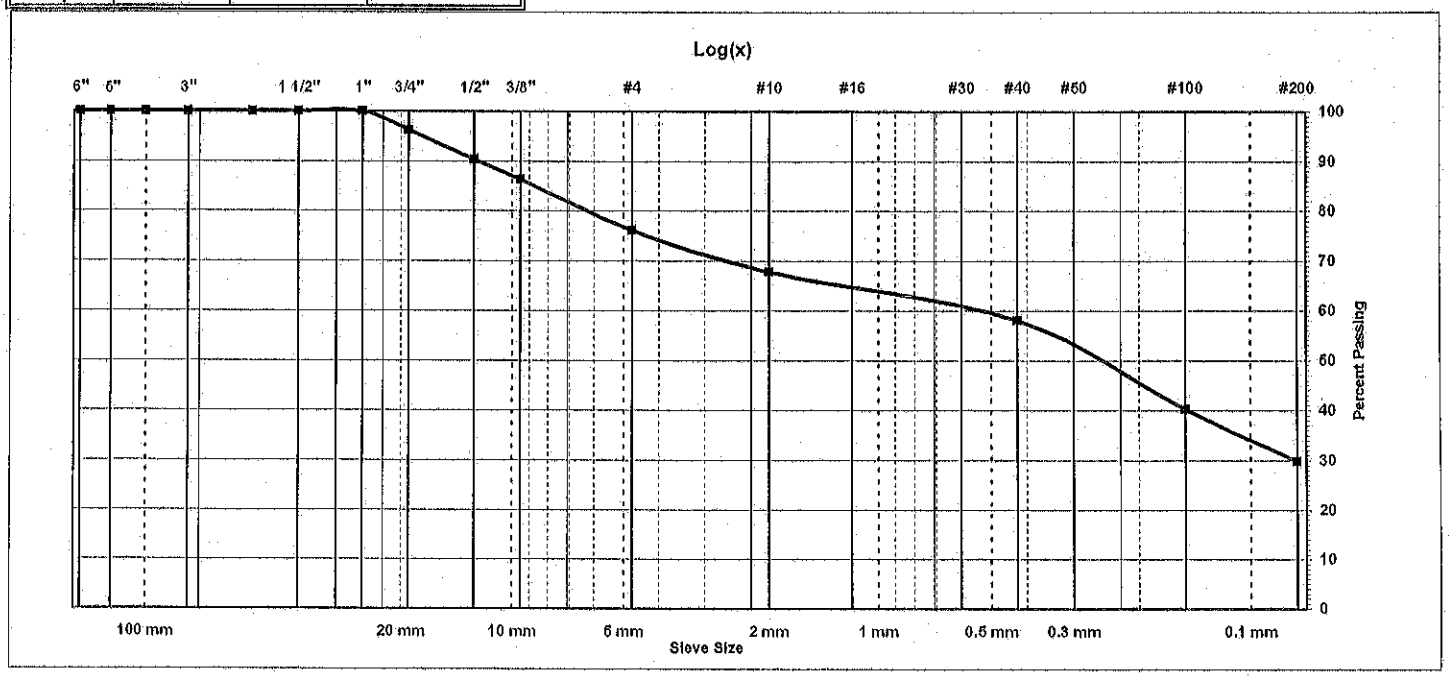
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	96	
12.5 mm	1/2"	90	
9.5 mm	3/8"	86	
4.75 mm	#4	76	
2.00 mm	#10	68	
425 µm	#40	58	
150 µm	#100	40	
75 µm	#200	29.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	97.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	23.8	46.4	29.8



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2077

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-2 @ 7' **Authorized By:** Client **Date:** 6/29/2007

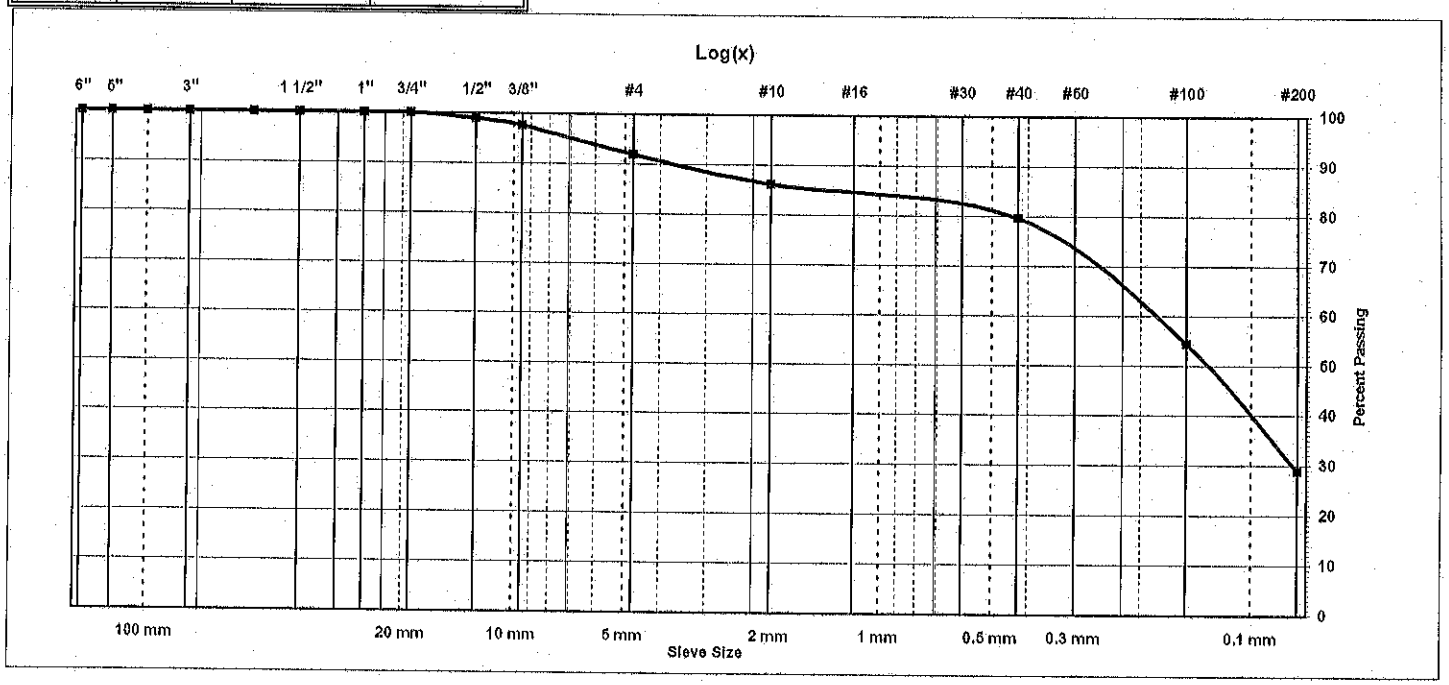
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	98	
4.75 mm	#4	92	
2.00 mm	#10	86	
425 µm	#40	80	
150 µm	#100	54	
75 µm	#200	28.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	8.2	63.0	28.8



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2078

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-2 @ 12' **Authorized By:** Client **Date:** 6/29/2007

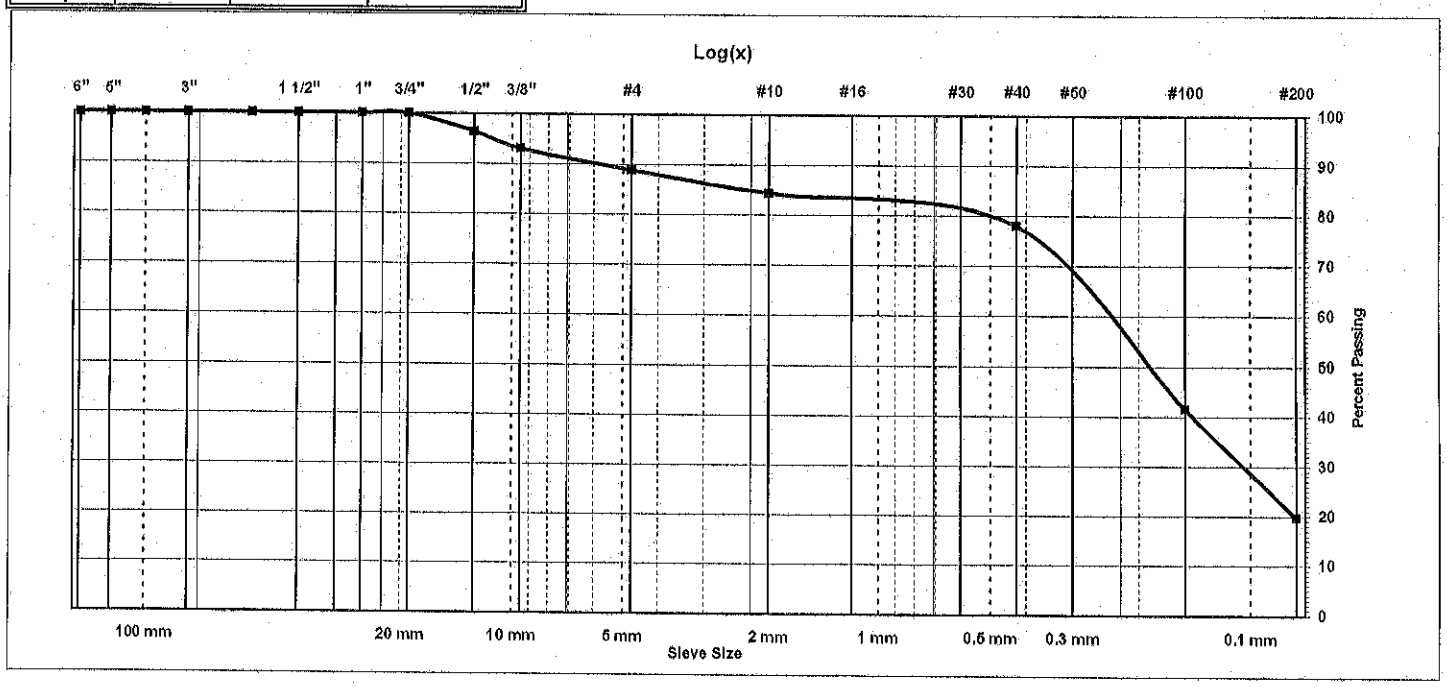
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	96	
9.5 mm	3/8"	93	
4.75 mm	#4	89	
2.00 mm	#10	84	
425 µm	#40	78	
150 µm	#100	42	
75 µm	#200	19.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	60.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	11.2	69.0	19.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2079

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-2 @ 17' **Authorized By:** Client **Date:** 6/29/2007

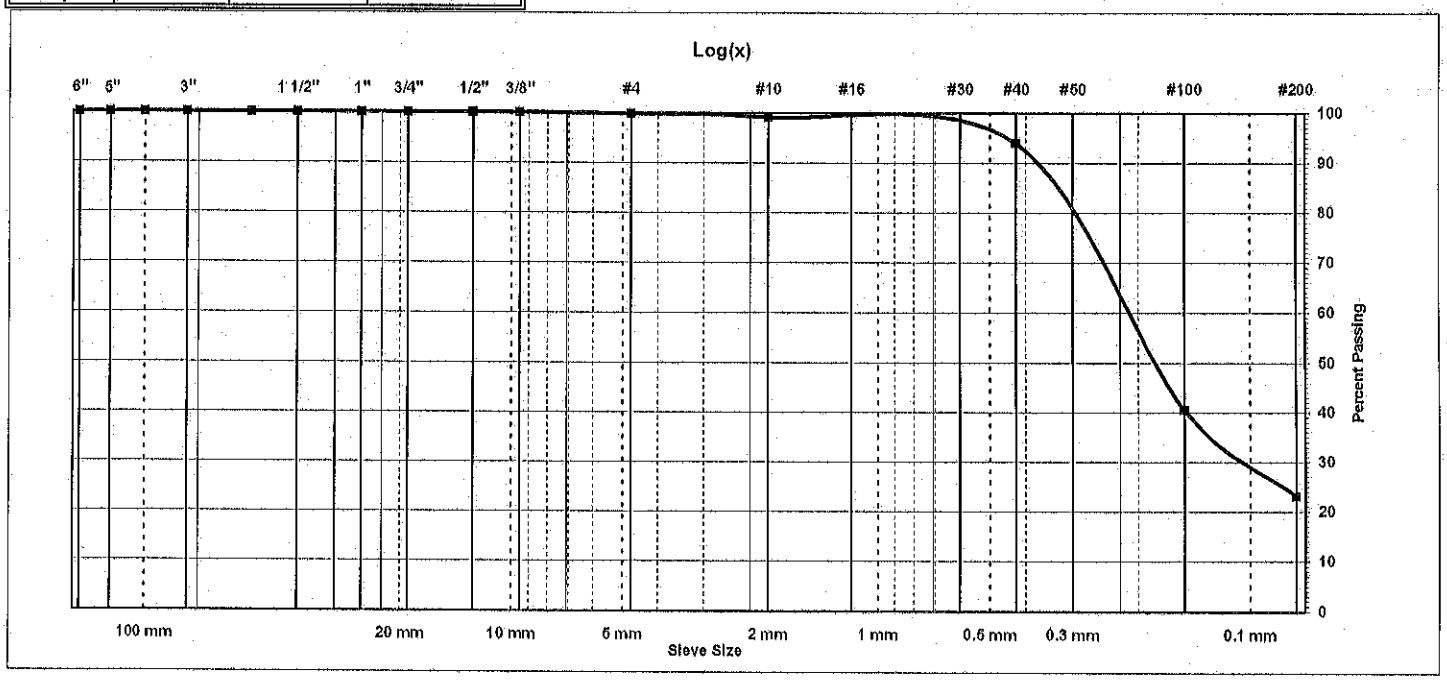
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4	100	
2.00 mm	#10	99	
425 µm	#40	94	
150 µm	#100	41	
75 µm	#200	23.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.6		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	108.8		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.3	76.6	23.1



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2080

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: RW-3 @ 2'
Authorized By: Client **Date:** 6/29/2007

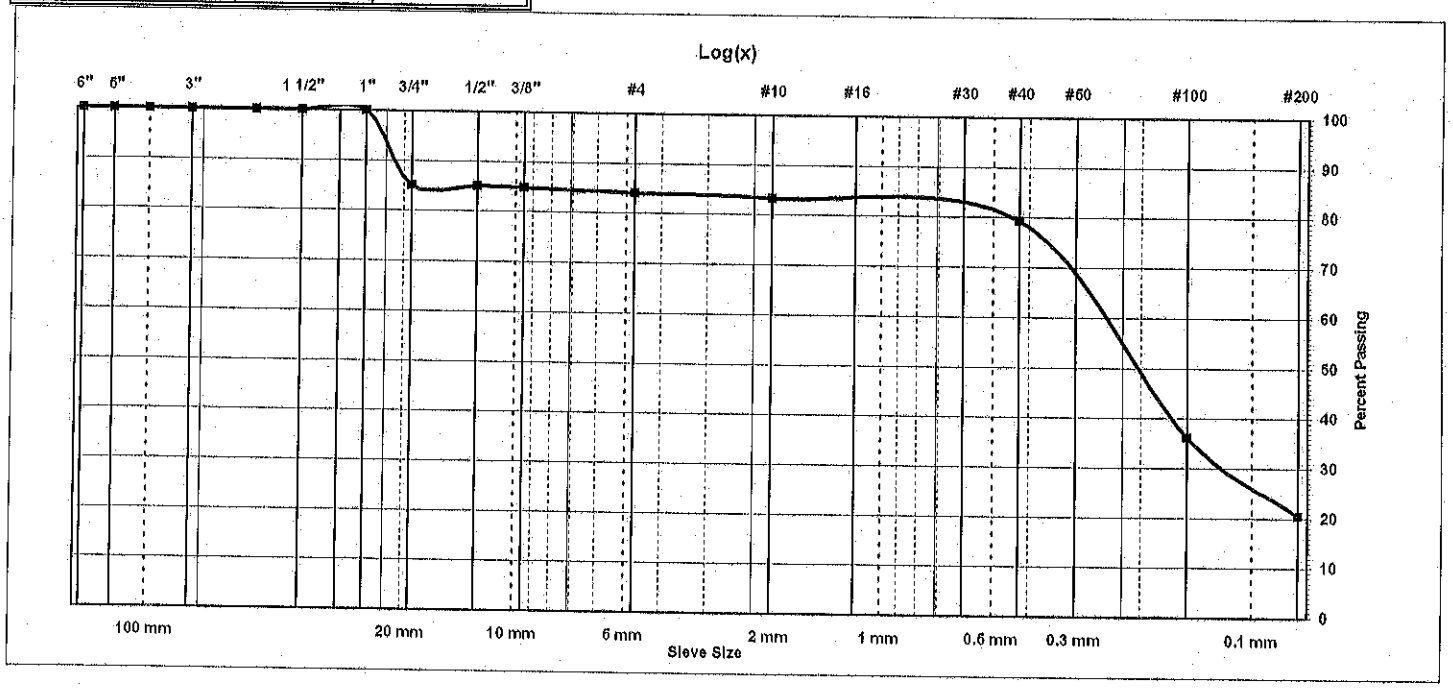
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	85	
12.5 mm	1/2"	85	
9.5 mm	3/8"	85	
4.75 mm	#4	84	
2.00 mm	#10	83	
425 µm	#40	79	
150 µm	#100	36	
75 µm	#200	20.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	1.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	15.9	63.6	20.4



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2081

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-3 @ 12' **Authorized By:** Client **Date:** 6/29/2007

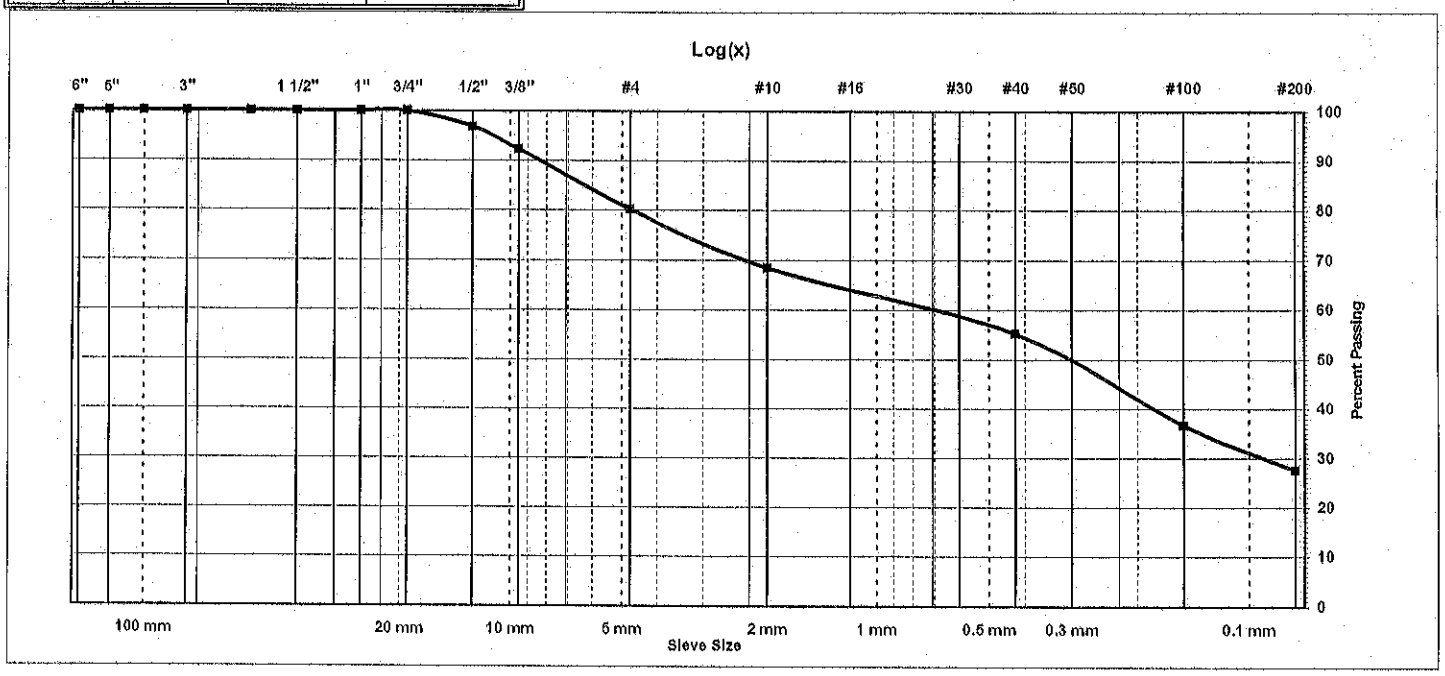
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	97	
9.5 mm	3/8"	92	
4.75 mm	#4	80	
2.00 mm	#10	69	
425 µm	#40	55	
150 µm	#100	37	
75 µm	#200	27.5	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	90.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	19.8	52.7	27.5



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2082

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-3 @ 22' **Authorized By:** Client **Date:** 6/29/2007

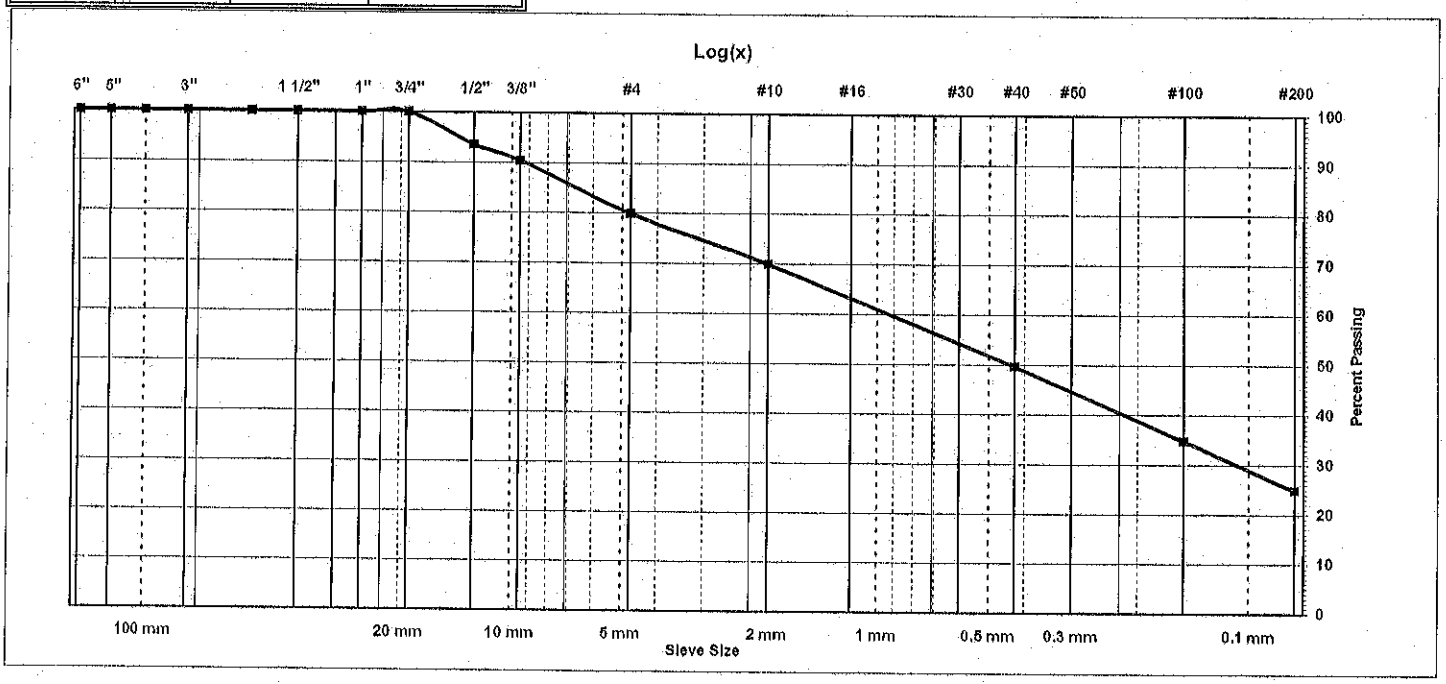
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	94	
9.5 mm	3/8"	90	
4.75 mm	#4	80	
2.00 mm	#10	70	
425 µm	#40	50	
150 µm	#100	35	
75 µm	#200	24.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.9		D2216
Liquid Limit	27		D 4318
Plasticity Index	9		D 4318
Unified Classification System	SC		D 2487
AASHTO Classification System	A-2-4(0)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	20.0	55.2	24.8



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2131

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-4 @ 2' **Authorized By:** Client **Date:** 6/29/2007

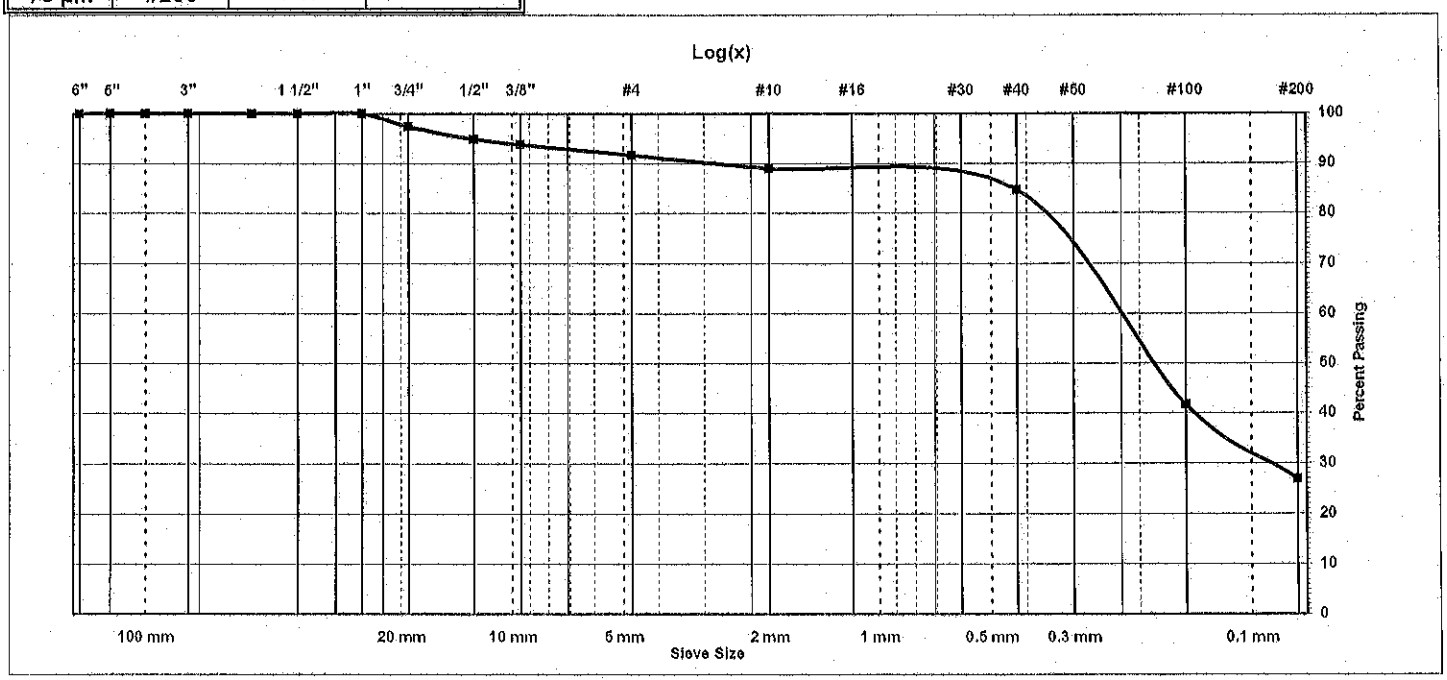
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	97	
12.5 mm	1/2"	95	
9.5 mm	3/8"	94	
4.75 mm	#4	92	
2.00 mm	#10	89	
425 µm	#40	85	
150 µm	#100	42	
75 µm	#200	26.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	8.3	64.8	26.9



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2132

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey gravel with sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-4 @ 12' **Authorized By:** Client **Date:** 6/29/2007

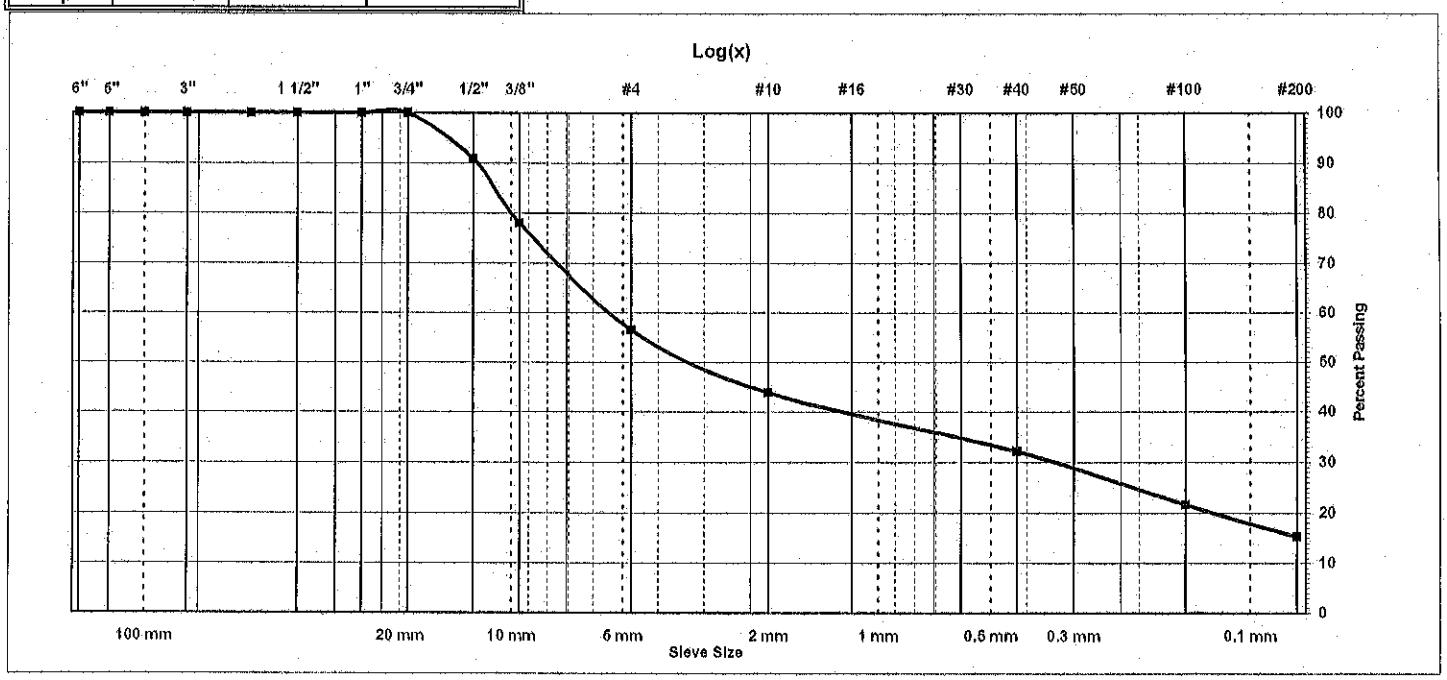
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	91	
9.5 mm	3/8"	78	
4.75 mm	#4	57	
2.00 mm	#10	44	
425 µm	#40	32	
150 µm	#100	22	
75 µm	#200	15.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	43.5	41.2	15.4



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LANDMARK
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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2133

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Poorly-graded sand with silt and gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-4 @ 17' **Authorized By:** Client **Date:** 6/29/2007

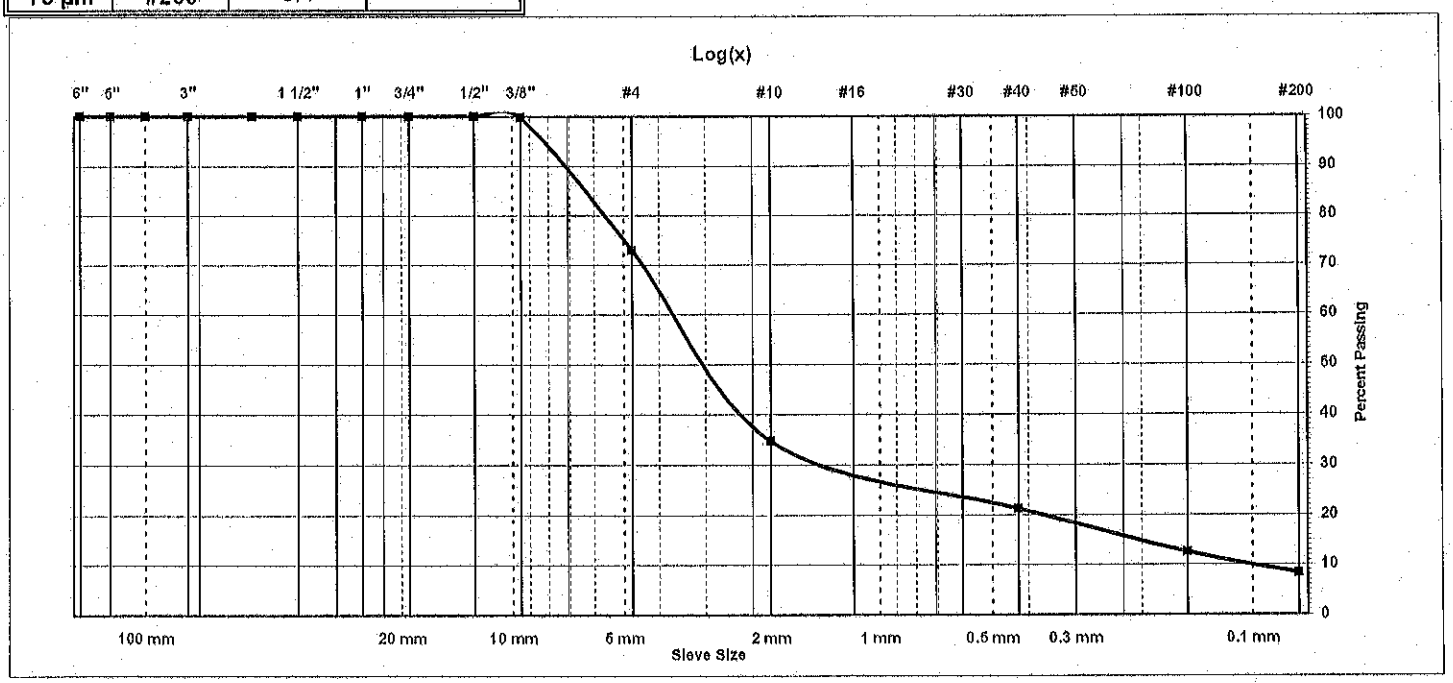
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	73	
2.00 mm	#10	35	
425 µm	#40	21	
150 µm	#100	13	
75 µm	#200	8.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	0.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	27.0	64.7	8.4



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2137

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-5 @ 2' **Authorized By:** Client **Date:** 6/29/2007

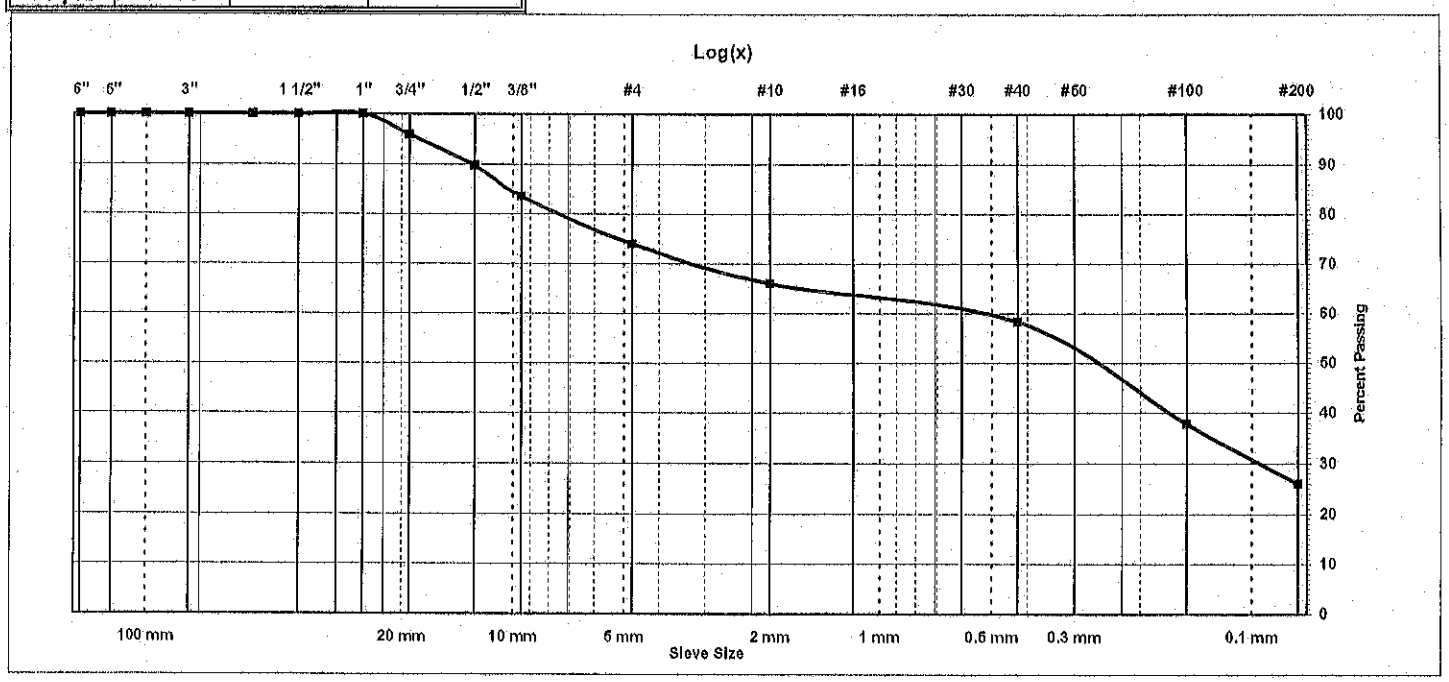
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	96	
12.5 mm	1/2"	90	
9.5 mm	3/8"	84	
4.75 mm	#4	74	
2.00 mm	#10	66	
425 µm	#40	58	
150 µm	#100	38	
75 µm	#200	26.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	26.0	47.9	26.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2139

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Poorly-graded sand with silt and gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-5 @ 12' **Authorized By:** Client **Date:** 6/29/2007

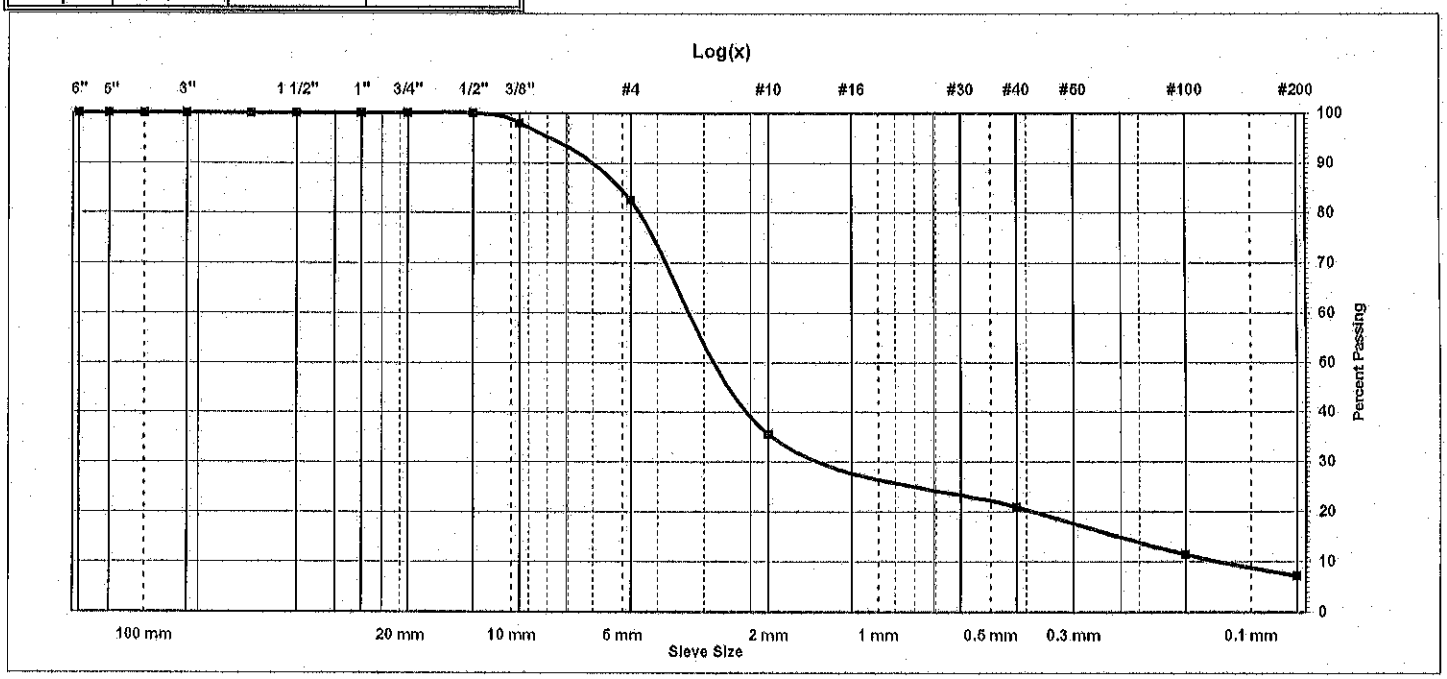
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"	100	
9.5 mm	3/8"	98	
4.75 mm	#4	83	
2.00 mm	#10	35	
425 µm	#40	21	
150 µm	#100	11	
75 µm	#200	7.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	0.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	17.5	75.4	7.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2088

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-7 @ 2' **Authorized By:** Client **Date:** 6/29/2007

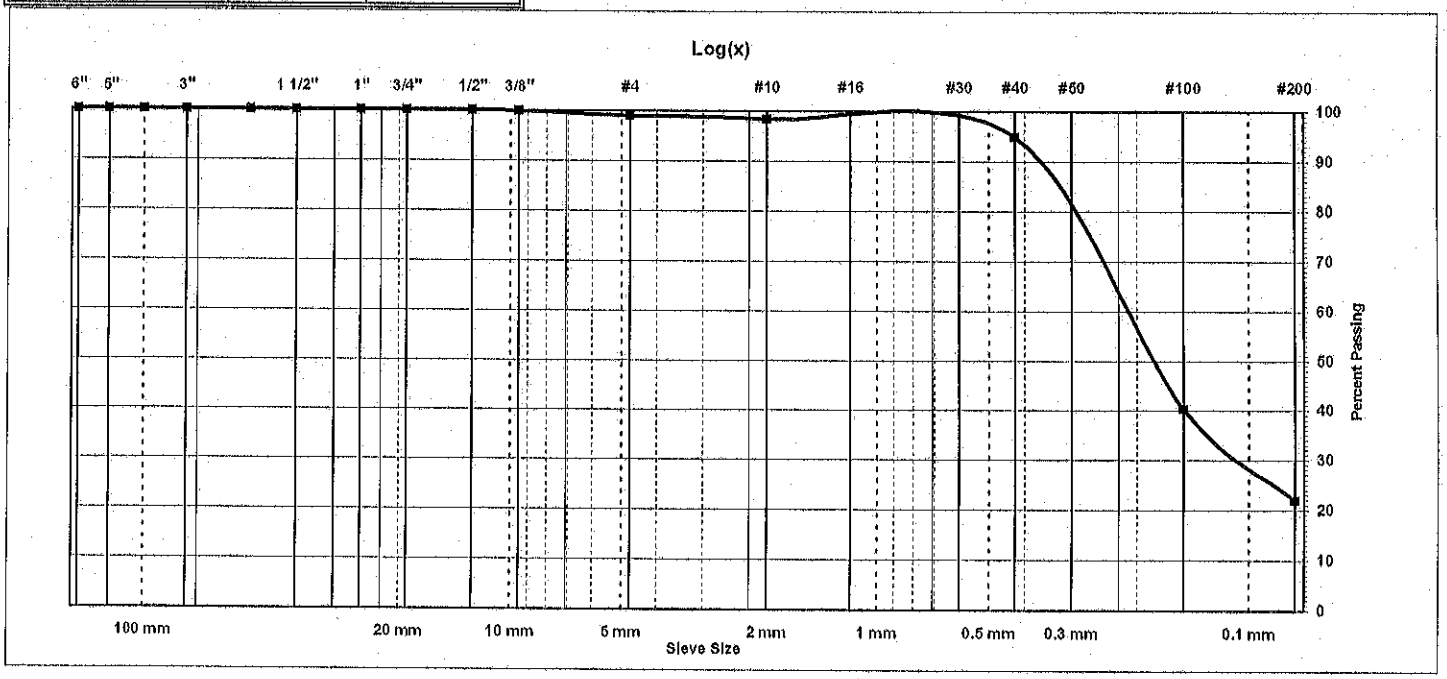
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	99	
2.00 mm	#10	98	
425 µm	#40	95	
150 µm	#100	40	
75 µm	#200	21.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	0.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	108.8		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	1.0	77.1	21.9



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2090

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-7 @ 17' **Authorized By:** Client **Date:** 6/29/2007

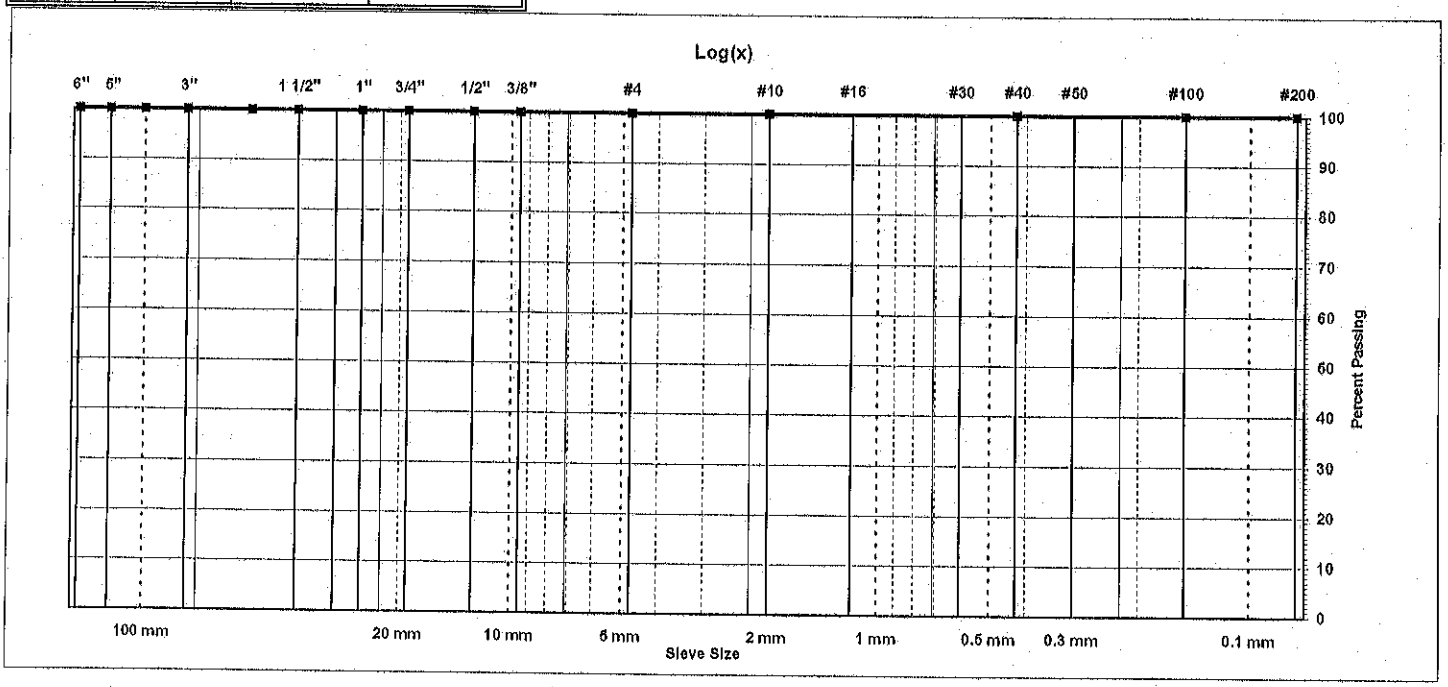
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.7		D2216
Liquid Limit	43		D 4318
Plasticity Index	19		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2091

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-8 @ 2' **Authorized By:** Client **Date:** 6/29/2007

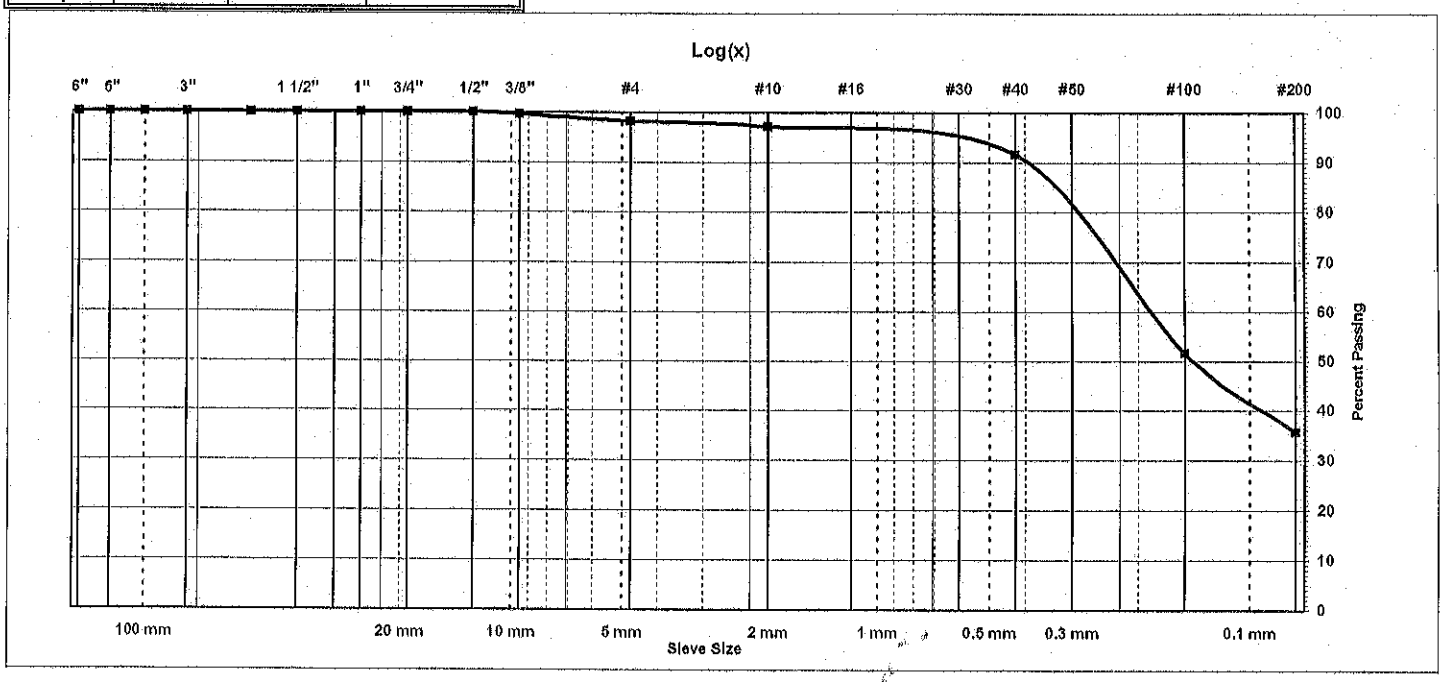
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	98	
2.00 mm	#10	97	
425 µm	#40	92	
150 µm	#100	52	
75 µm	#200	35.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	105.8		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	1.8	62.5	35.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2094

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-9 @ 2' **Authorized By:** Client **Date:** 6/29/2007

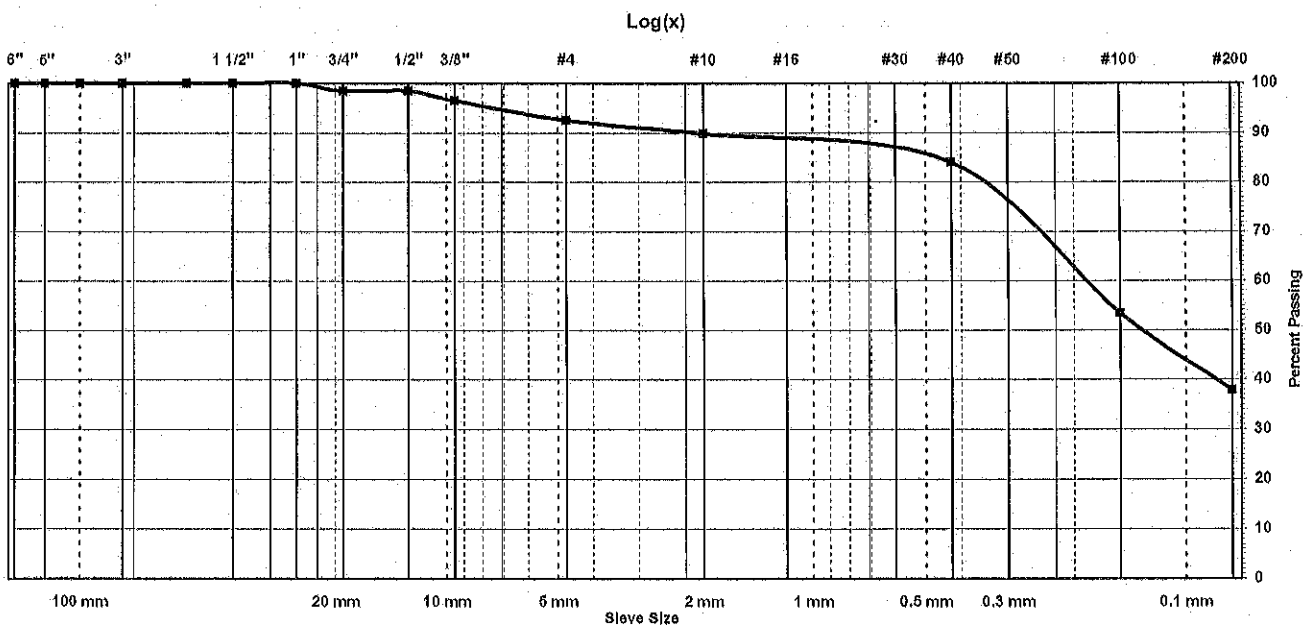
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	98	
9.5 mm	3/8"	96	
4.75 mm	#4	93	
2.00 mm	#10	90	
425 µm	#40	84	
150 µm	#100	53	
75 µm	#200	37.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	100.0		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	7.4	54.8	37.8



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2097

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: ET-2 @ 2'
Authorized By: Client **Date:** 6/29/2007

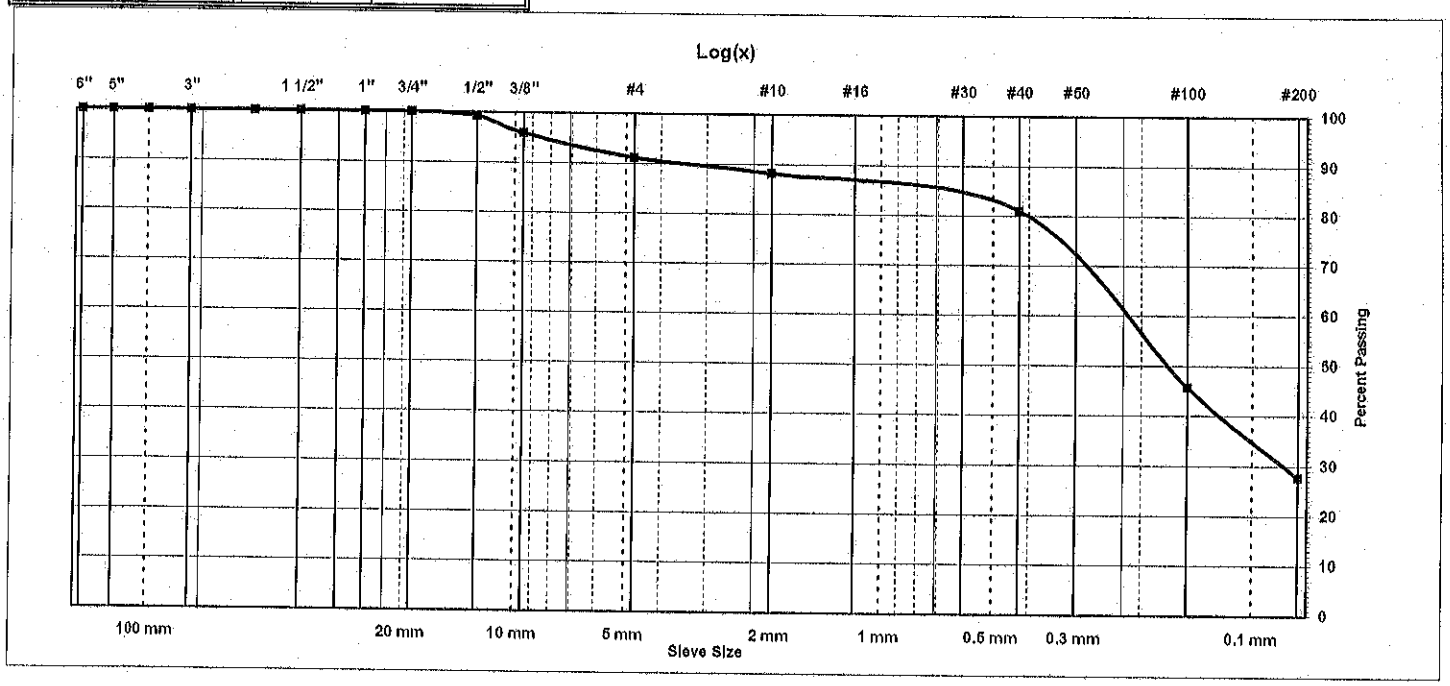
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	96	
4.75 mm	#4	91	
2.00 mm	#10	88	
425 µm	#40	81	
150 µm	#100	46	
75 µm	#200	27.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	57.9		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	8.9	63.4	27.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2098

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Poorly-graded gravel with silt and sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-2 @ 7' **Authorized By:** Client **Date:** 6/29/2007

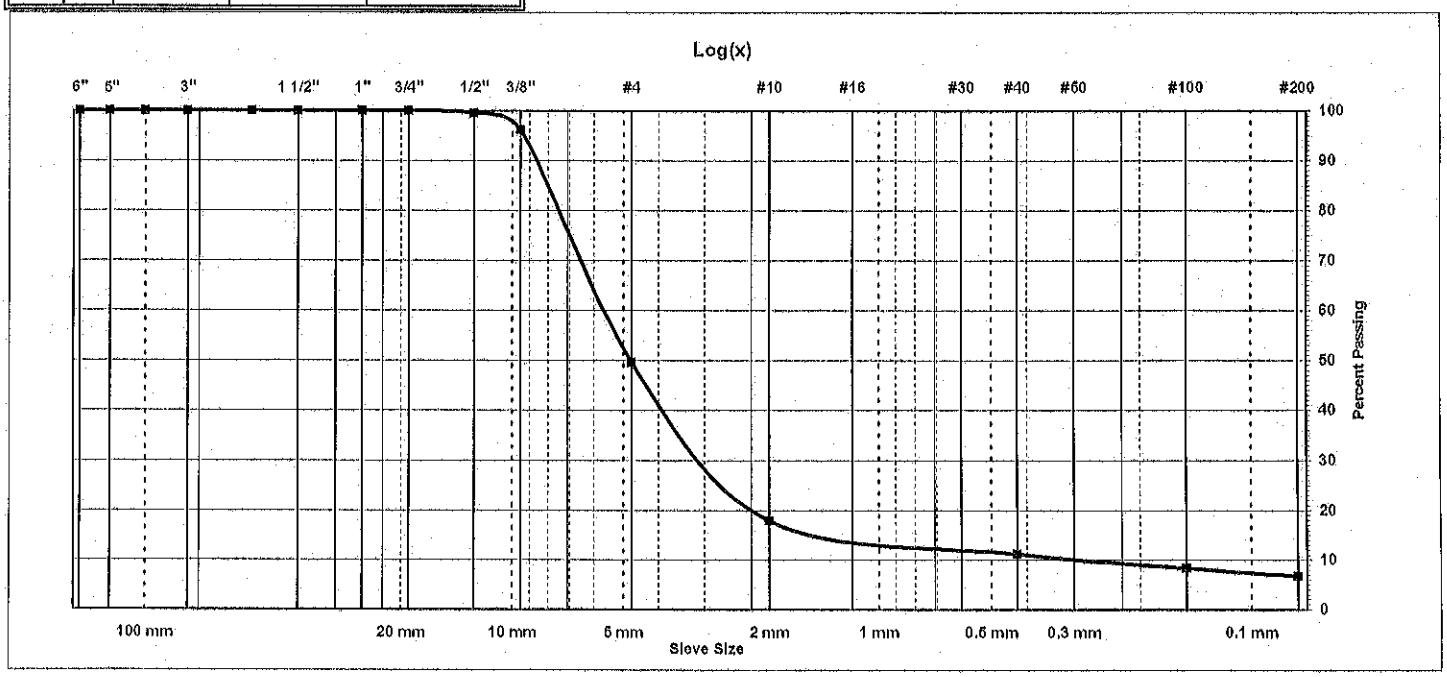
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	96	
4.75 mm	#4	50	
2.00 mm	#10	18	
425 µm	#40	11	
150 µm	#100	8	
75 µm	#200	6.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	0.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	50.4	42.9	6.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2144

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-3 @ 7' **Authorized By:** Client **Date:** 6/29/2007

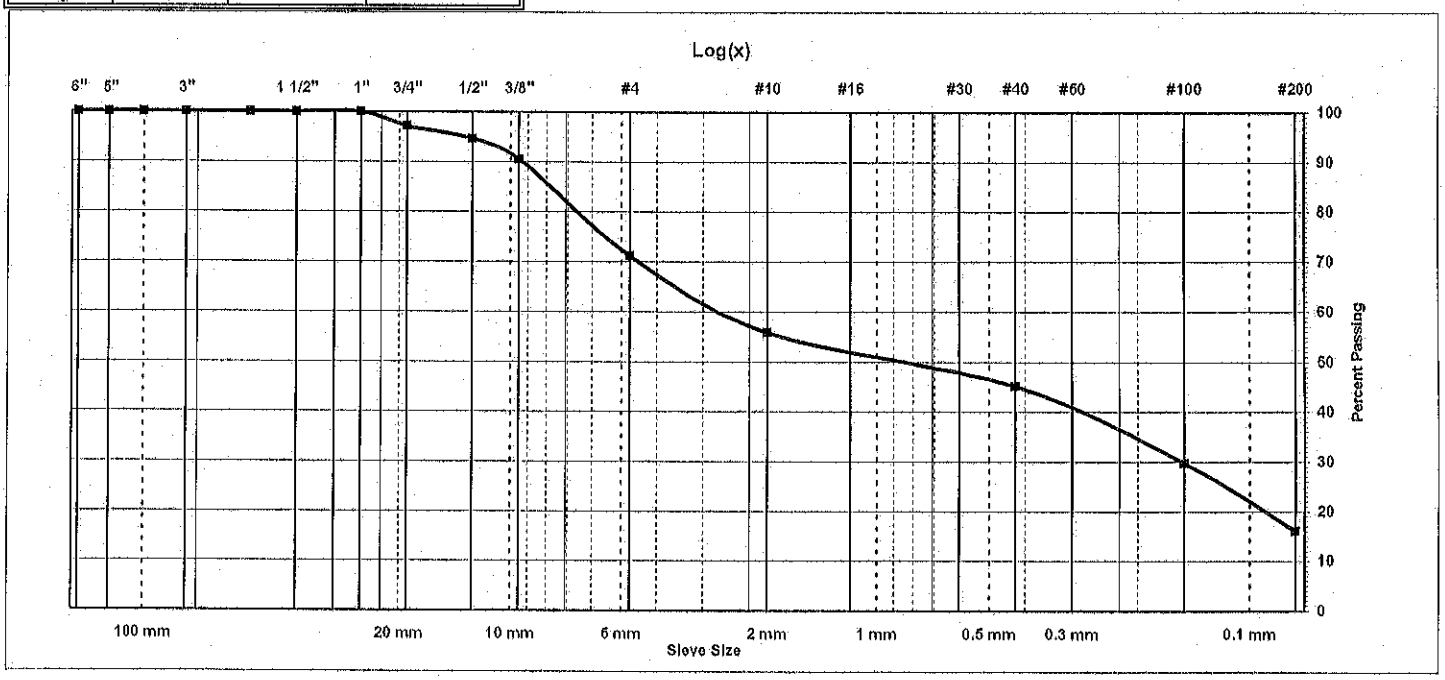
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	97	
12.5 mm	1/2"	95	
9.5 mm	3/8"	90	
4.75 mm	#4	71	
2.00 mm	#10	56	
425 µm	#40	45	
150 µm	#100	30	
75 µm	#200	16.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	11.6		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	28.8	55.1	16.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2145

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-3 @ 12' **Authorized By:** Client **Date:** 6/29/2007

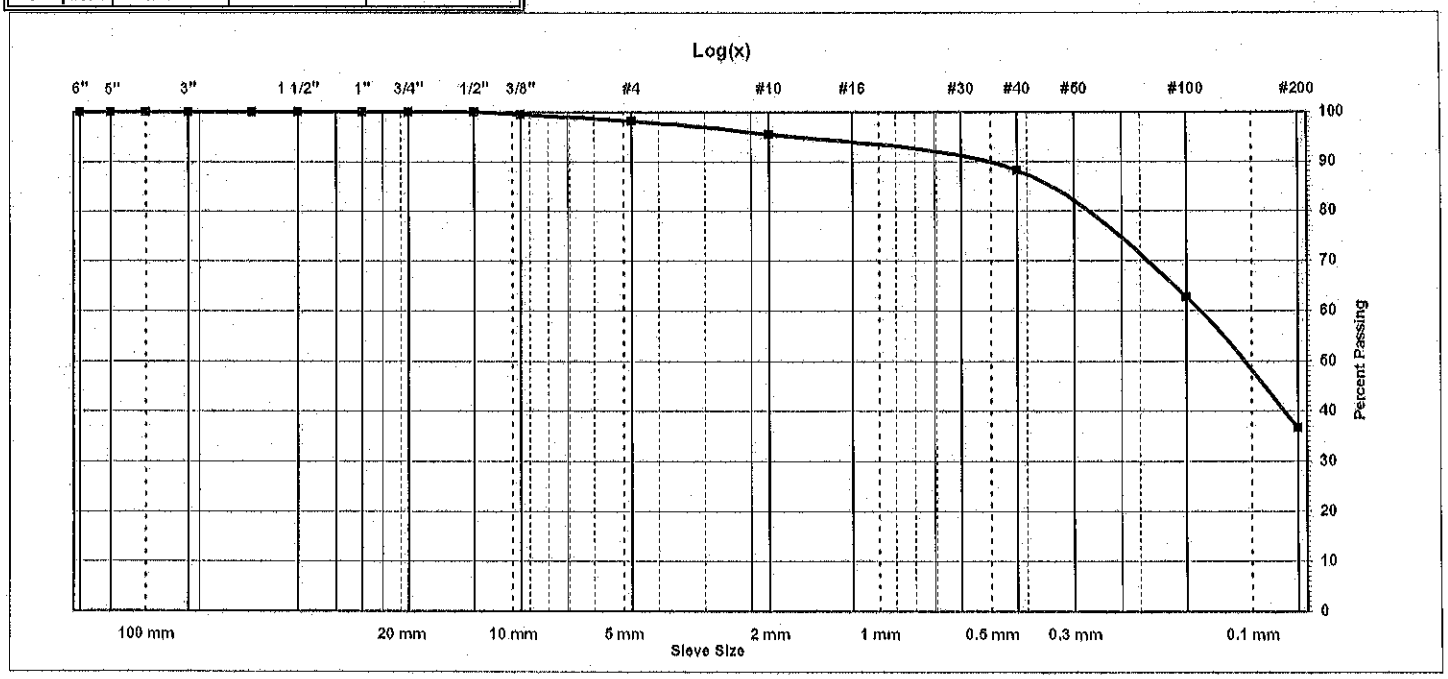
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	98	
2.00 mm	#10	95	
425 µm	#40	88	
150 µm	#100	63	
75 µm	#200	36.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.2		D2216
Liquid Limit	32		D 4318
Plasticity Index	15		D 4318
Dry Unit Weight, pcf	57.6		C 29
Unified Classification System	SC		D 2487
AASHTO Classification System	A-6(1)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	1.8	61.5	36.7



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2147

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-4 @ 2' **Authorized By:** Client **Date:** 6/29/2007

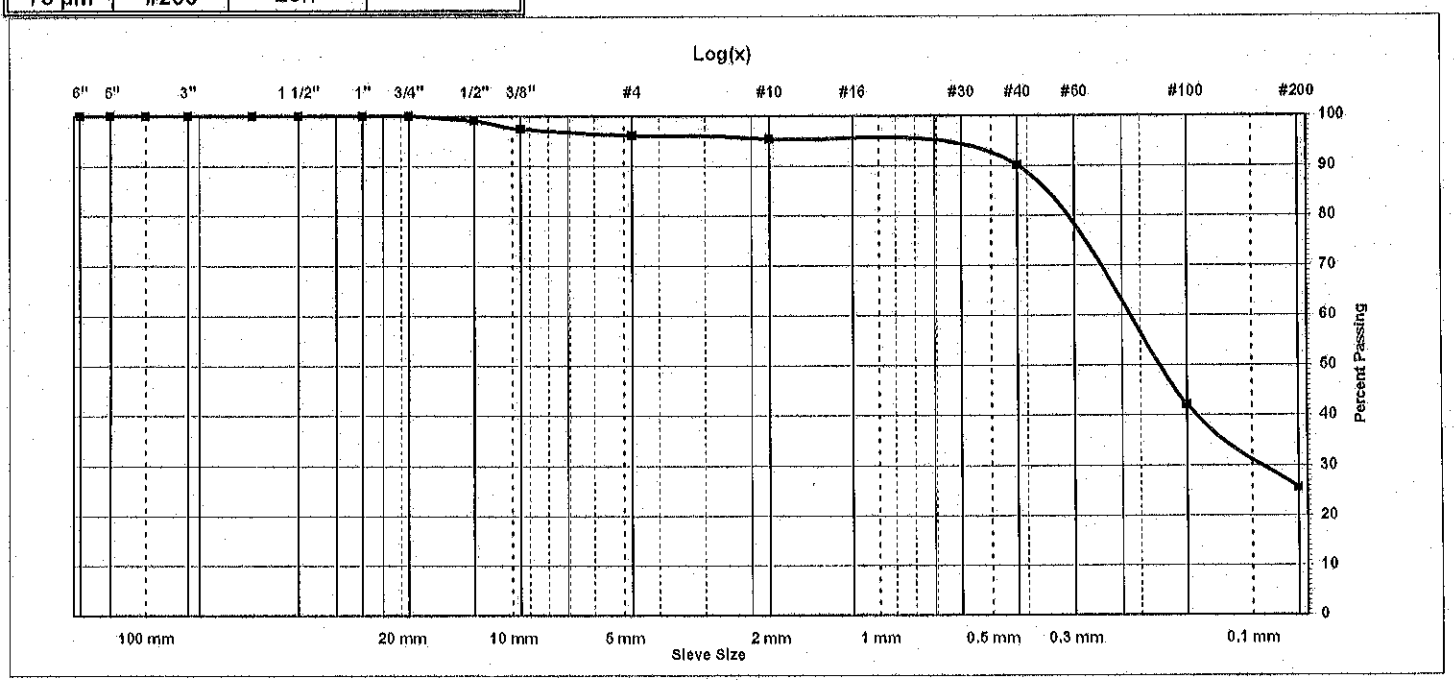
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	97	
4.75 mm	#4	96	
2.00 mm	#10	95	
425 µm	#40	90	
150 µm	#100	42	
75 µm	#200	25.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	1.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	3.9	70.4	25.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2148

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-4 @ 7' **Authorized By:** Client **Date:** 6/29/2007

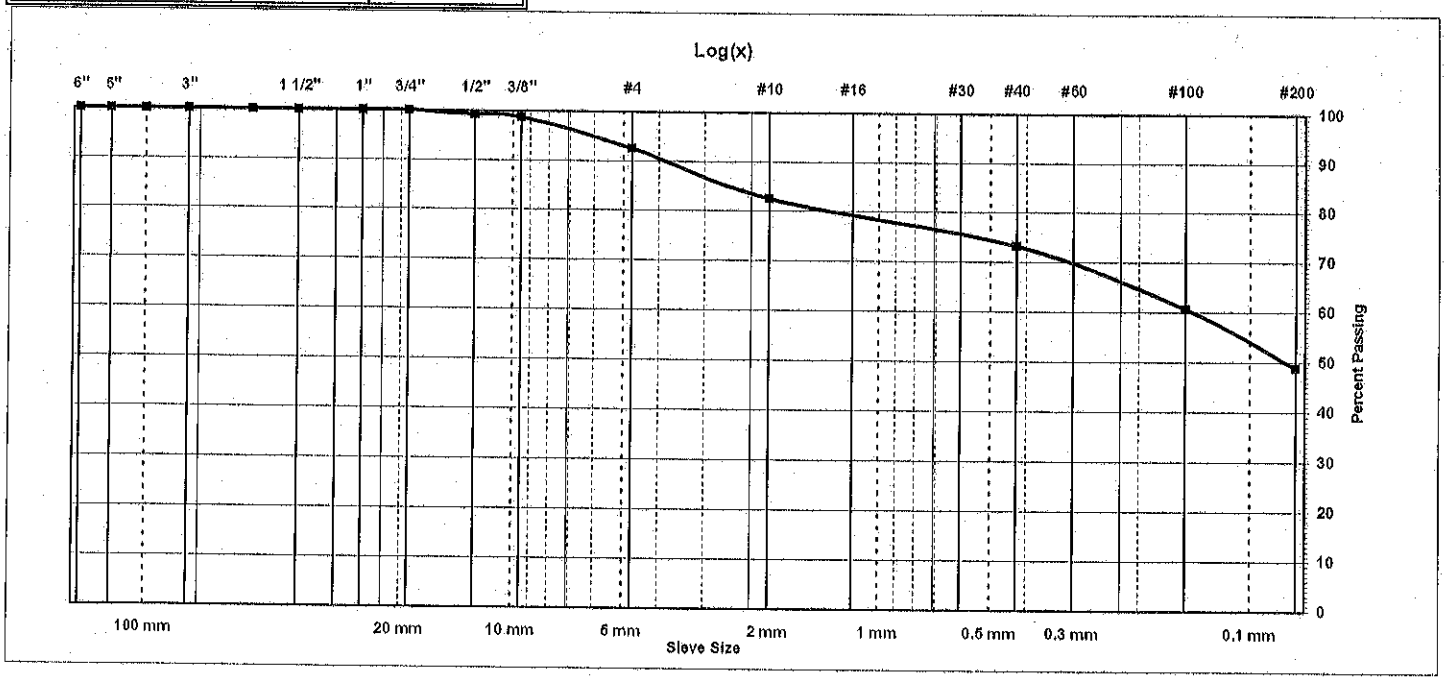
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	99	
4.75 mm	#4	92	
2.00 mm	#10	83	
425 µm	#40	73	
150 µm	#100	61	
75 µm	#200	48.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	95.4		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	7.5	43.7	48.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2149

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-4 @ 12' **Authorized By:** Client **Date:** 6/29/2007

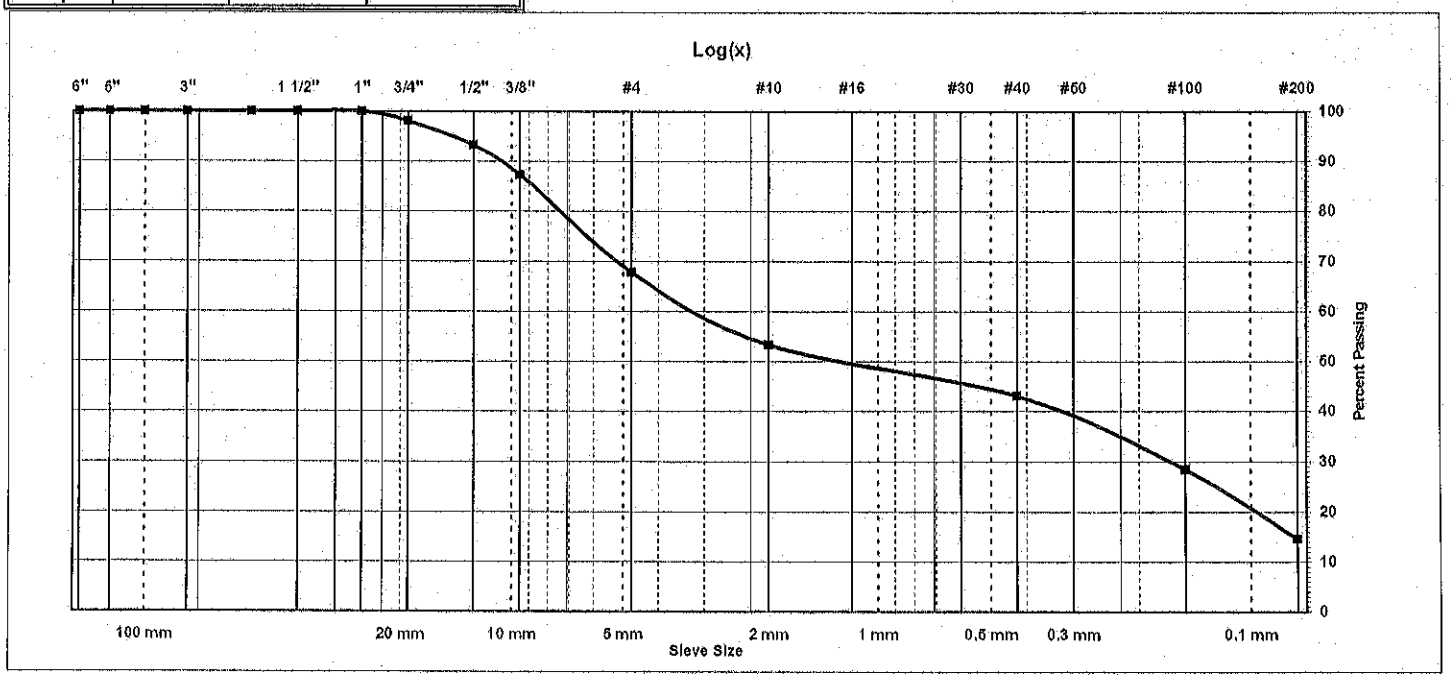
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	93	
9.5 mm	3/8"	87	
4.75 mm	#4	68	
2.00 mm	#10	53	
425 µm	#40	43	
150 µm	#100	29	
75 µm	#200	14.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	32.1	53.1	14.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2152

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-5 @ 7' **Authorized By:** Client **Date:** 6/29/2007

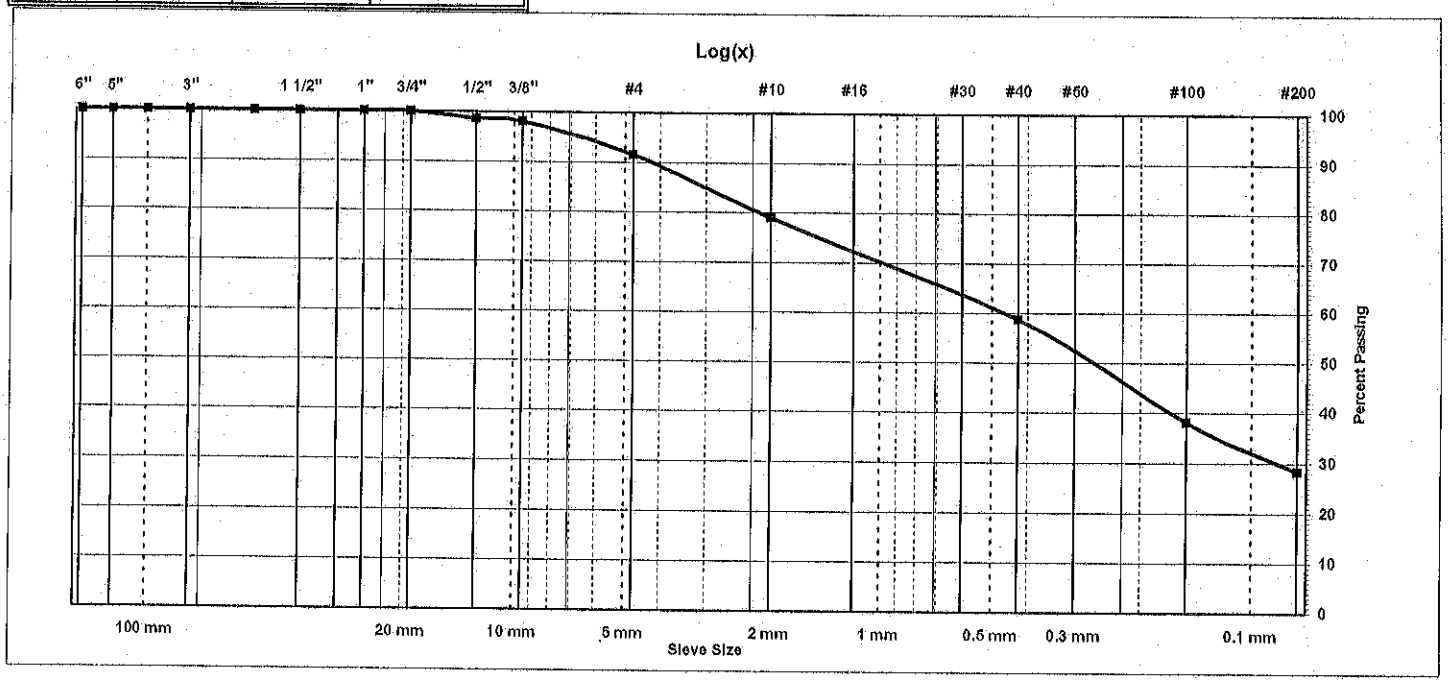
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	98	
4.75 mm	#4	92	
2.00 mm	#10	79	
425 µm	#40	59	
150 µm	#100	38	
75 µm	#200	28.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.5		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	105.2		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	8.5	63.2	28.4



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2202

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 7' **Authorized By:** Client **Date:** 6/29/2007

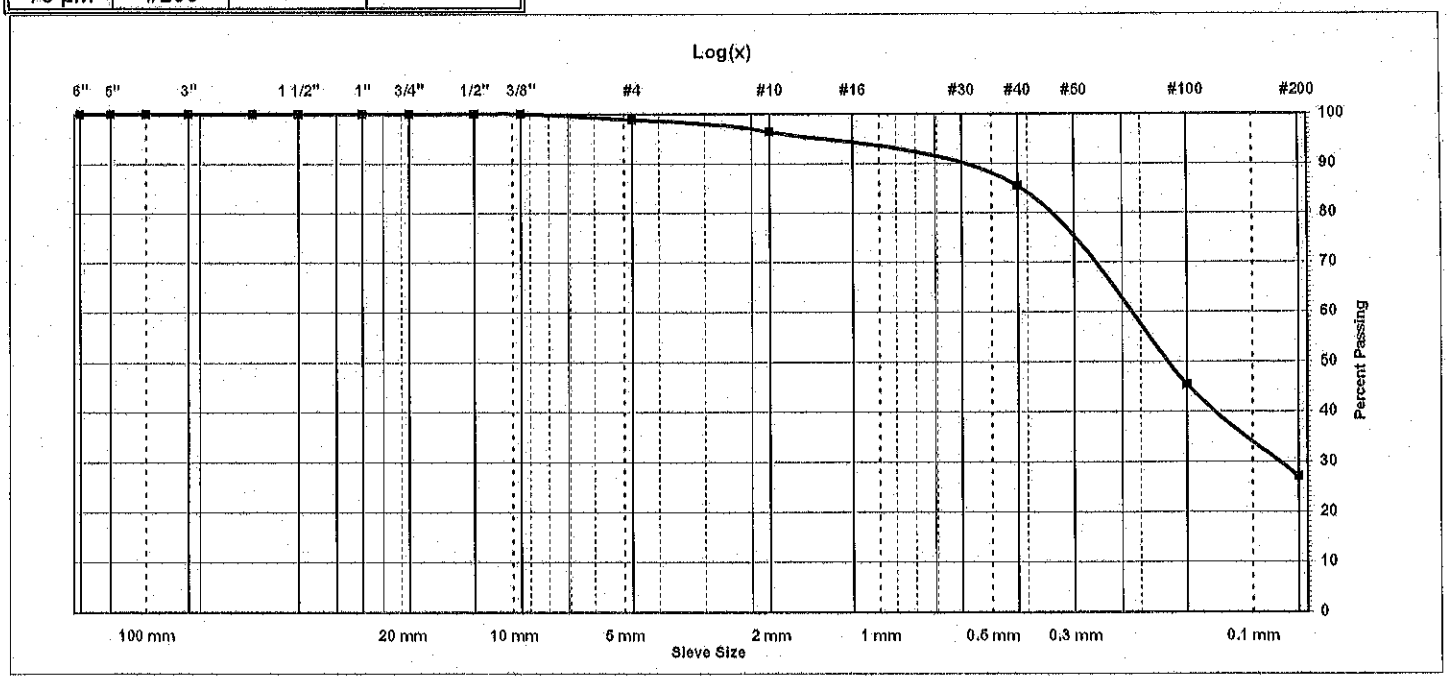
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	99	
2.00 mm	#10	96	
425 µm	#40	85	
150 µm	#100	45	
75 µm	#200	27.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	105.6		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	1.2	71.8	27.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2214

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silt / Clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-9 @ 2' **Authorized By:** Client **Date:** 6/29/2007

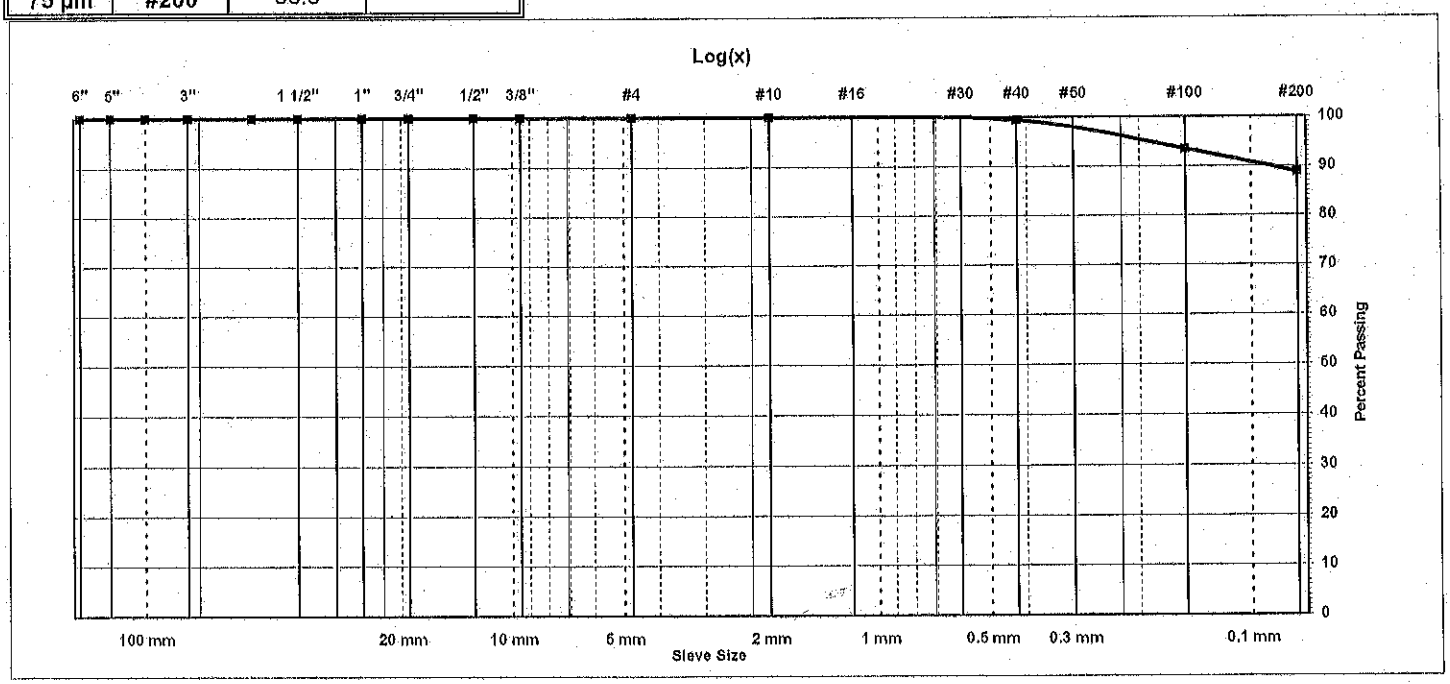
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10	100	
425 µm	#40	99	
150 µm	#100	93	
75 µm	#200	88.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	11.2	88.8



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2216

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / Clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-10 @ 2' **Authorized By:** Client **Date:** 6/29/2007

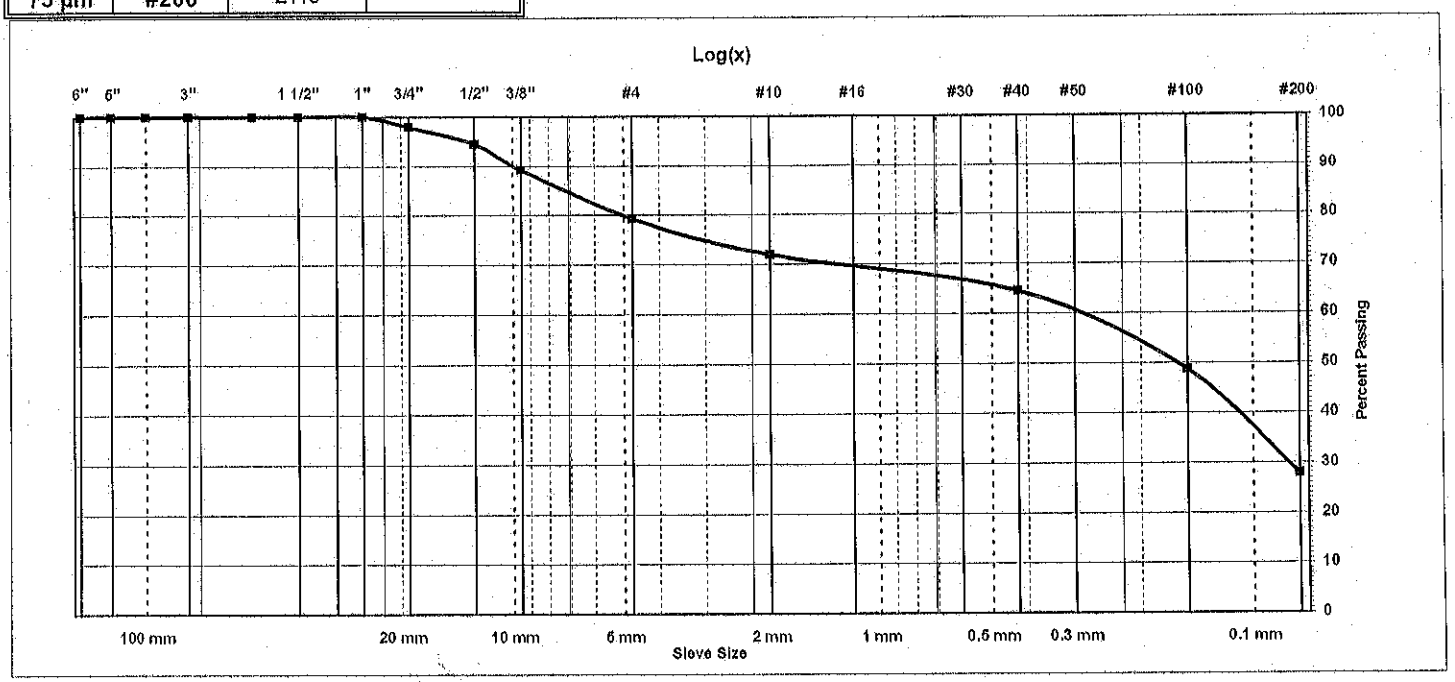
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	95	
9.5 mm	3/8"	89	
4.75 mm	#4	79	
2.00 mm	#10	72	
425 µm	#40	64	
150 µm	#100	49	
75 µm	#200	27.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	20.7	51.4	27.9



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2217

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-10 @ 5' **Authorized By:** Client **Date:** 6/29/2007

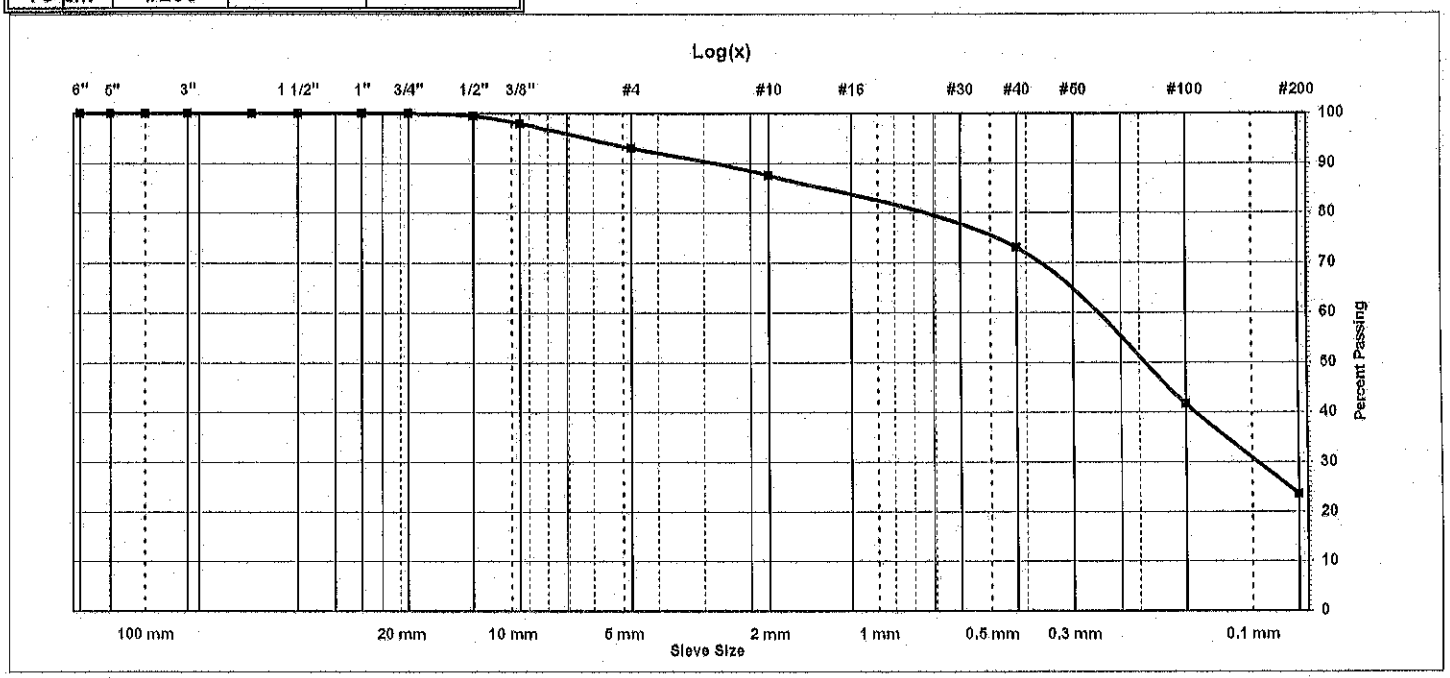
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	98	
4.75 mm	#4	93	
2.00 mm	#10	88	
425 µm	#40	73	
150 µm	#100	42	
75 µm	#200	23.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.2		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	114.5		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	6.9	69.5	23.6



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2260

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-1 @ 5' **Authorized By:** Client **Date:** 6/29/2007

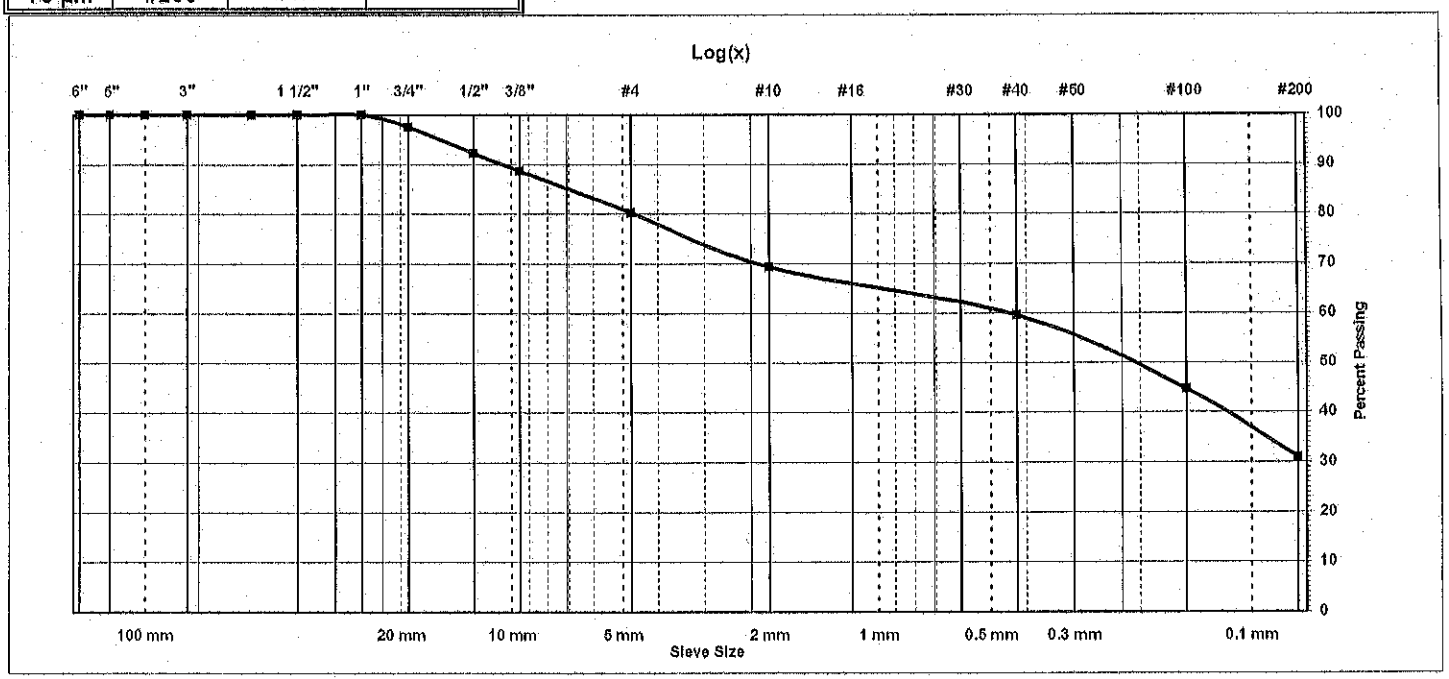
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	92	
9.5 mm	3/8"	89	
4.75 mm	#4	80	
2.00 mm	#10	69	
425 µm	#40	60	
150 µm	#100	45	
75 µm	#200	31.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	19.7	49.3	31.0



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2220

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-2 @ 5' **Authorized By:** Client **Date:** 6/29/2007

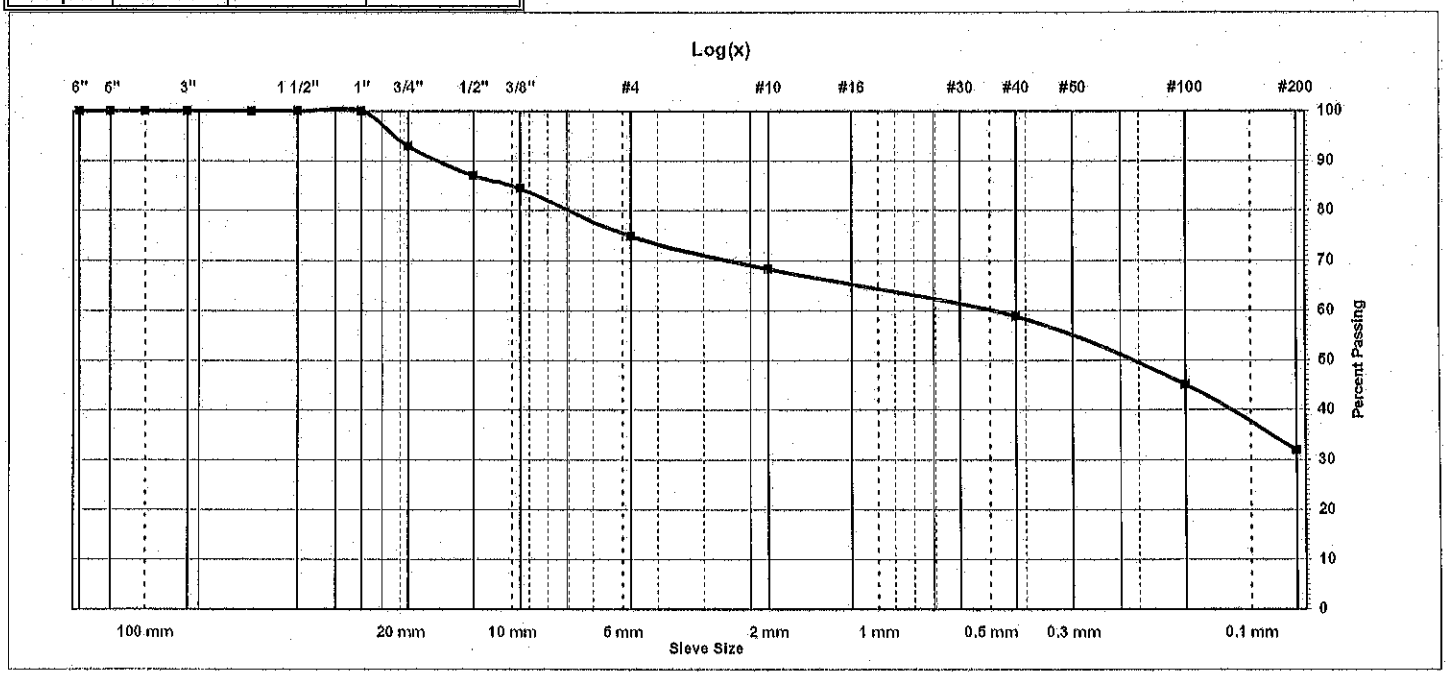
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	93	
12.5 mm	1/2"	87	
9.5 mm	3/8"	84	
4.75 mm	#4	75	
2.00 mm	#10	68	
425 µm	#40	59	
150 µm	#100	45	
75 µm	#200	31.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	37		D 4318
Plasticity Index	9		D 4318
Dry Unit Weight, pcf	57.0		C 29
Unified Classification System	SC		D 2487
AASHTO Classification System	A-2-4(0)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	25.1	43.0	31.9



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2221

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-2 at 10' **Authorized By:** Client **Date:** 6/29/2007

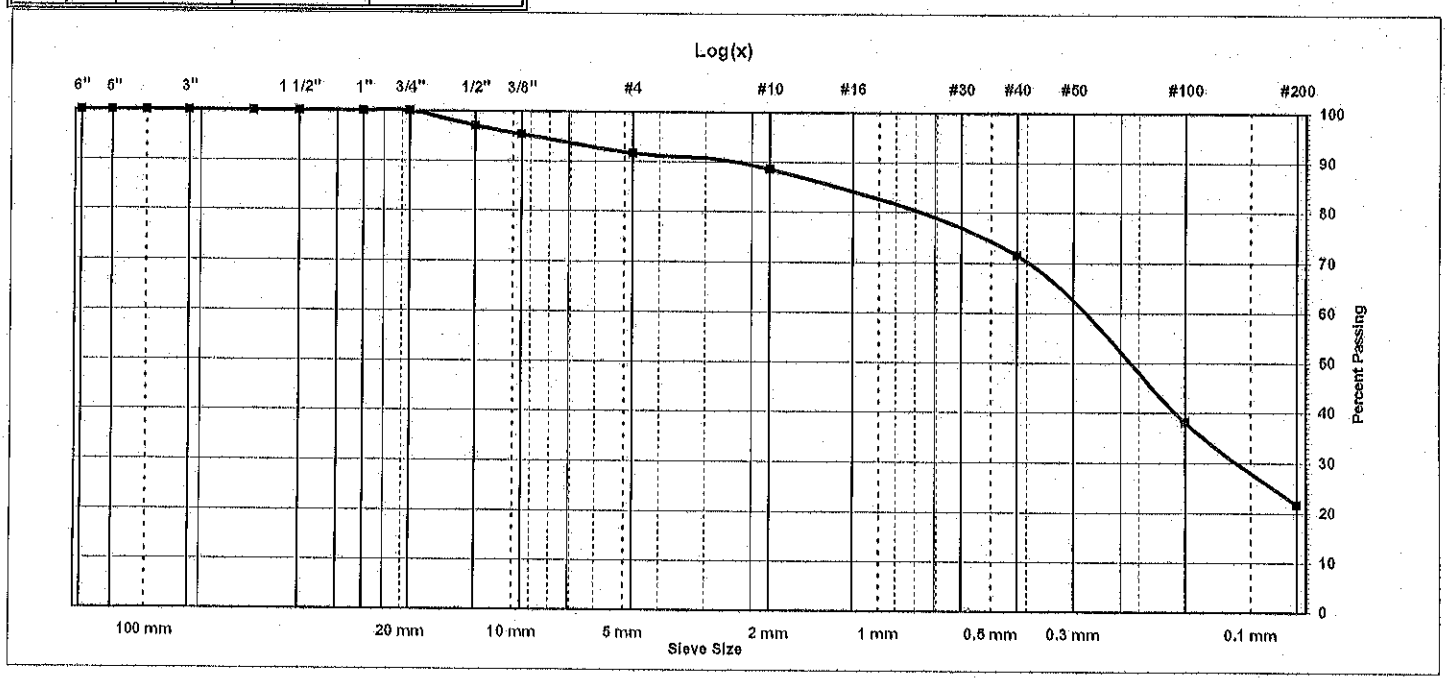
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	97	
9.5 mm	3/8"	95	
4.75 mm	#4	92	
2.00 mm	#10	89	
425 µm	#40	72	
150 µm	#100	38	
75 µm	#200	21.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.5		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	8.4	70.0	21.6



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2222

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / Clayey sand **Tested By:** T. Roberts **Date:** 7/2/2007
Location of Sample: A-2 at 15' **Authorized By:** Client **Date:** 6/29/2007

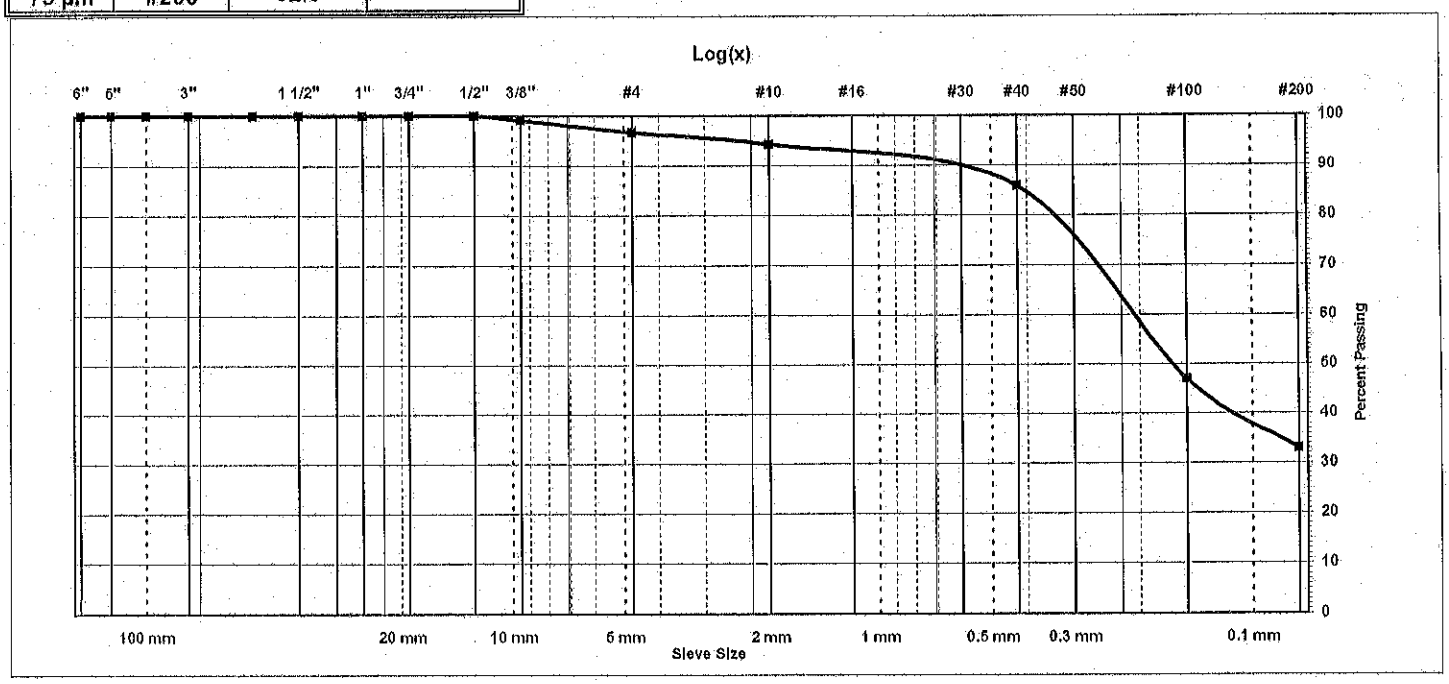
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"	100	
9.5 mm	3/8"	99	
4.75 mm	#4	97	
2.00 mm	#10	94	
425 µm	#40	86	
150 µm	#100	47	
75 µm	#200	32.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	3.3	63.7	32.9



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2223

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-3 @ 15' **Authorized By:** Client **Date:** 6/29/2007

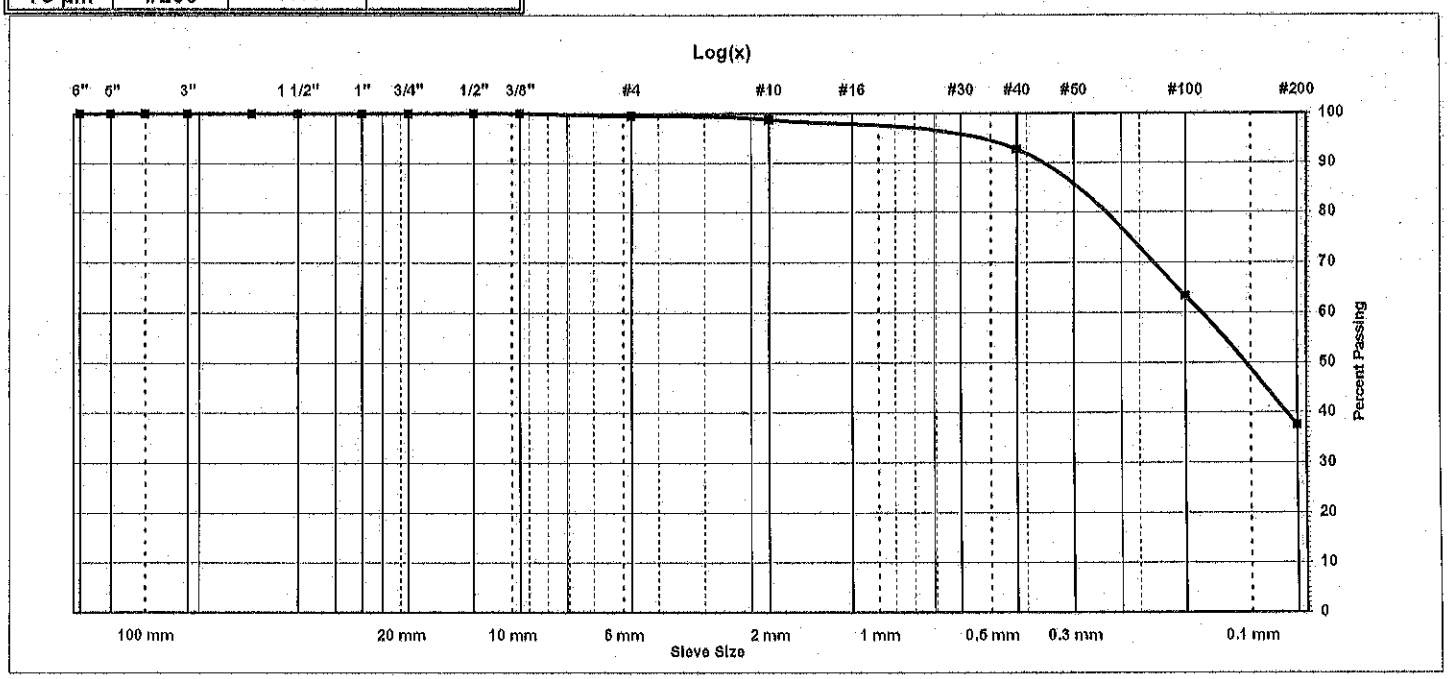
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4	100	
2.00 mm	#10	99	
425 µm	#40	93	
150 µm	#100	63	
75 µm	#200	37.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	33		D 4318
Plasticity Index	11		D 4318
Dry Unit Weight, pcf	55.8		C 29
Unified Classification System	SC		D 2487
AASHTO Classification System	A-6(1)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.5	62.1	37.4



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2225

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Poorly-graded gravel with silt and sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-4 at 5' **Authorized By:** Client **Date:** 6/29/2007

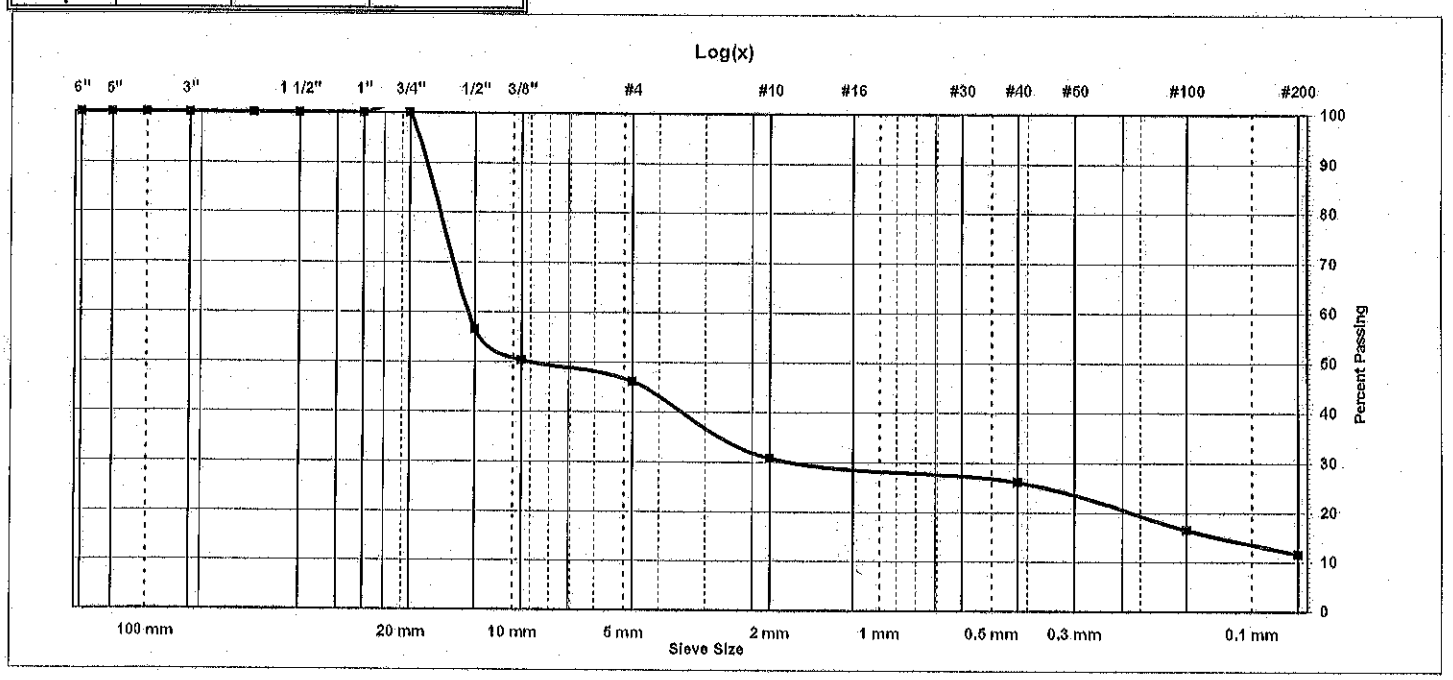
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	56	
9.5 mm	3/8"	50	
4.75 mm	#4	46	
2.00 mm	#10	31	
425 µm	#40	26	
150 µm	#100	16	
75 µm	#200	11.5	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	12.2		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	54.0	34.5	11.5



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2233

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-6 at 2' **Authorized By:** Client **Date:** 6/29/2007

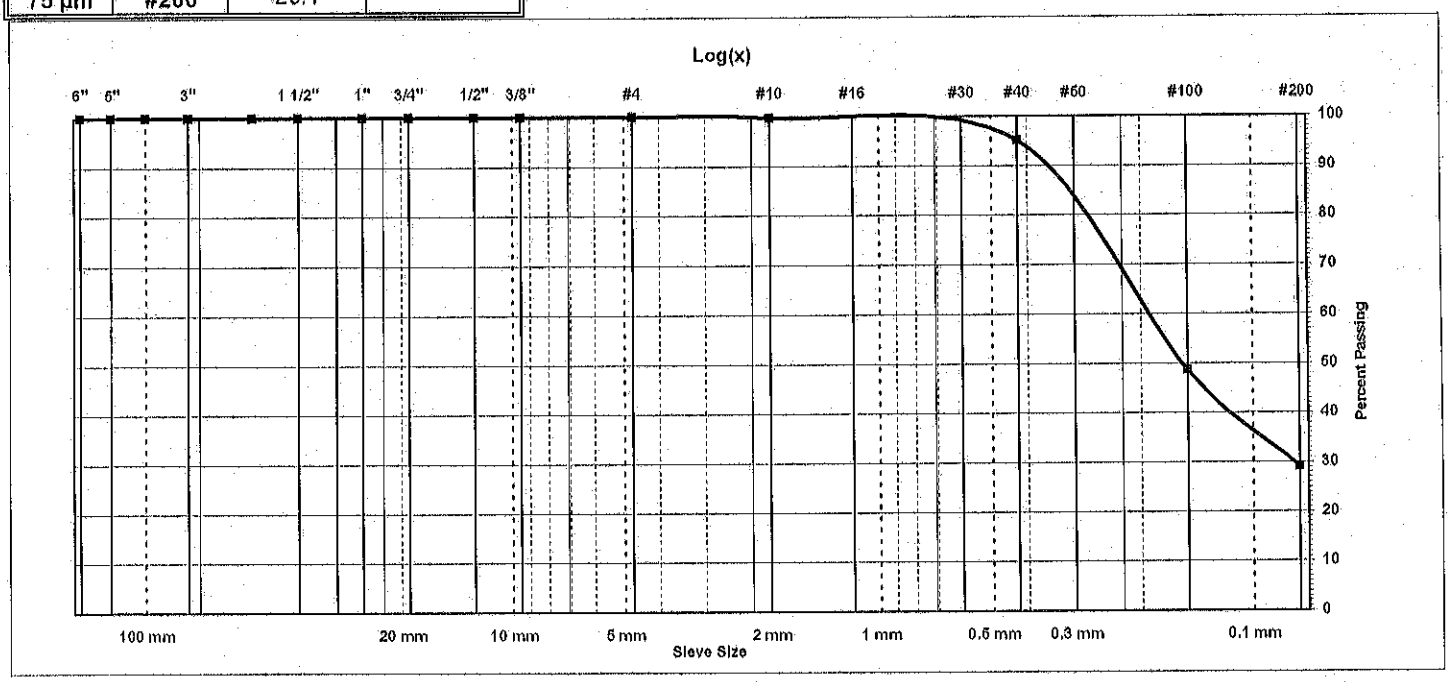
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10	100	
425 µm	#40	95	
150 µm	#100	49	
75 µm	#200	29.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	70.9	29.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2236

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-7 @ 2' **Authorized By:** Client **Date:** 6/29/2007

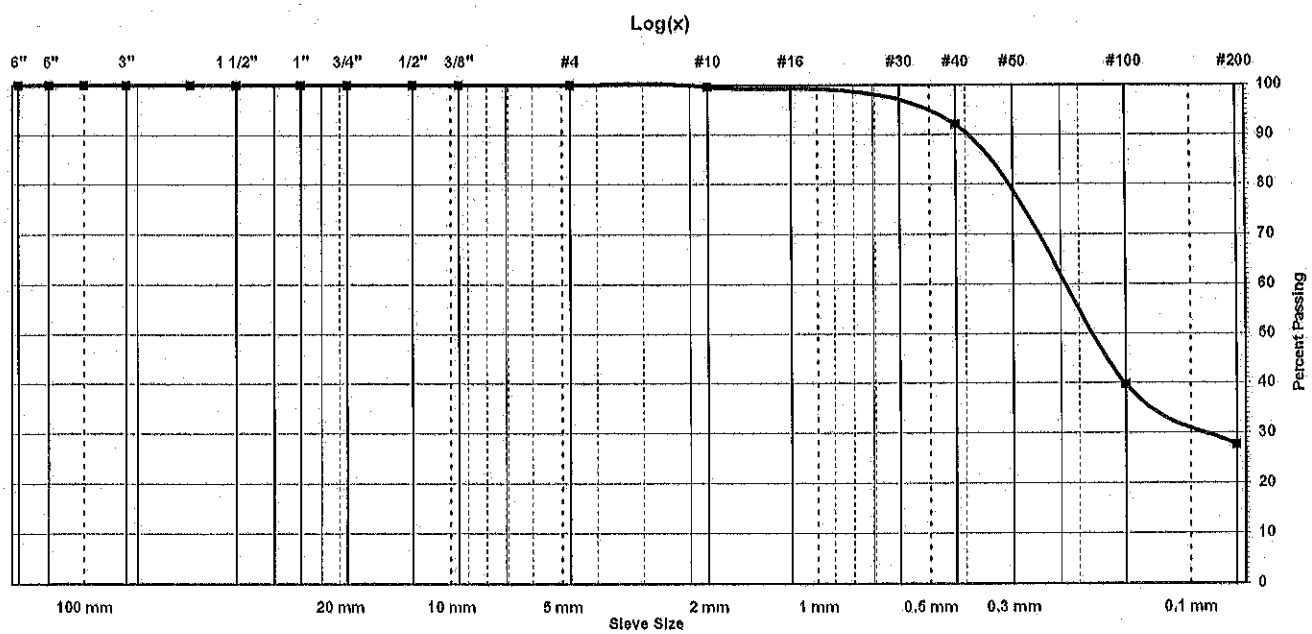
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4	100	
2.00 mm	#10	100	
425 µm	#40	92	
150 µm	#100	40	
75 µm	#200	27.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	120.7		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.1	72.3	27.6



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2238

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Sandy silt / clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-8 @ 2' **Authorized By:** Client **Date:** 6/29/2007

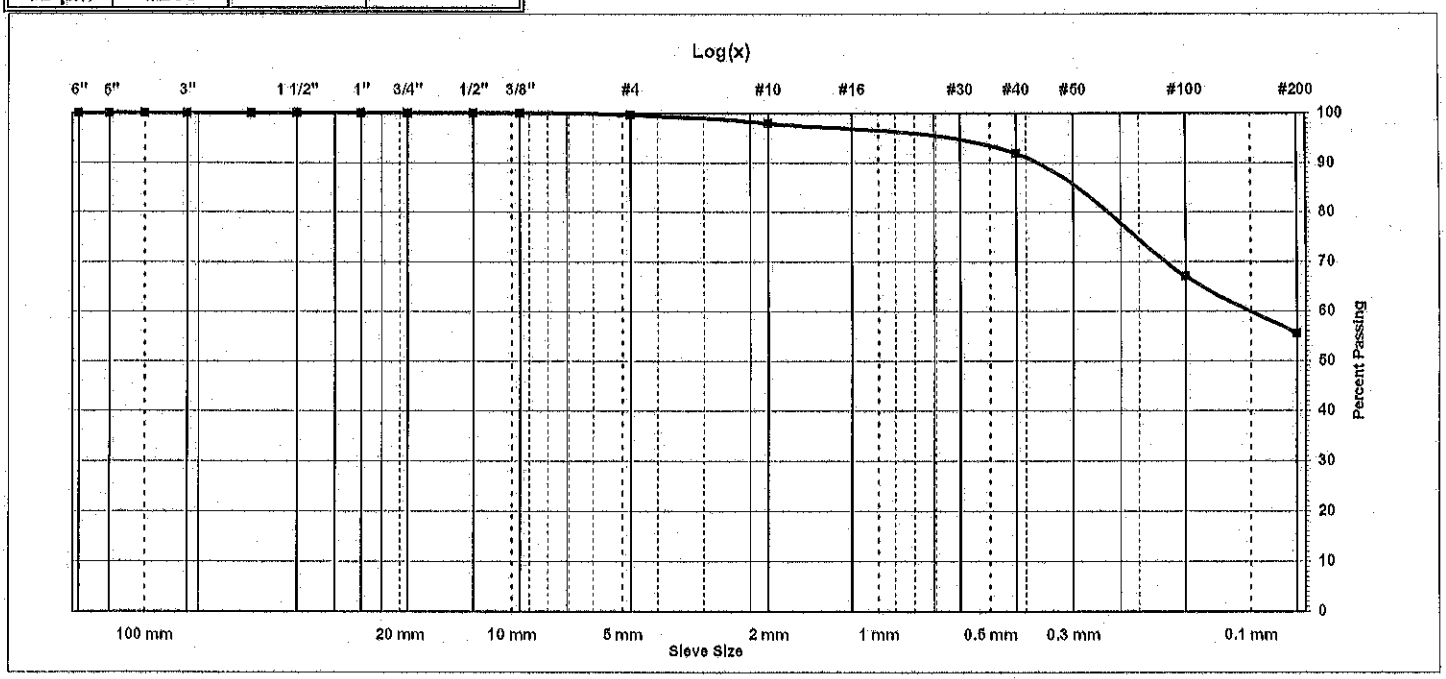
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4	100	
2.00 mm	#10	98	
425 µm	#40	92	
150 µm	#100	67	
75 µm	#200	55.5	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	116.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.4	44.1	55.5



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2239

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / Clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-8 at 10' **Authorized By:** Client **Date:** 6/29/2007

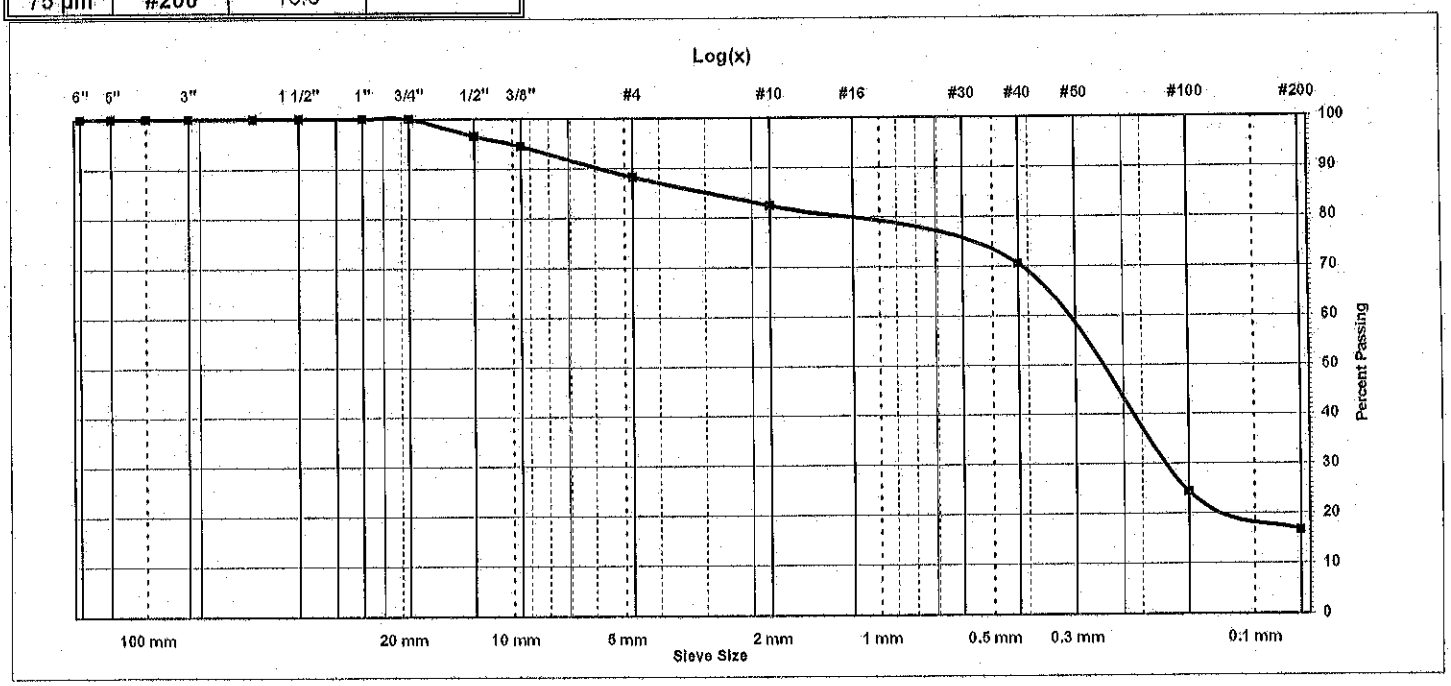
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	96	
9.5 mm	3/8"	94	
4.75 mm	#4	88	
2.00 mm	#10	82	
425 µm	#40	70	
150 µm	#100	24	
75 µm	#200	16.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	11.8	71.5	16.6



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2262

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-2 @ 5' **Authorized By:** Client **Date:** 6/29/2007

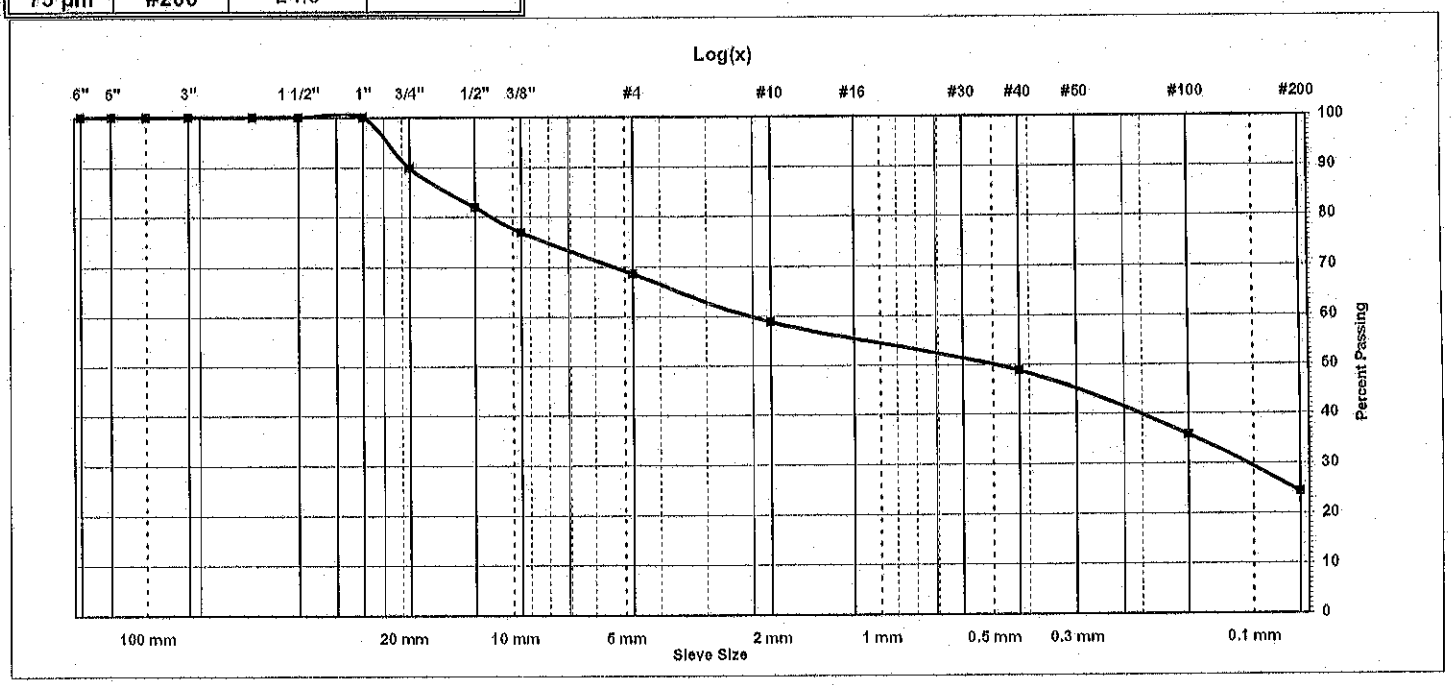
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	90	
12.5 mm	1/2"	82	
9.5 mm	3/8"	77	
4.75 mm	#4	69	
2.00 mm	#10	59	
425 µm	#40	49	
150 µm	#100	36	
75 µm	#200	24.3	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.6		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	107.6		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	31.4	44.3	24.3



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2264

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Sandy silt / clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-2 @ 15' **Authorized By:** Client **Date:** 6/29/2007

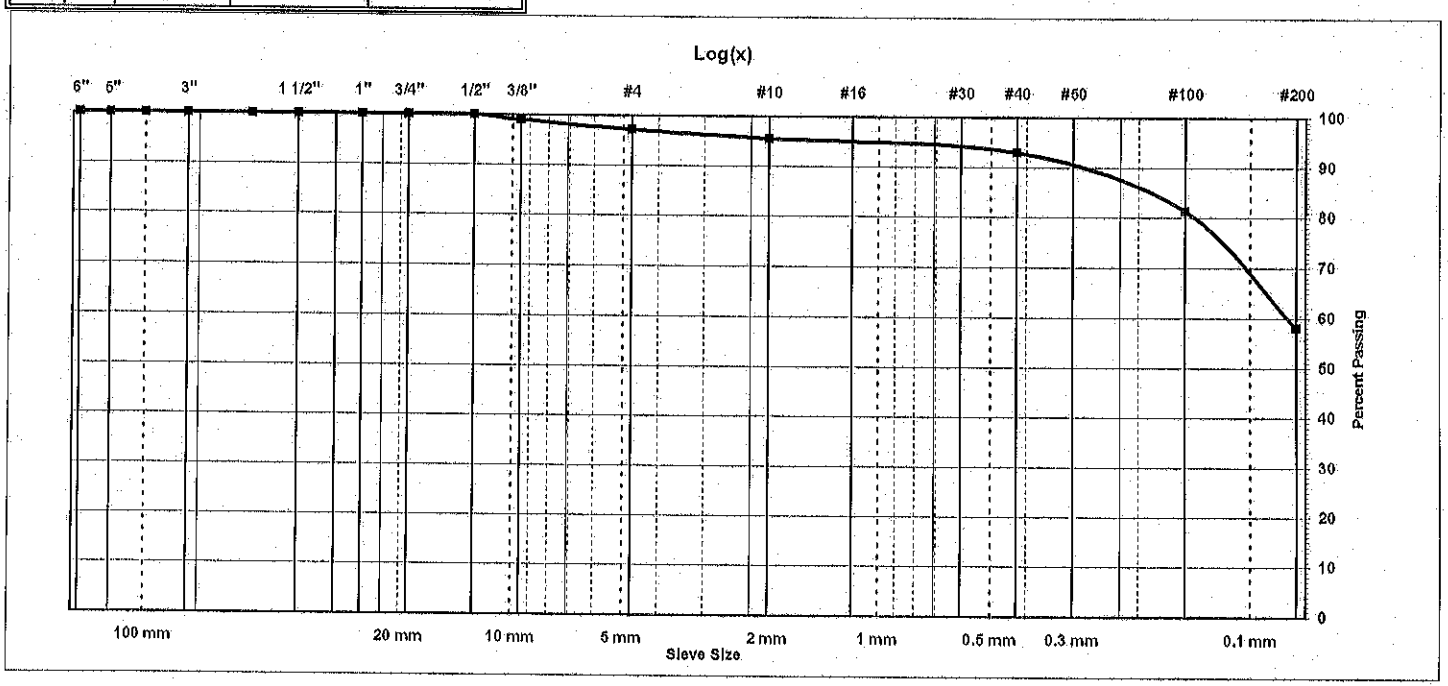
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"	100	
9.5 mm	3/8"	99	
4.75 mm	#4	97	
2.00 mm	#10	96	
425 µm	#40	93	
150 µm	#100	81	
75 µm	#200	58.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	2.9	39.2	58.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2265

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: LS-3 @ 10'
Authorized By: Client **Date:** 6/29/2007

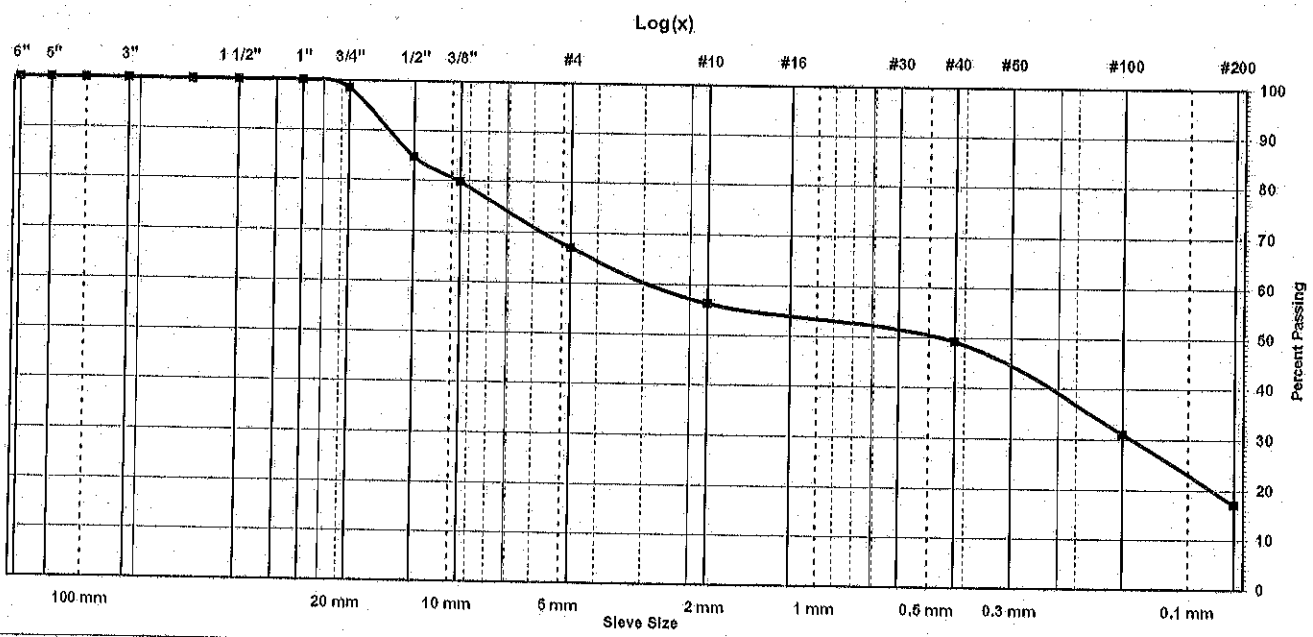
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	85	
9.5 mm	3/8"	80	
4.75 mm	#4	67	
2.00 mm	#10	56	
425 µm	#40	49	
150 µm	#100	31	
75 µm	#200	17.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	33.0	50.0	17.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2266

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-3 @ 15' **Authorized By:** Client **Date:** 6/29/2007

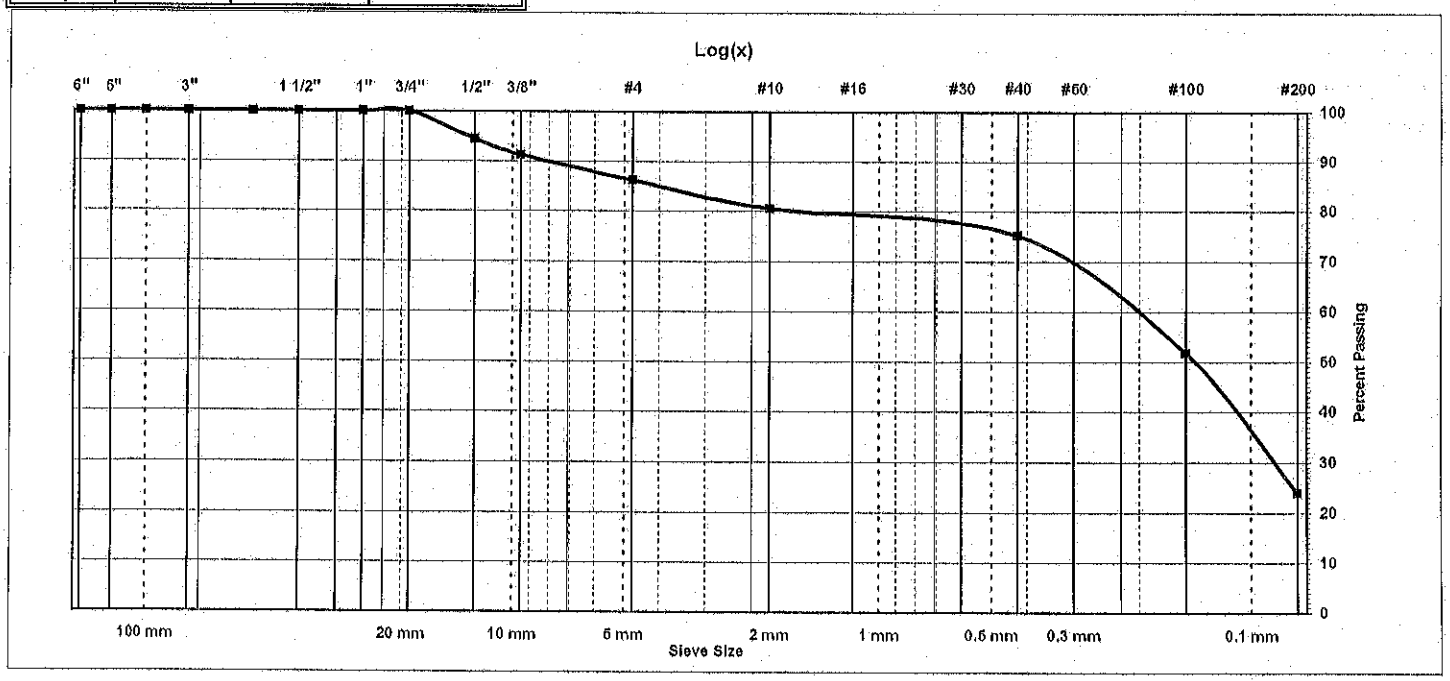
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	94	
9.5 mm	3/8"	91	
4.75 mm	#4	86	
2.00 mm	#10	81	
425 µm	#40	75	
150 µm	#100	52	
75 µm	#200	23.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	13.8	62.3	23.9



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2267

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-4 @ 5' **Authorized By:** Client **Date:** 6/29/2007

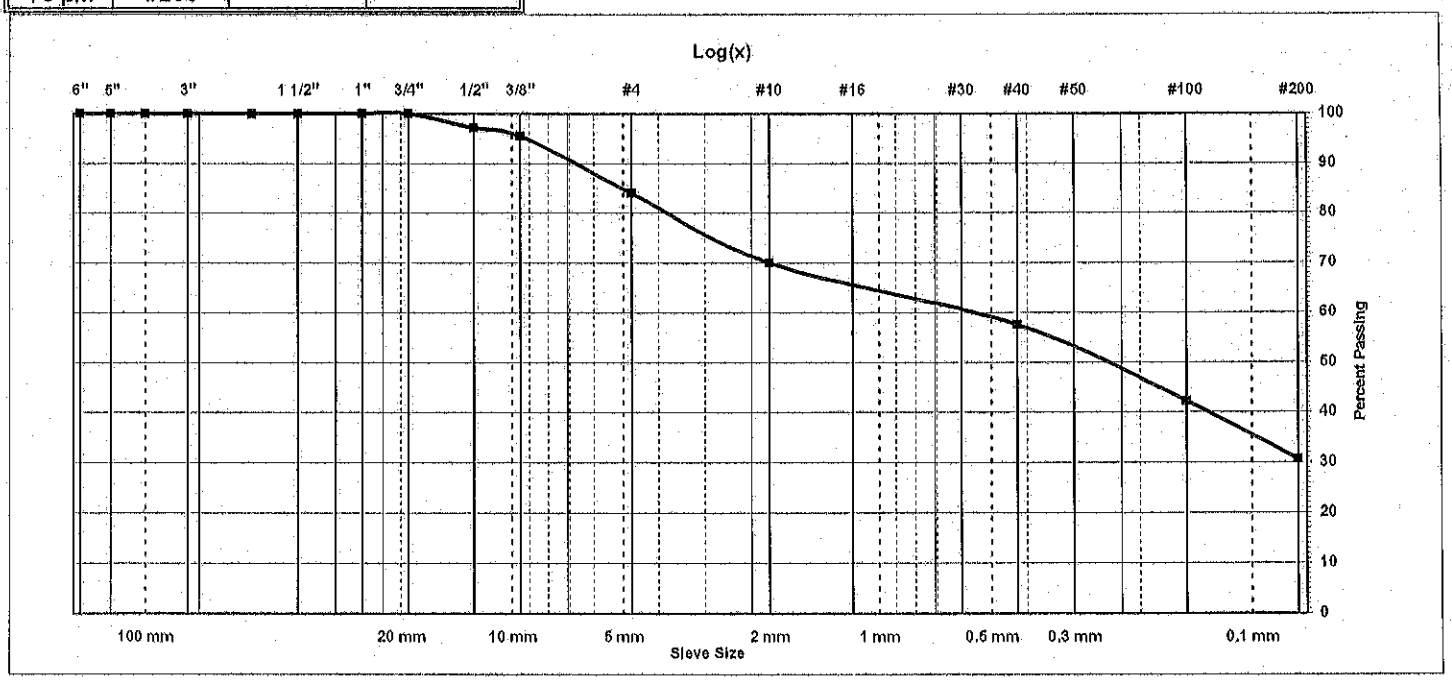
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	97	
9.5 mm	3/8"	95	
4.75 mm	#4	84	
2.00 mm	#10	70	
425 µm	#40	58	
150 µm	#100	42	
75 µm	#200	30.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	9.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	15.9	53.4	30.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2268

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Sandy silt / clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-4 @ 10' **Authorized By:** Client **Date:** 6/29/2007

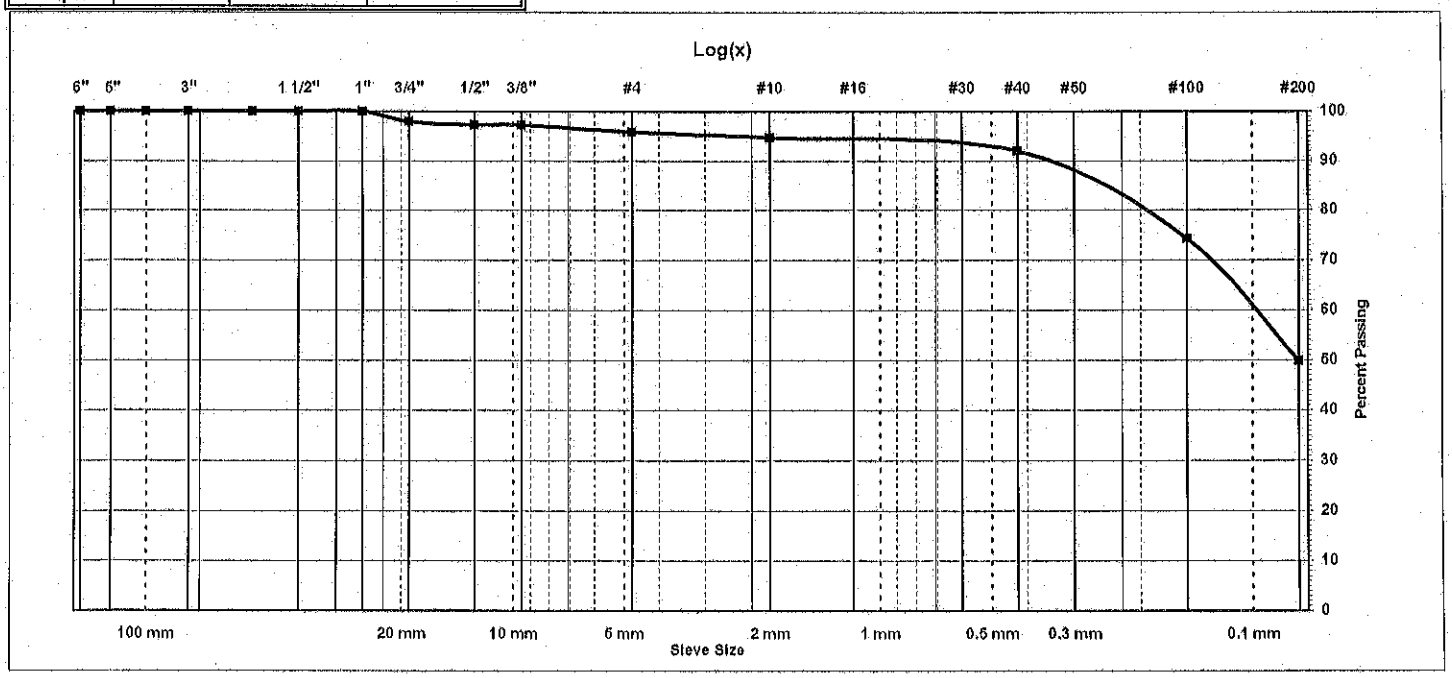
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	98	
12.5 mm	1/2"	97	
9.5 mm	3/8"	97	
4.75 mm	#4	96	
2.00 mm	#10	95	
425 µm	#40	92	
150 µm	#100	74	
75 µm	#200	49.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	9.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	102.8		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	4.1	46.1	49.8



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2269

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-5 @ 5' **Authorized By:** Client **Date:** 6/29/2007

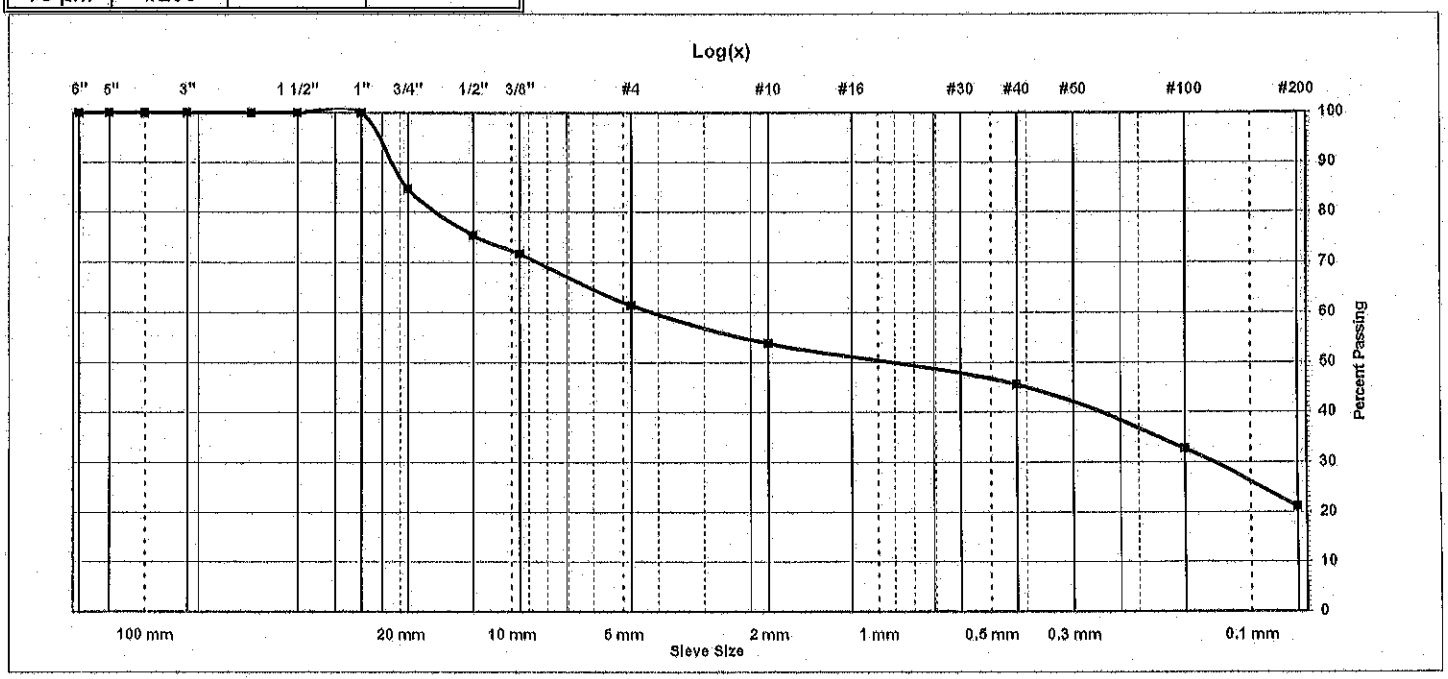
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	85	
12.5 mm	1/2"	75	
9.5 mm	3/8"	72	
4.75 mm	#4	61	
2.00 mm	#10	54	
425 µm	#40	46	
150 µm	#100	33	
75 µm	#200	21.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	15.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	83.0		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	38.6	40.4	21.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2272

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: LS-6 @ 5'
Authorized By: Client **Date:** 6/29/2007

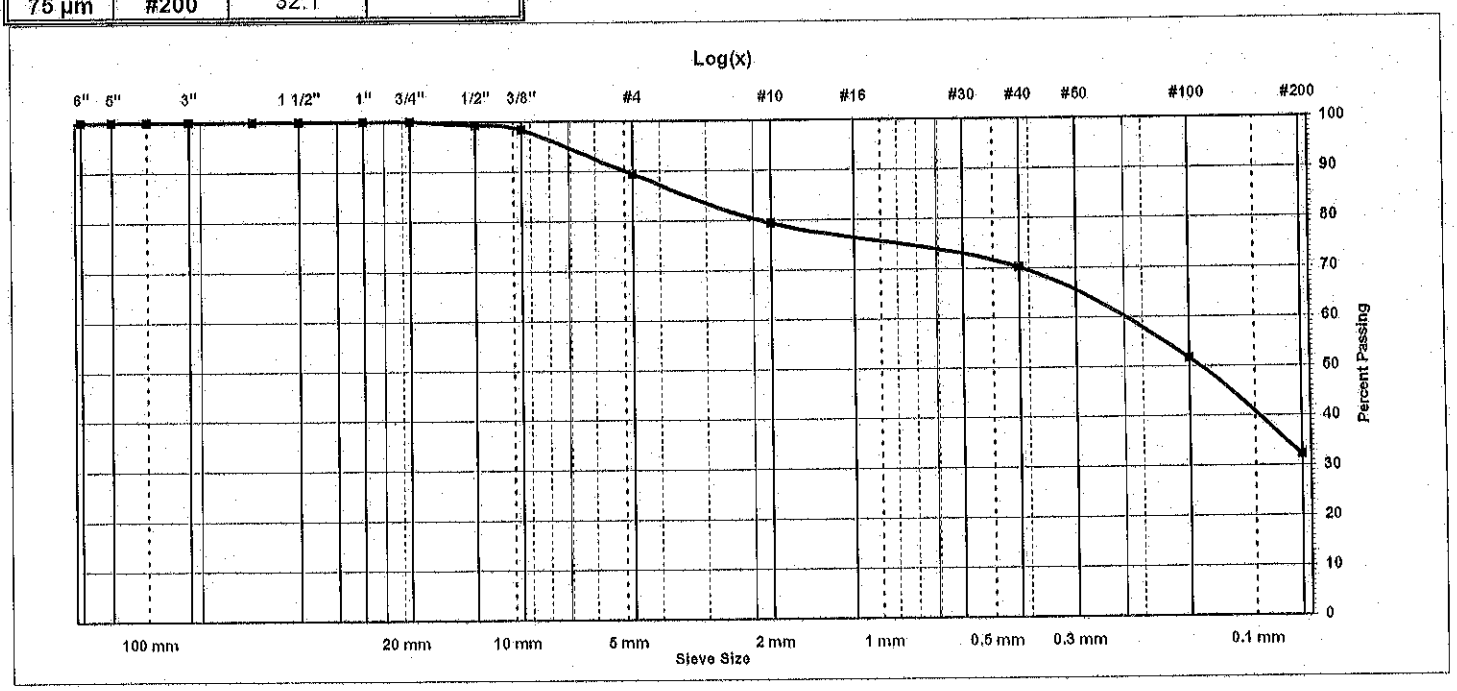
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	98	
4.75 mm	#4	89	
2.00 mm	#10	79	
425 µm	#40	70	
150 µm	#100	52	
75 µm	#200	32.1	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	98.3		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	10.7	57.2	32.1



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2276

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-7 @ 2' **Authorized By:** Client **Date:** 6/29/2007

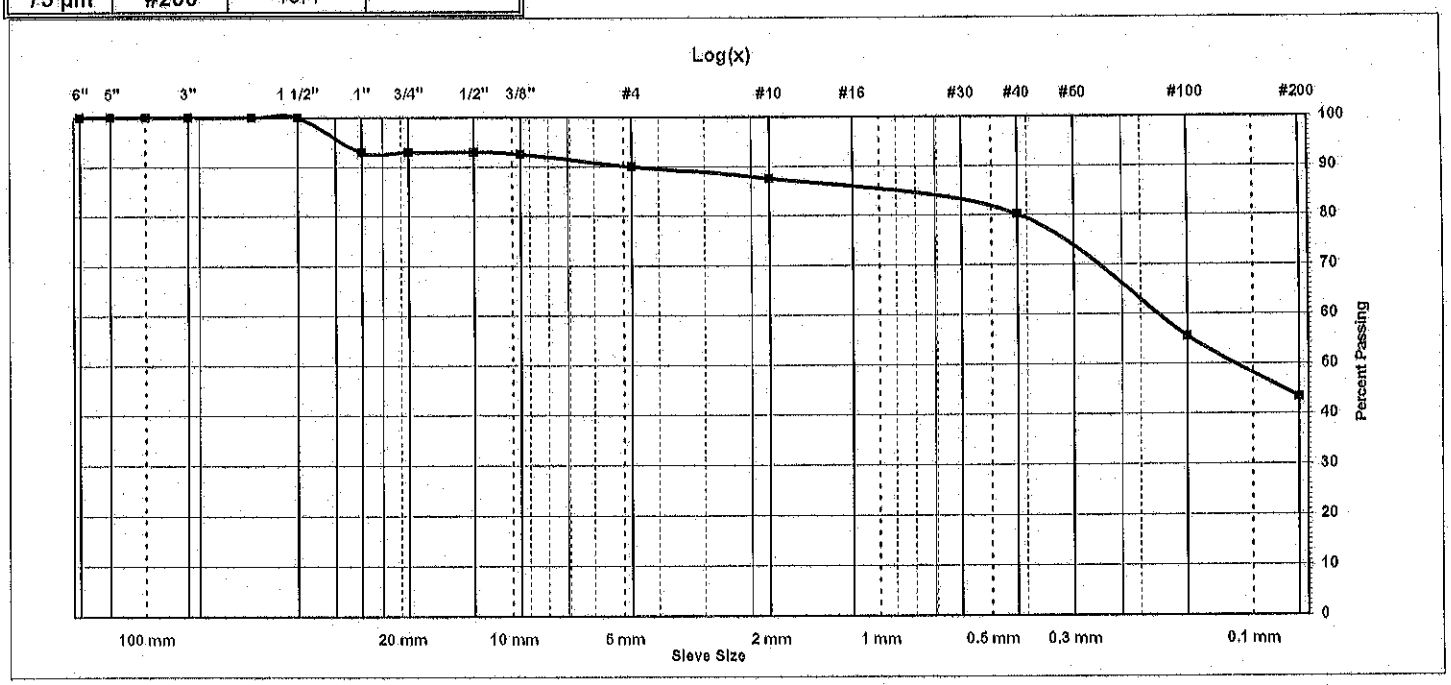
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"	100	
25 mm	1"	93	
19 mm	3/4"	93	
12.5 mm	1/2"	93	
9.5 mm	3/8"	92	
4.75 mm	#4	90	
2.00 mm	#10	87	
425 µm	#40	80	
150 µm	#100	55	
75 µm	#200	43.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	97.8		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	10.0	46.6	43.4



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2278

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-8 @ 2' **Authorized By:** Client **Date:** 6/29/2007

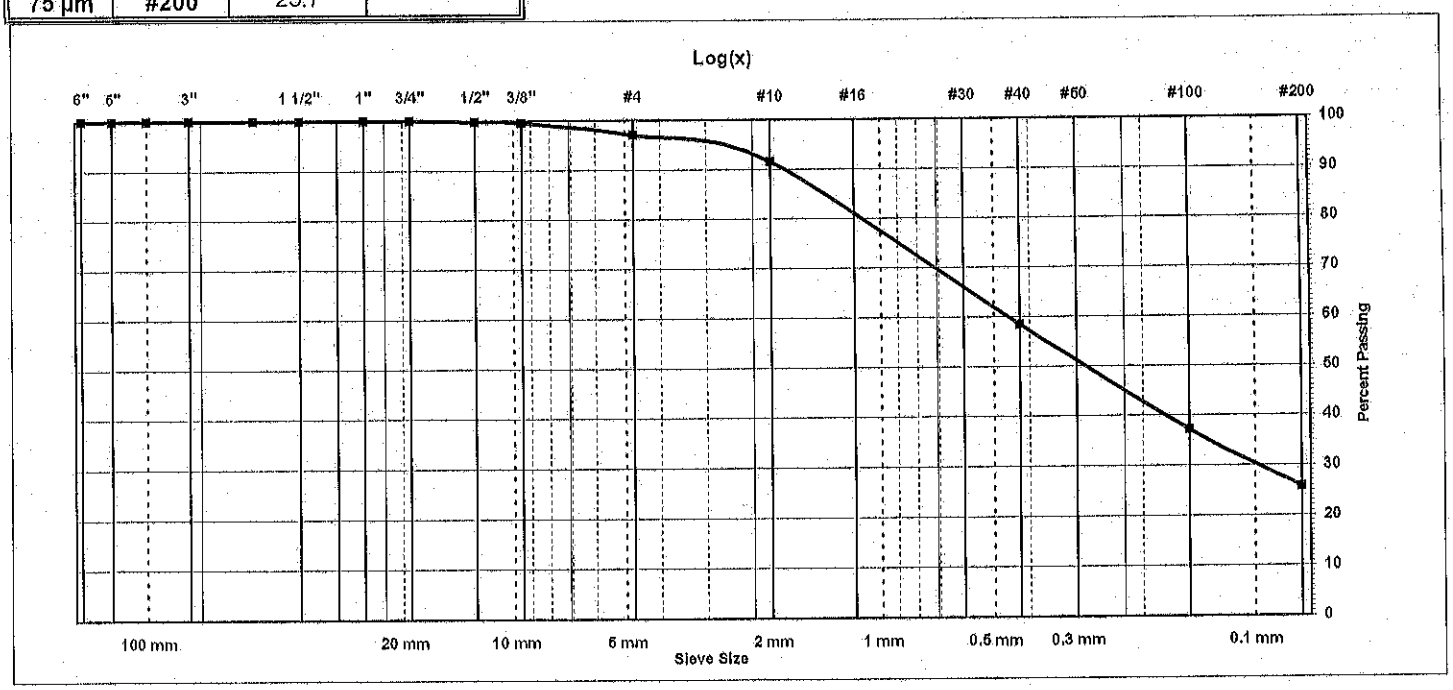
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"	100	
9.5 mm	3/8"	100	
4.75 mm	#4	97	
2.00 mm	#10	92	
425 µm	#40	58	
150 µm	#100	37	
75 µm	#200	25.7	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	2.9	71.4	25.7



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2280

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Clayey sand
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: LS-9 @ 7'
Authorized By: Client **Date:** 6/29/2007

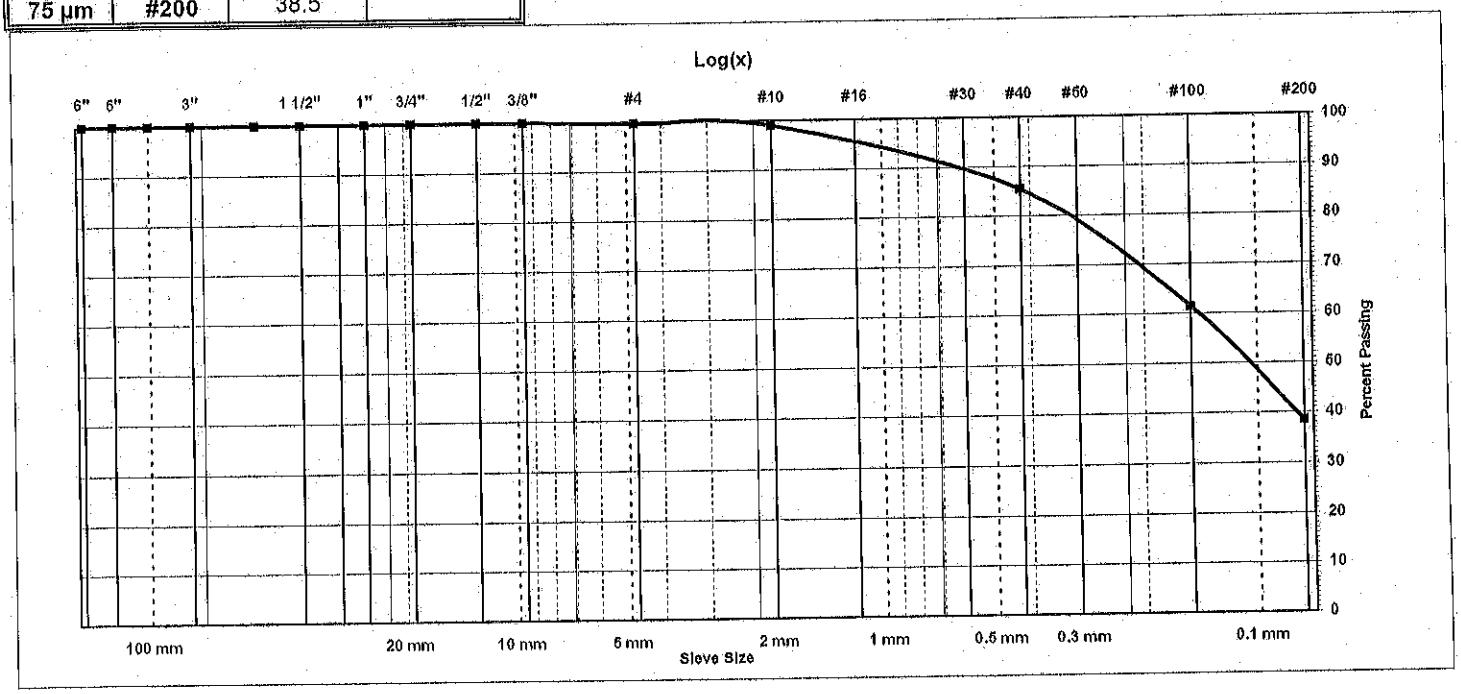
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4	100	
2.00 mm	#10	99	
425 µm	#40	85	
150 µm	#100	61	
75 µm	#200	38.5	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.7		D2216
Liquid Limit	39		D 4318
Plasticity Index	21		D 4318
Unified Classification System	SC		D 2487
AASHTO Classification System	A-6(3)		AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.4	61.1	38.5



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2049

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-3 @ 12' **Authorized By:** Client **Date:** 6/29/2007

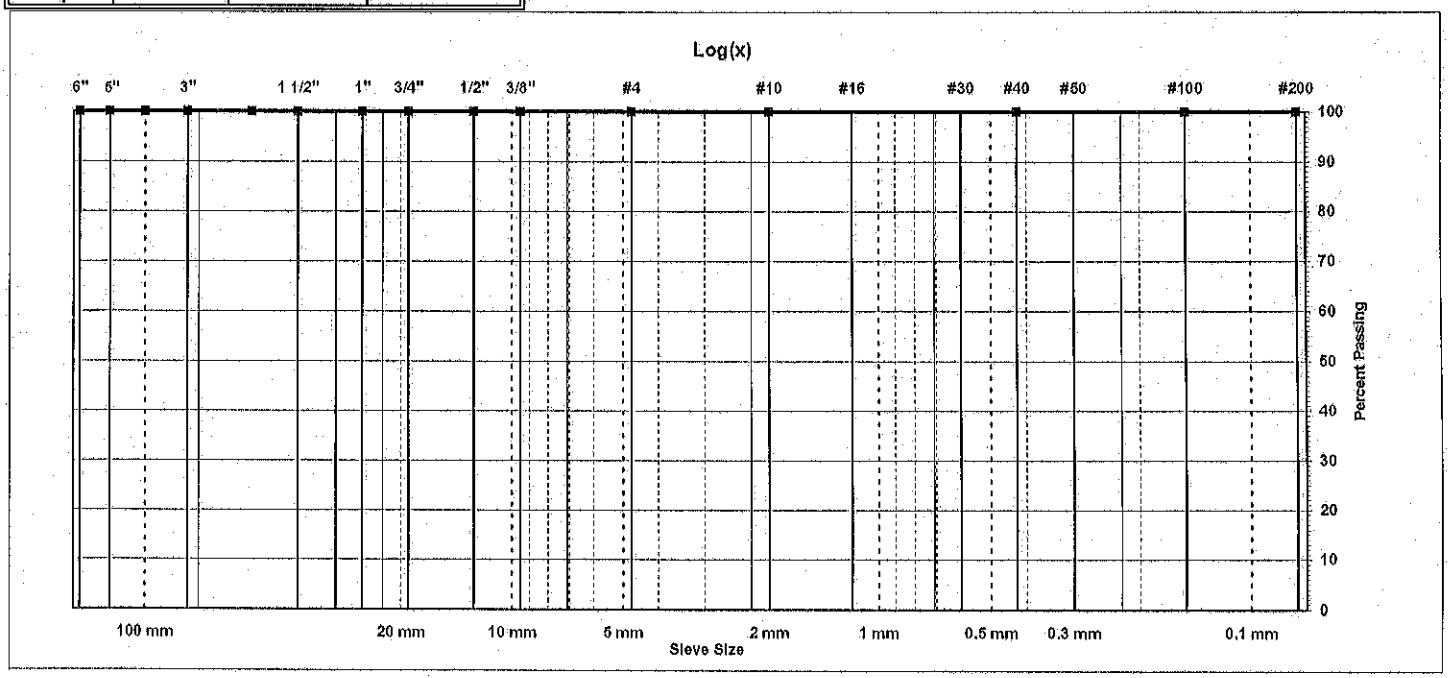
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	53		D 4318
Plasticity Index	25		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2051

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-3 @ 22' **Authorized By:** Client **Date:** 6/29/2007

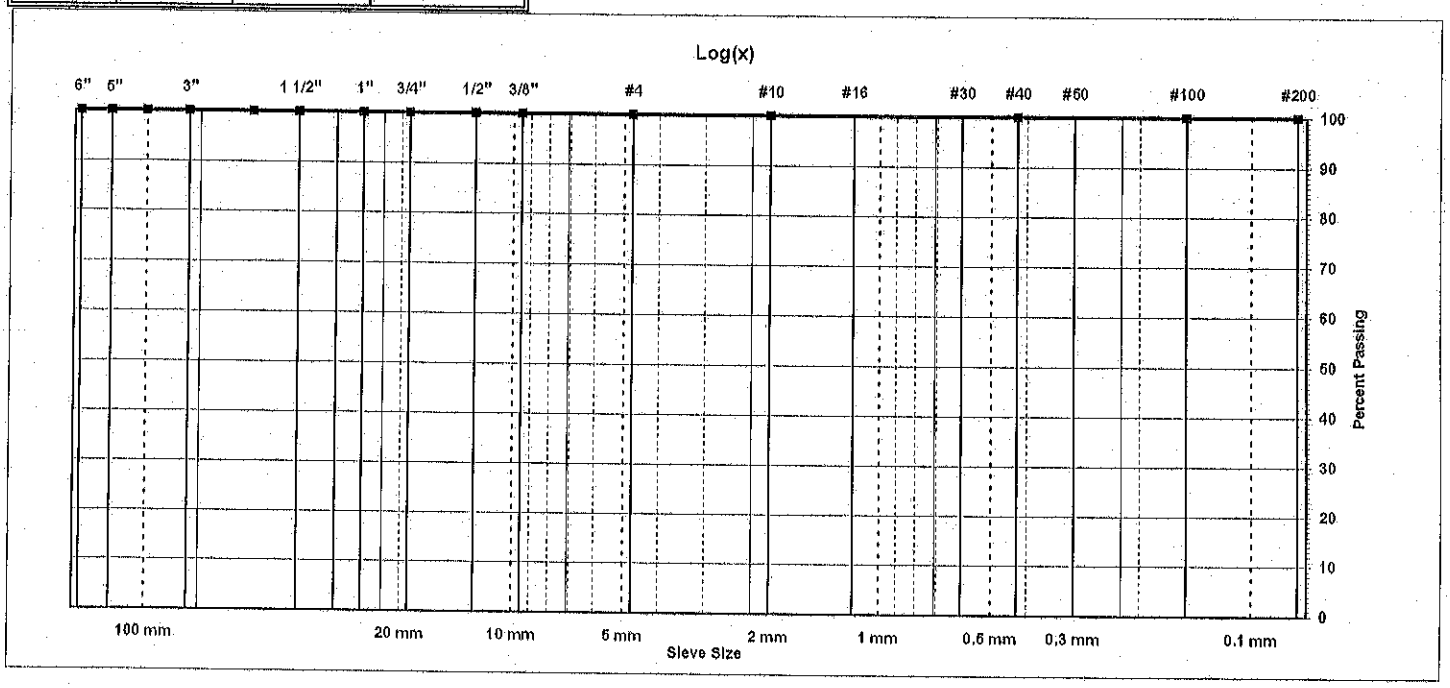
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	38		D 4318
Plasticity Index	16		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2294

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean Clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @32' **Authorized By:** Client **Date:** 6/29/2007

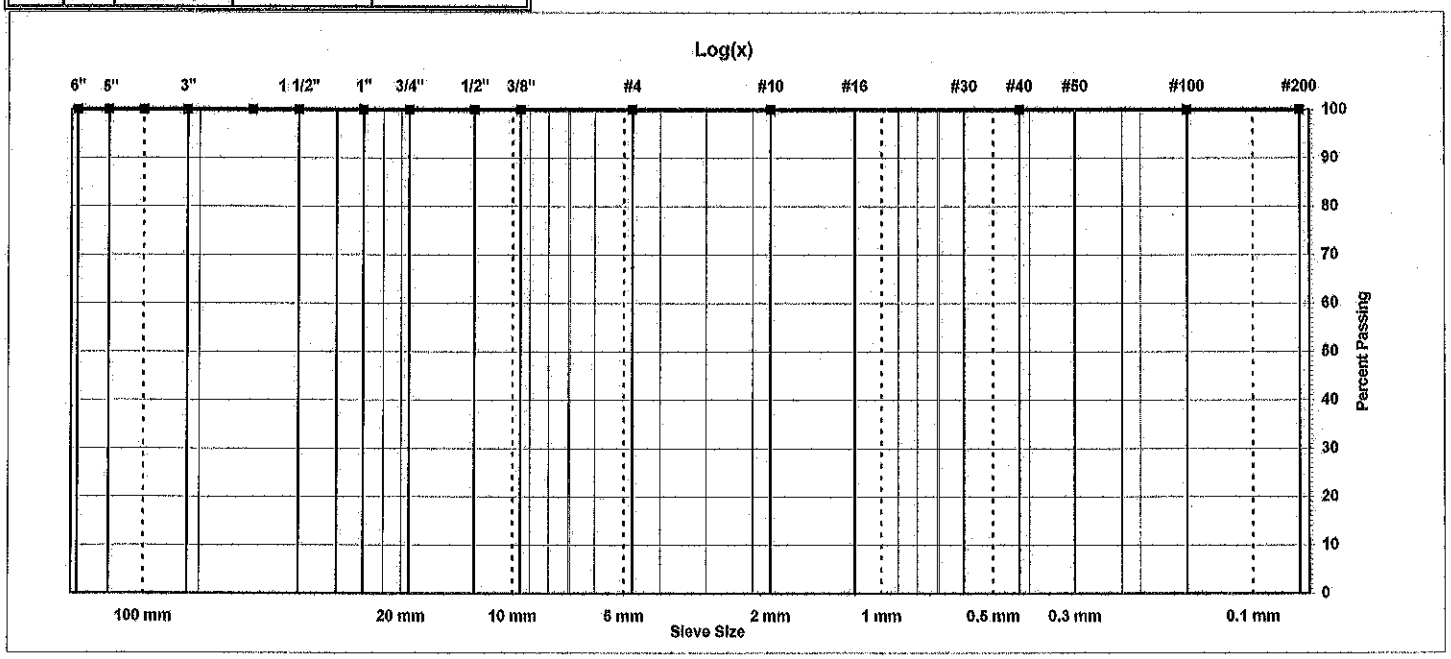
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	46		D 4318
Plasticity Index	22		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

LL 38
PL 20
PI 18

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2054

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-5 @ 22' **Authorized By:** Client **Date:** 6/29/2007

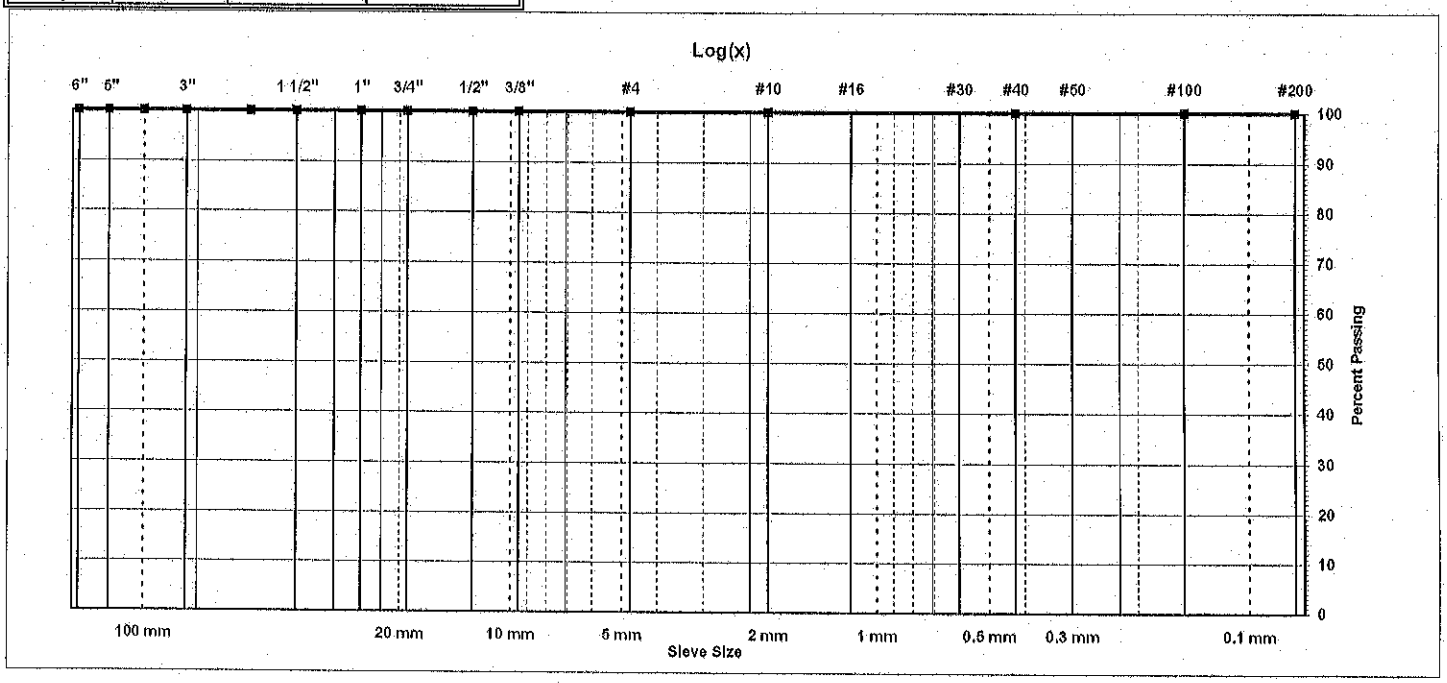
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	38		D 4318
Plasticity Index	18		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2060

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-6 @ 12' **Authorized By:** Client **Date:** 6/29/2007

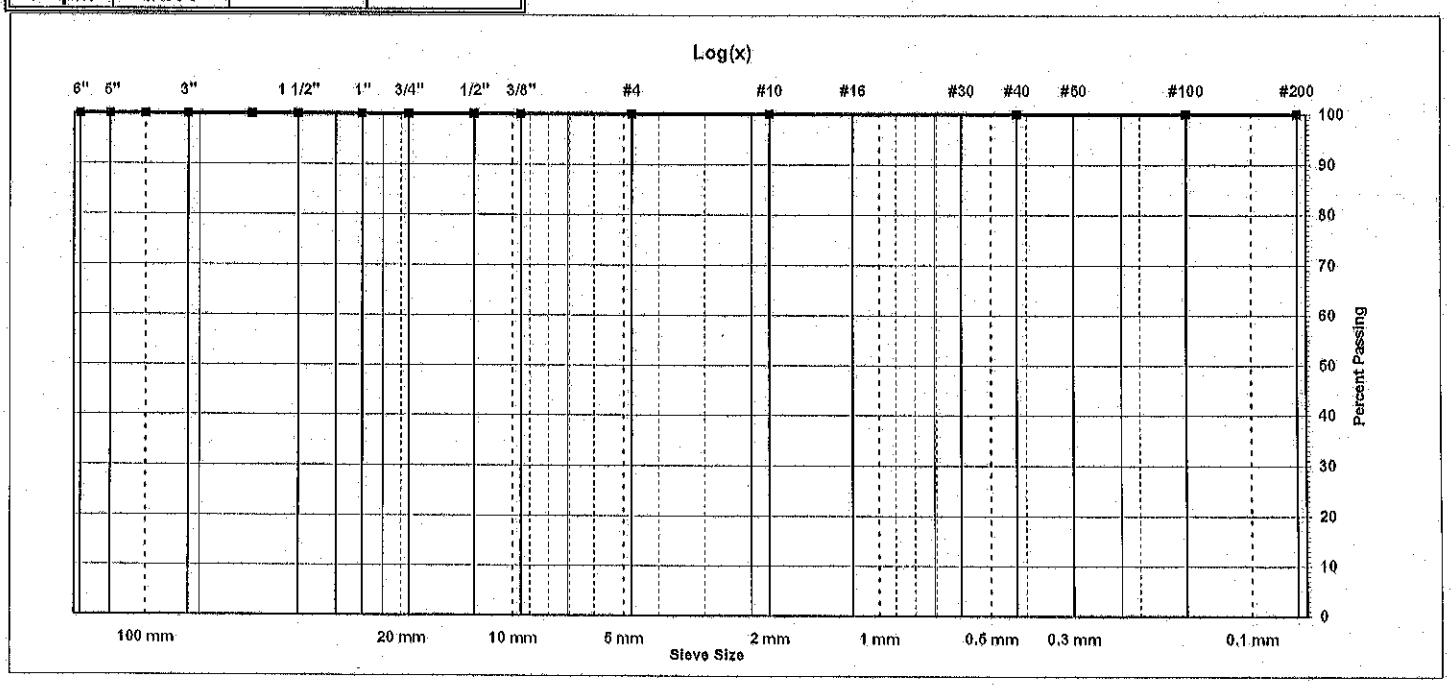
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	49		D 4318
Plasticity Index	25		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2063

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-6 @ 32' **Authorized By:** Client **Date:** 6/29/2007

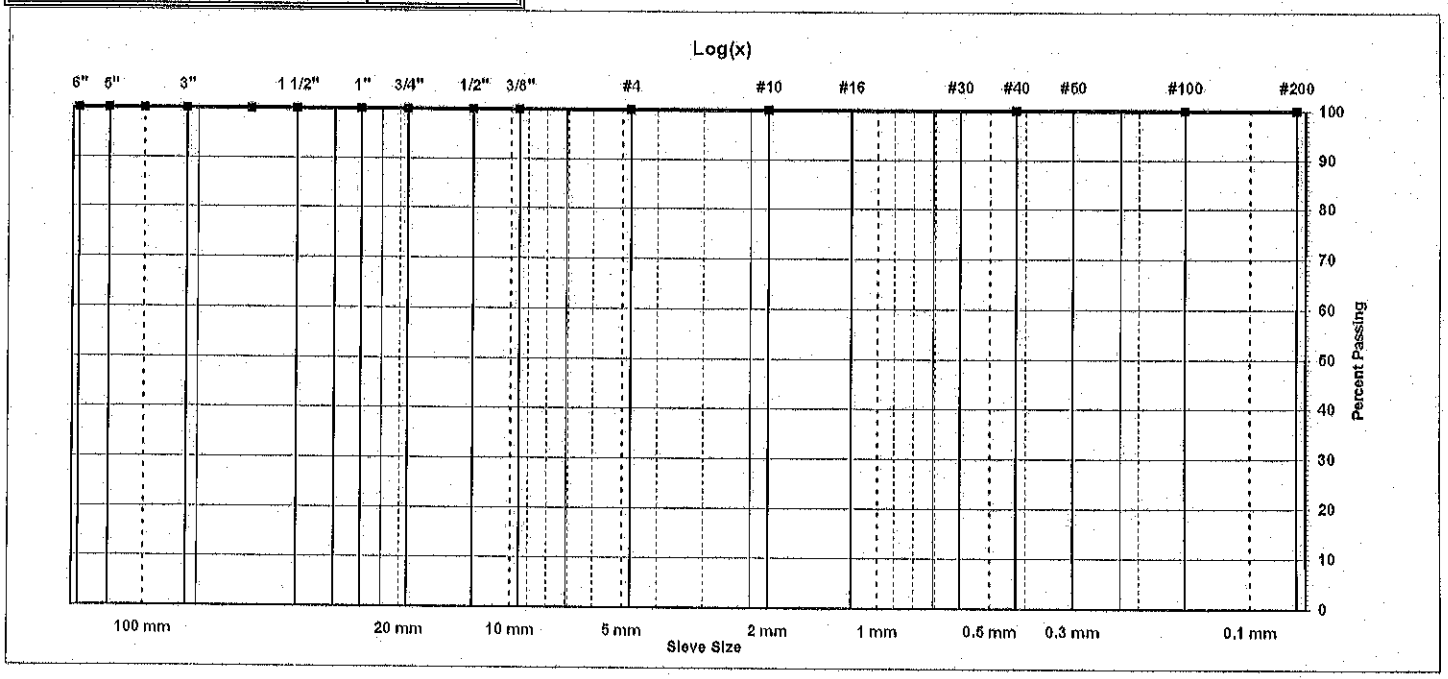
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	51		D 4318
Plasticity Index	31		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2064

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-7 @ 7' **Authorized By:** Client **Date:** 6/29/2007

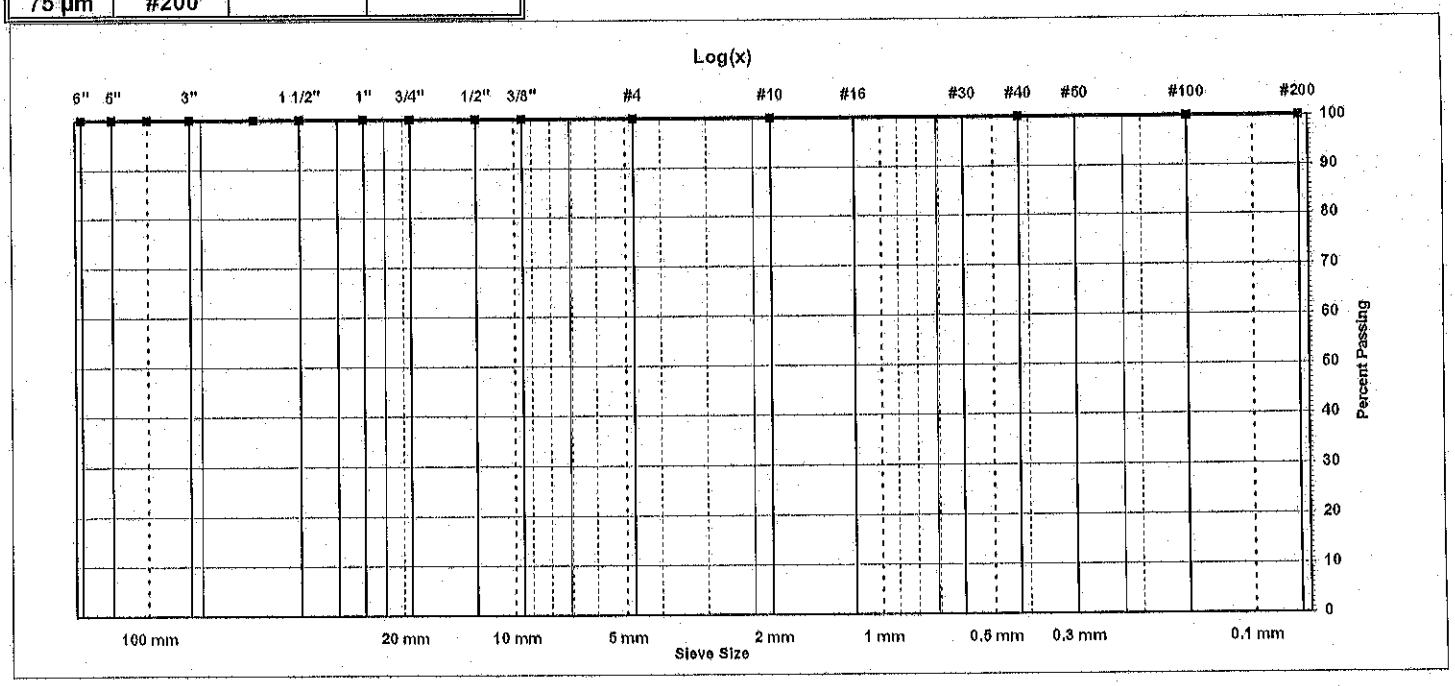
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	9.3		D2216
Liquid Limit	23		D 4318
Plasticity Index	12		D 4318
Dry Unit Weight, pcf	50.9		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2066

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-7 @ 23' **Authorized By:** Client **Date:** 6/29/2007

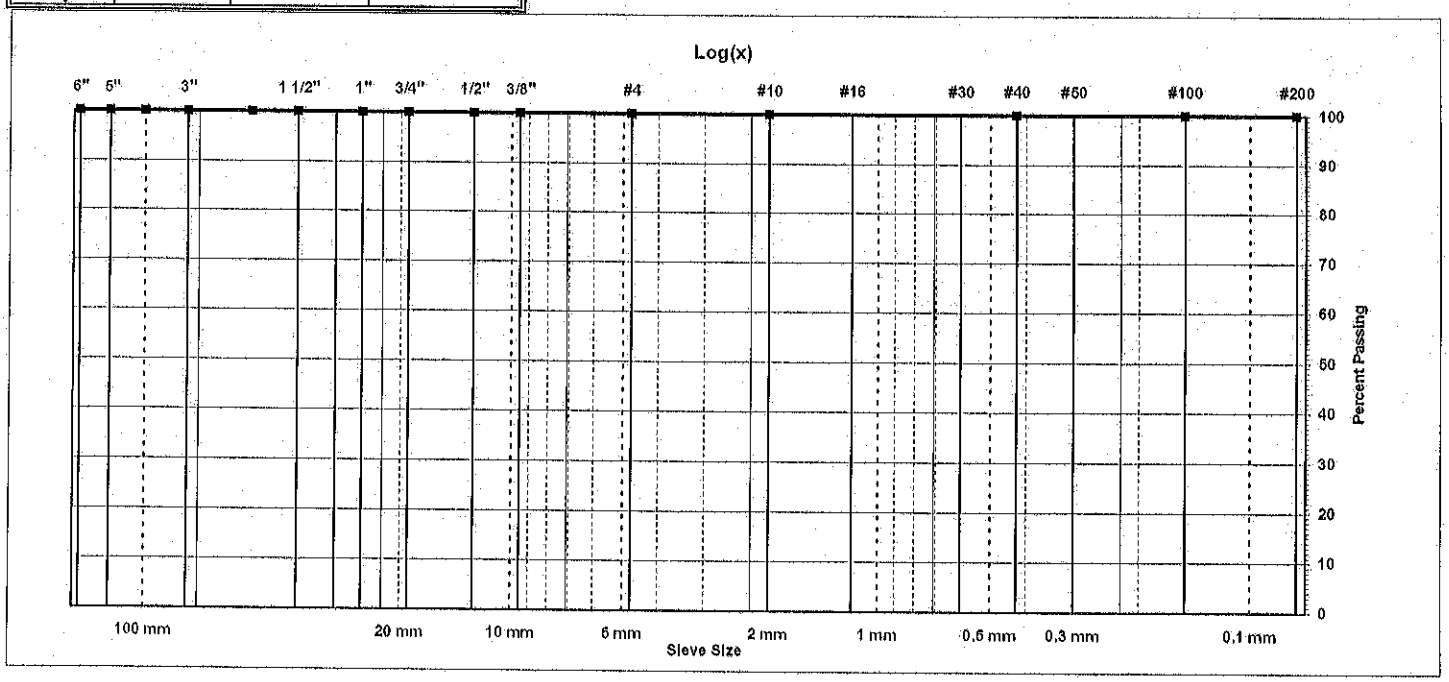
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	24		D 4318
Plasticity Index	8		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2068

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-8 @ 7' **Authorized By:** Client **Date:** 6/29/2007

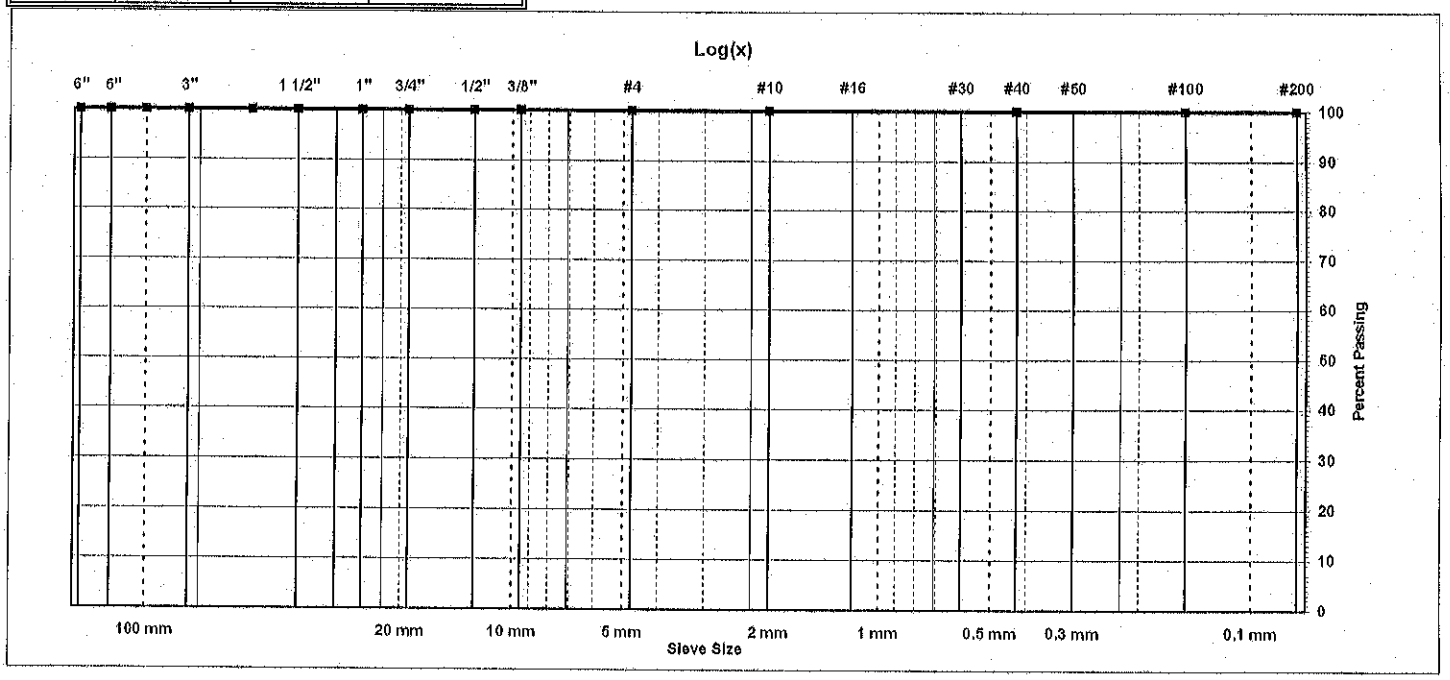
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	30		D 4318
Plasticity Index	13		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2069

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-8 @ 11' **Authorized By:** Client **Date:** 6/29/2007

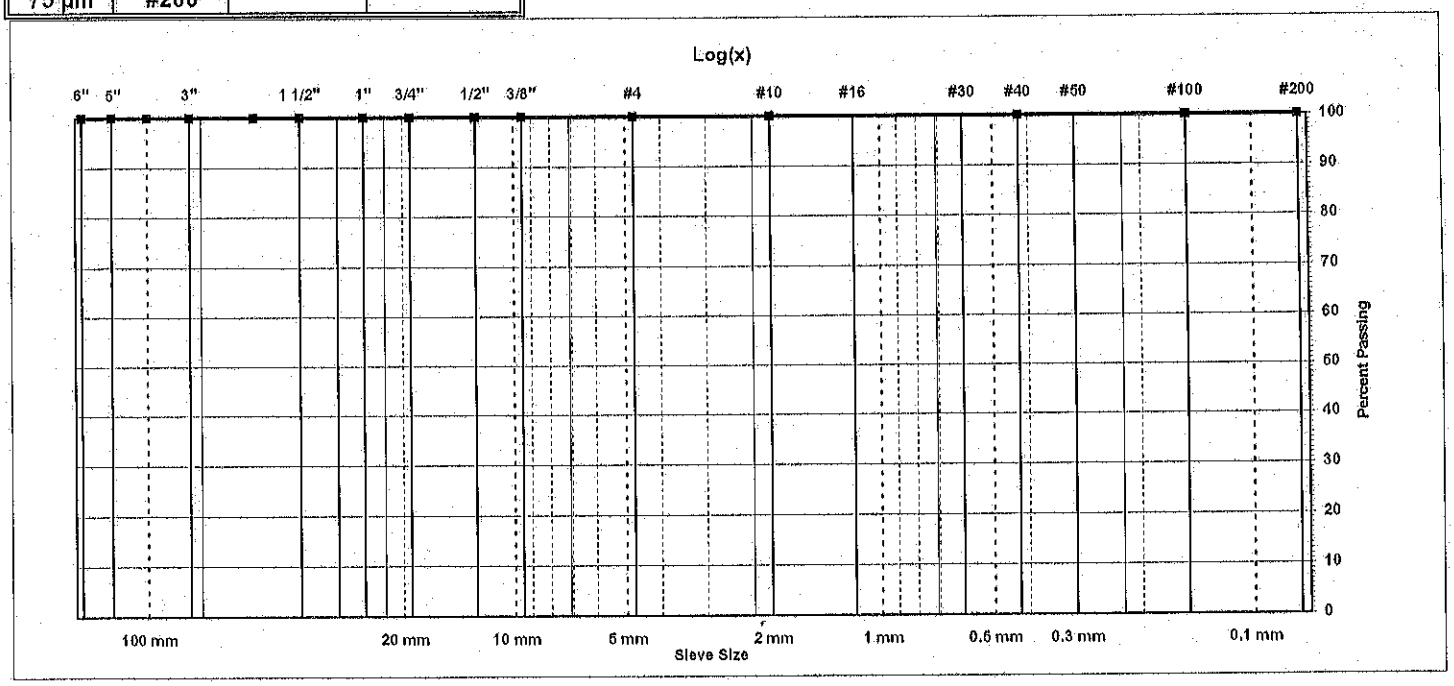
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	24		D 4318
Plasticity Index	9		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2290

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @14' **Authorized By:** Client **Date:** 6/29/2007

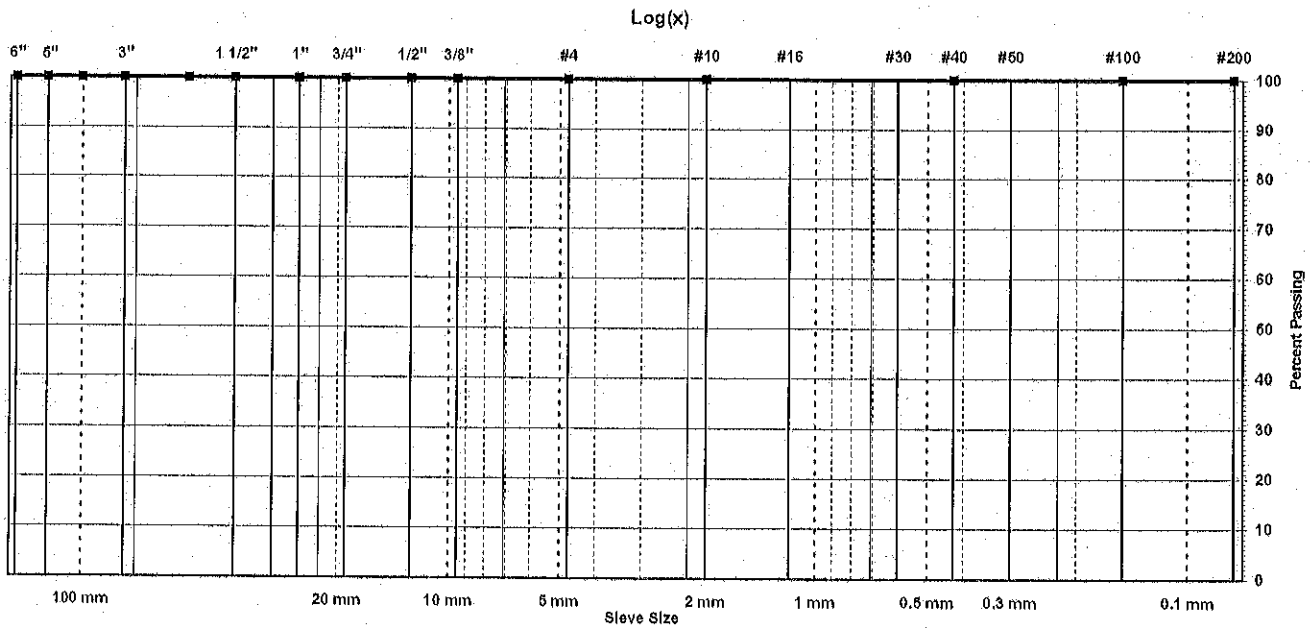
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	20.1		D2216
Liquid Limit	50		D 4318
Plasticity Index	29		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2291

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 16' **Authorized By:** Client **Date:** 6/29/2007

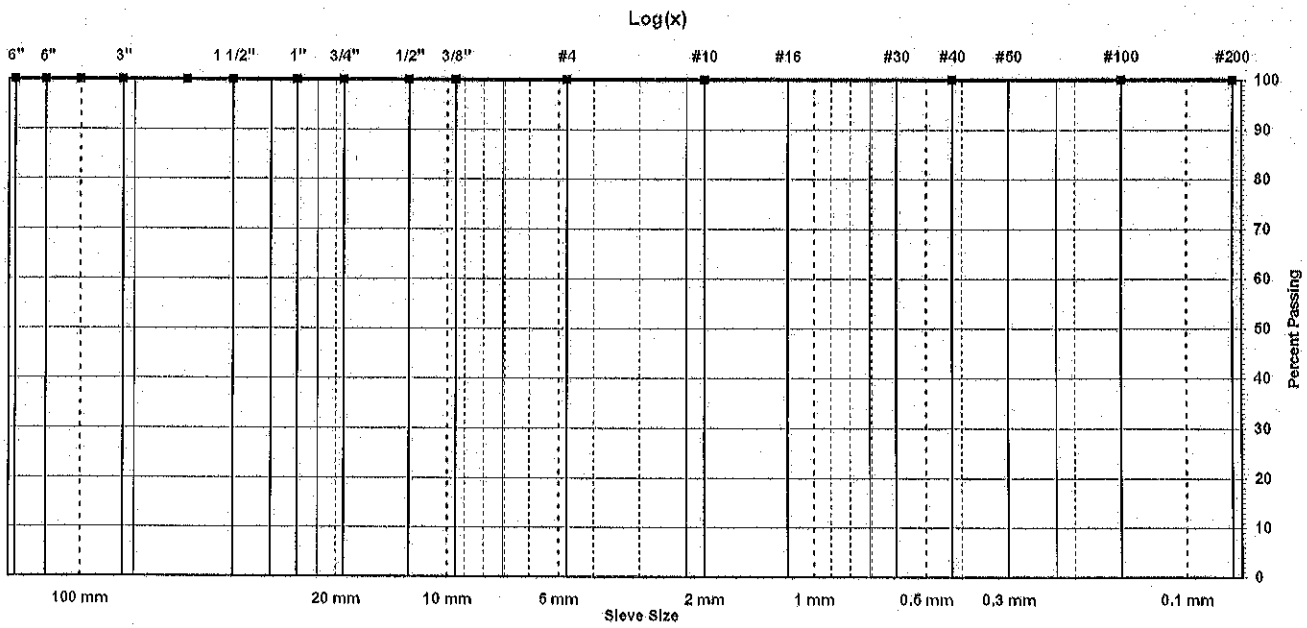
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	19.7		D2216
Liquid Limit	47		D 4318
Plasticity Index	25		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2134

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-4 @ 22' **Authorized By:** Client **Date:** 6/29/2007

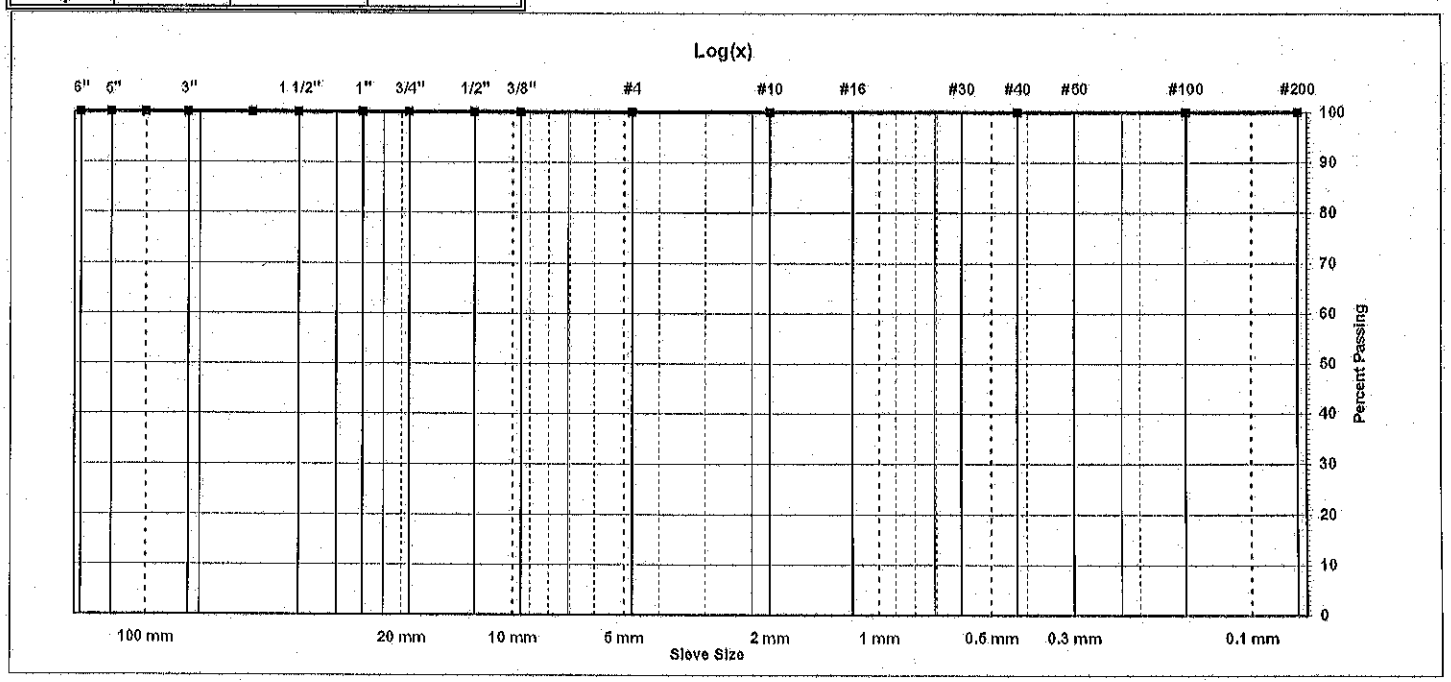
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	14.5		D2216
Liquid Limit	55		D 4318
Plasticity Index	32		D 4318
Dry Unit Weight, pcf	40.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2136

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-4 @ 32' **Authorized By:** Client **Date:** 6/29/2007

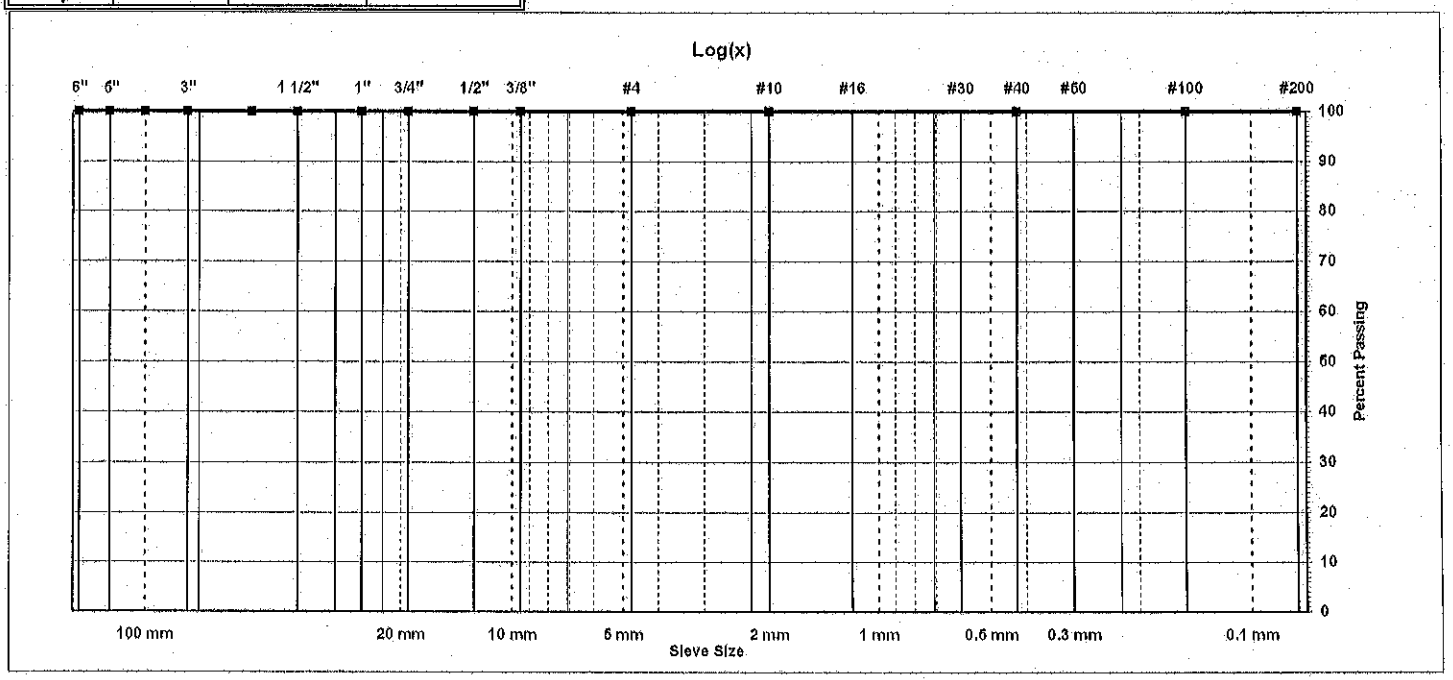
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	62		D 4318
Plasticity Index	37		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2141

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-5 @ 22' **Authorized By:** Client **Date:** 6/29/2007

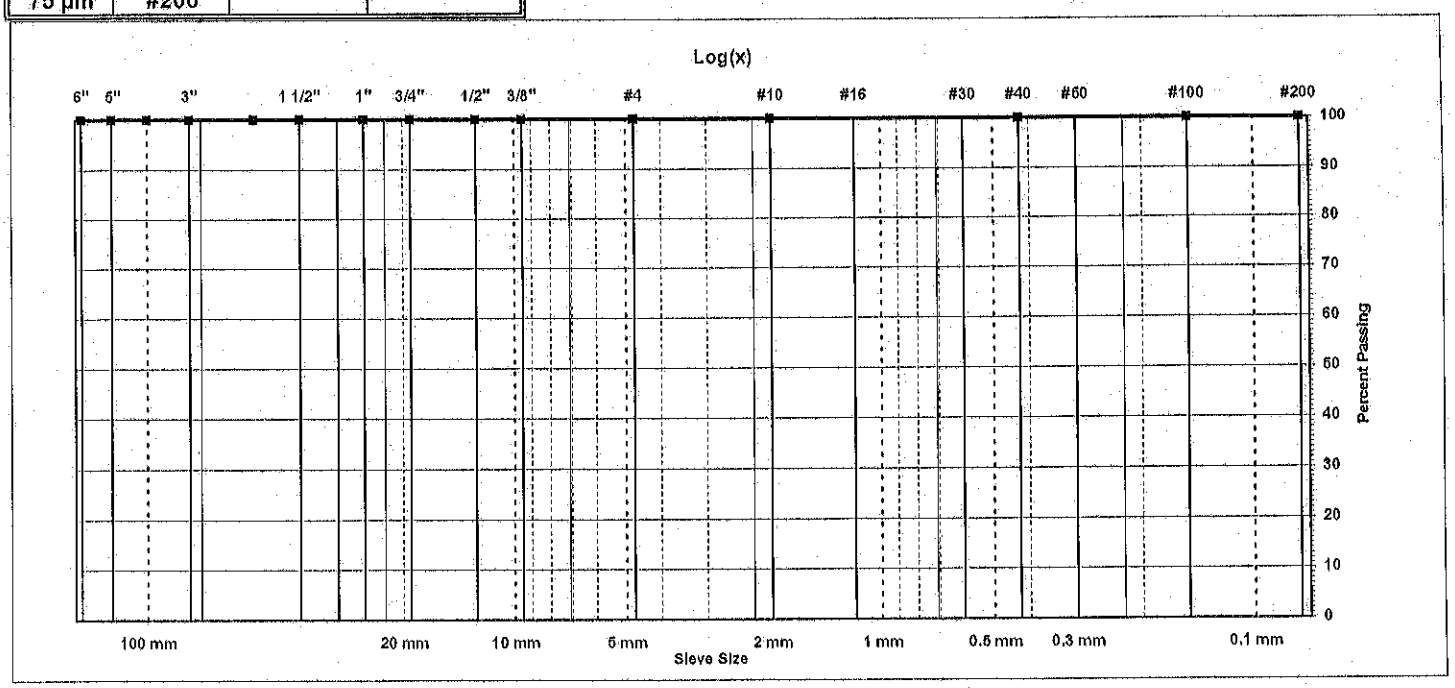
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	47		D 4318
Plasticity Index	22		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2142

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-5 @ 32' **Authorized By:** Client **Date:** 6/29/2007

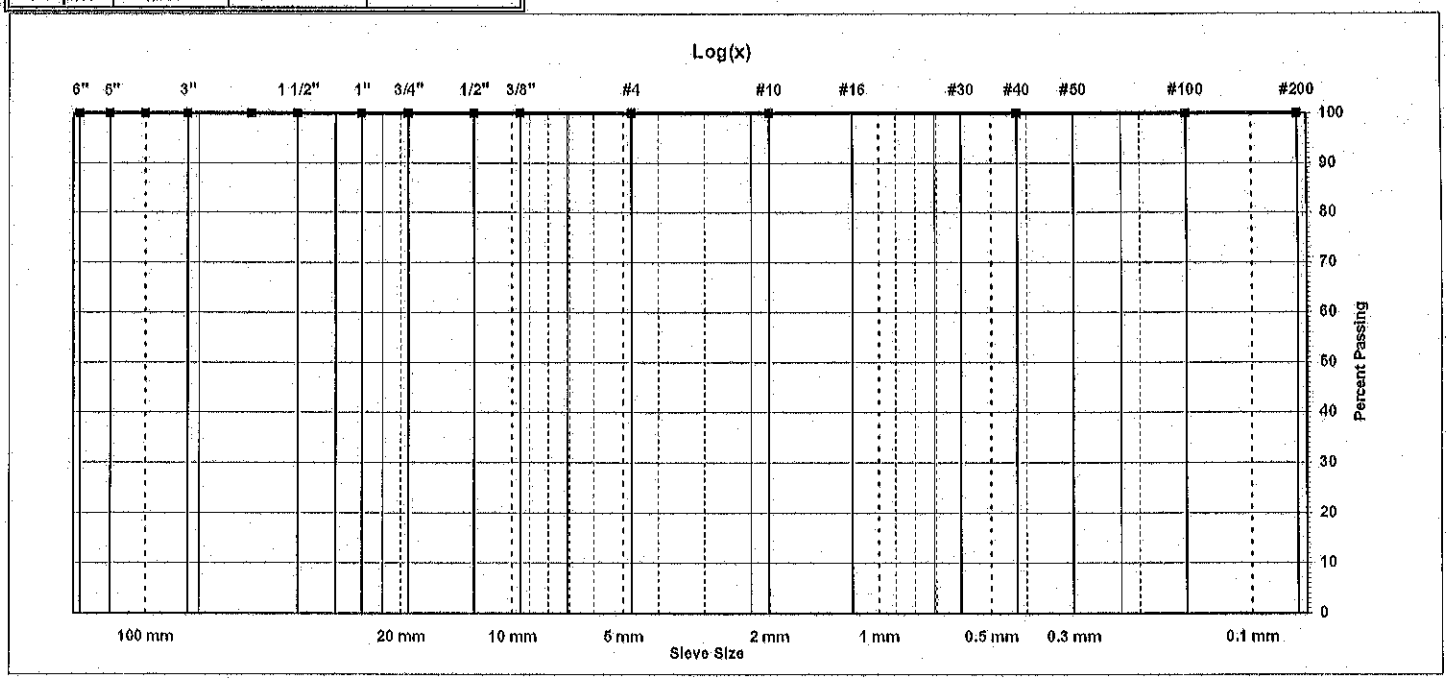
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	52		D 4318
Plasticity Index	26		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2086

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-6 @ 27' **Authorized By:** Client **Date:** 6/29/2007

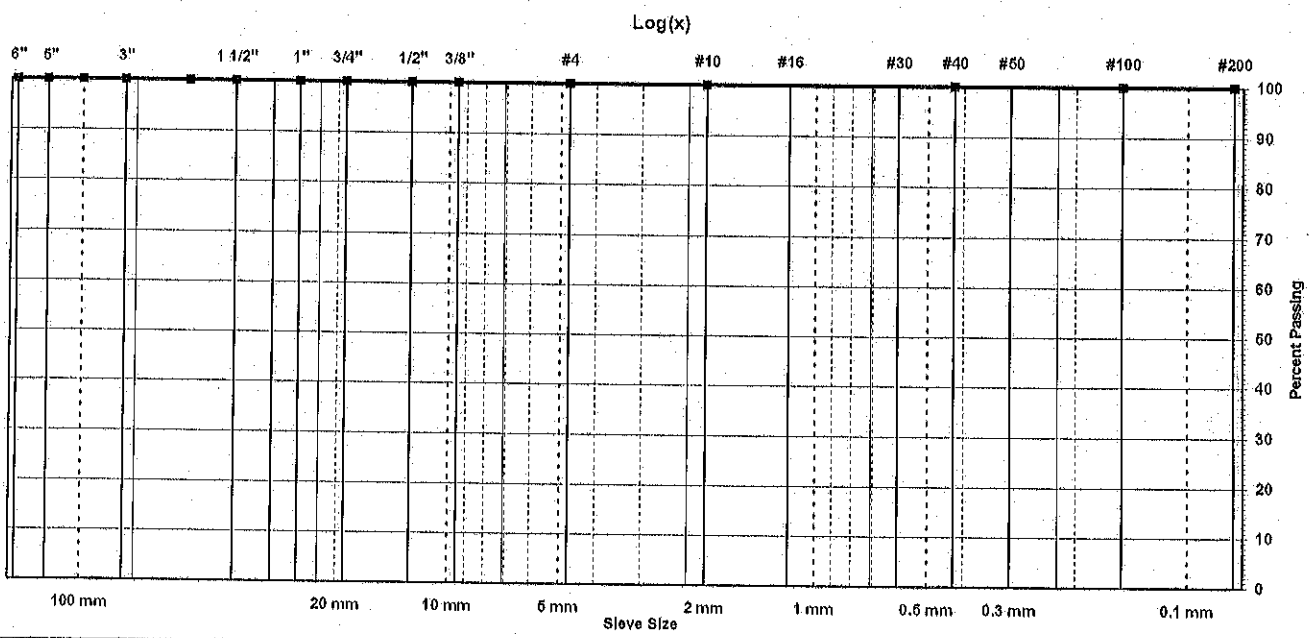
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	9.8		D2216
Liquid Limit	42		D 4318
Plasticity Index	18		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2087

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-6 @ 32' **Authorized By:** Client **Date:** 6/29/2007

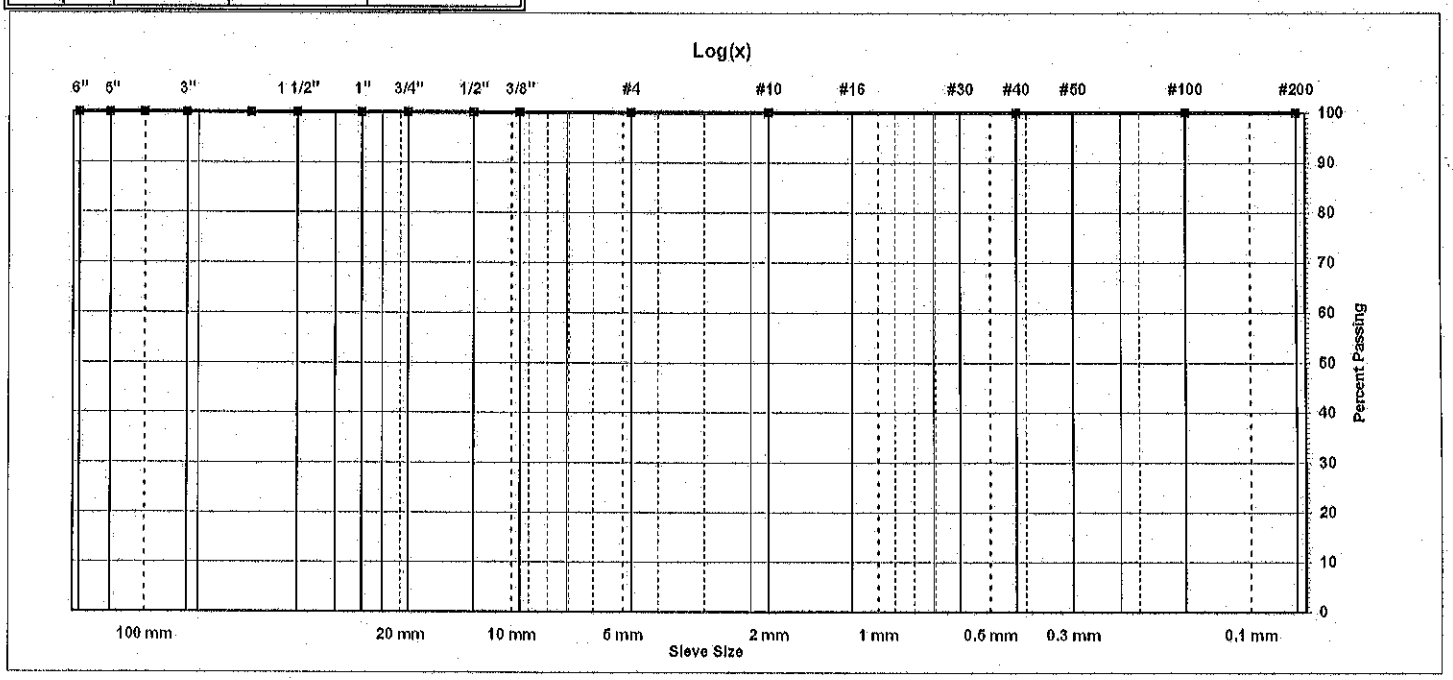
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	9.4		D2216
Liquid Limit	46		D 4318
Plasticity Index	24		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2092

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-8 @ 11' **Authorized By:** Client **Date:** 6/29/2007

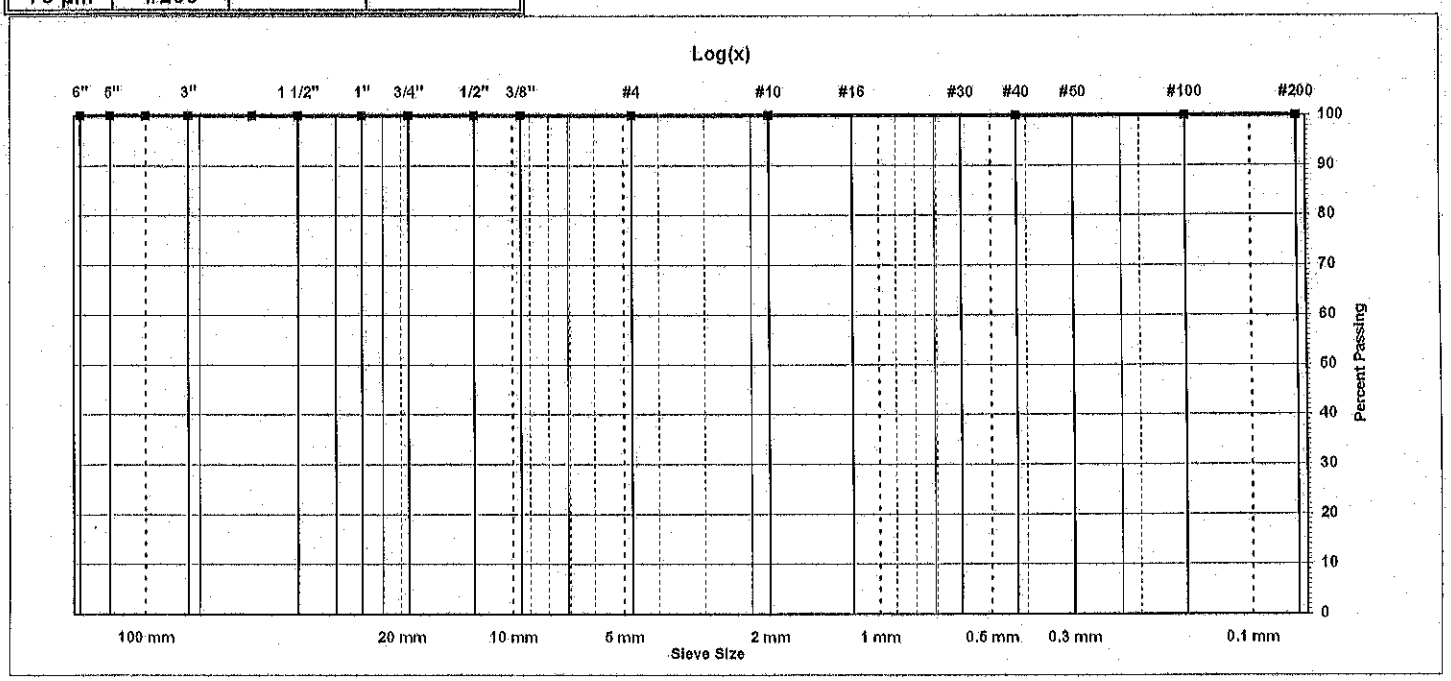
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	24		D 4318
Plasticity Index	8		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2093

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-8 @ 15' **Authorized By:** Client **Date:** 6/29/2007

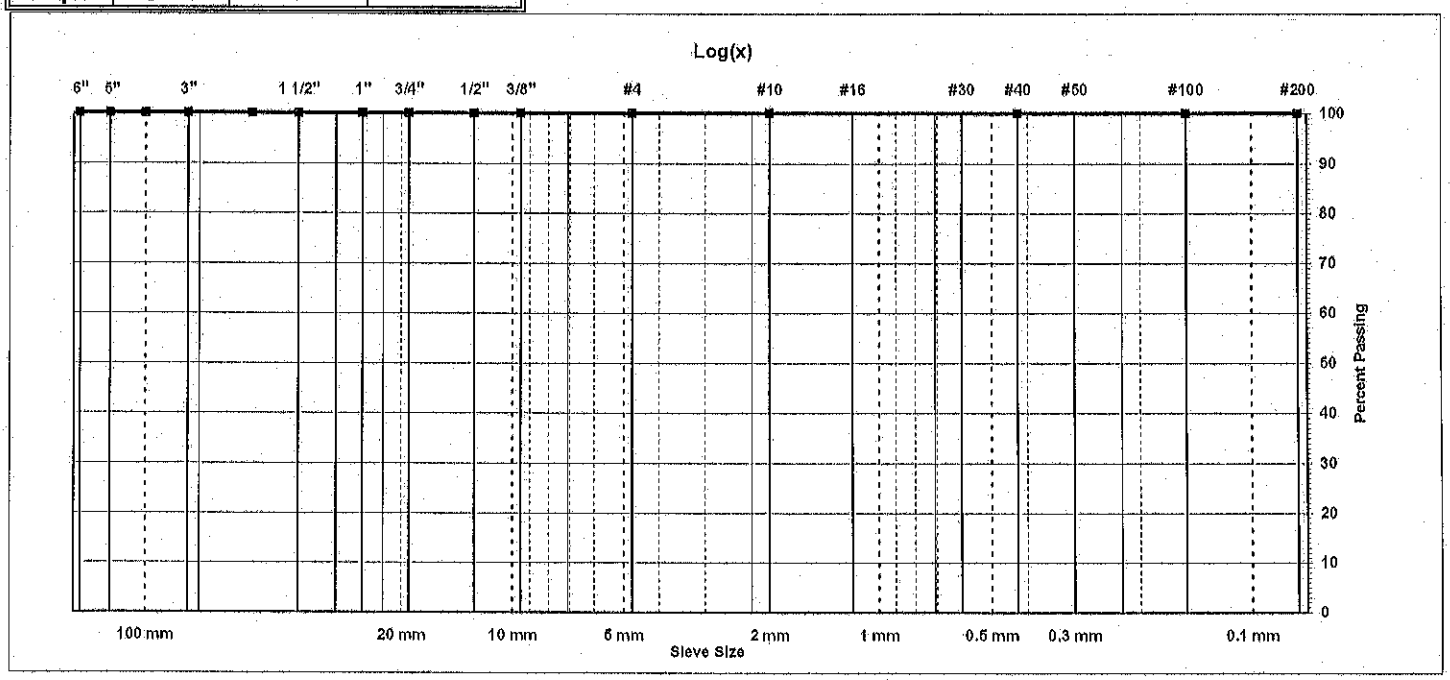
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	26		D 4318
Plasticity Index	9		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2096

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-9 @ 12' **Authorized By:** Client **Date:** 6/29/2007

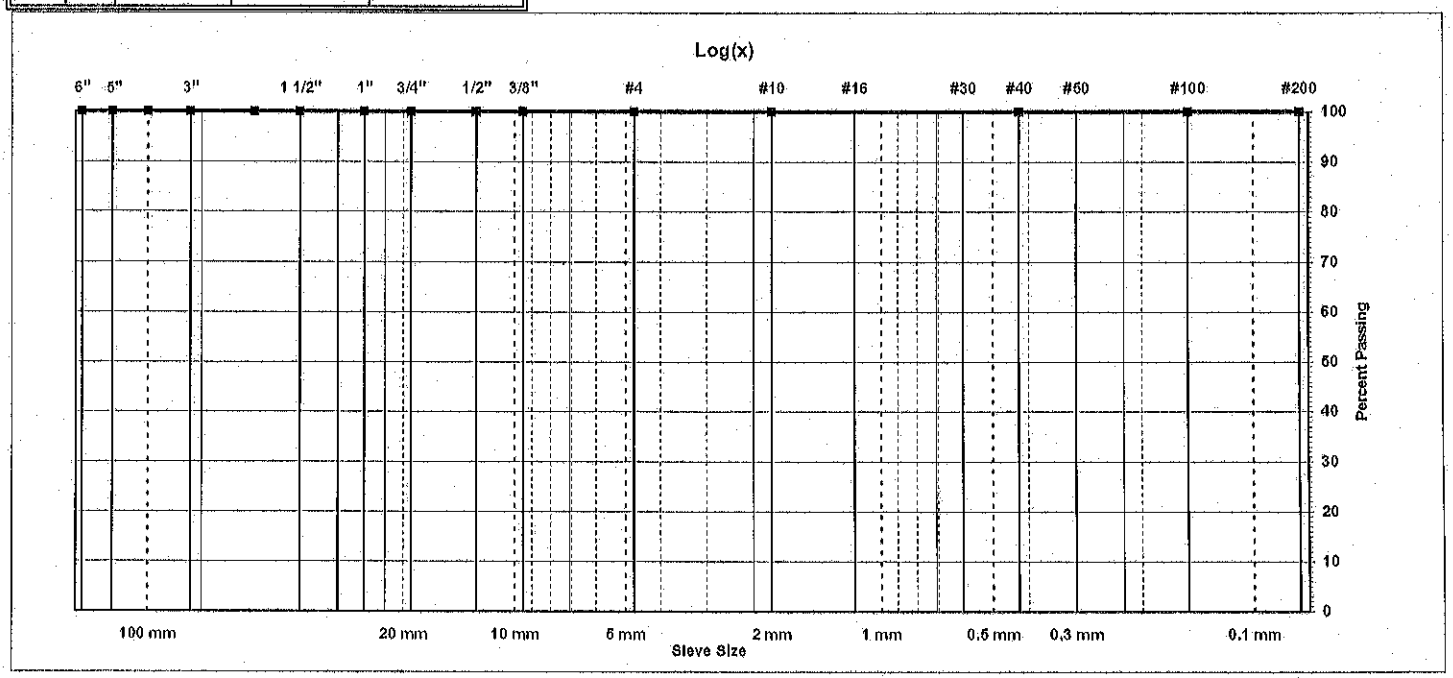
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	33		D 4318
Plasticity Index	16		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2146

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-3 @ 17' **Authorized By:** Client **Date:** 6/29/2007

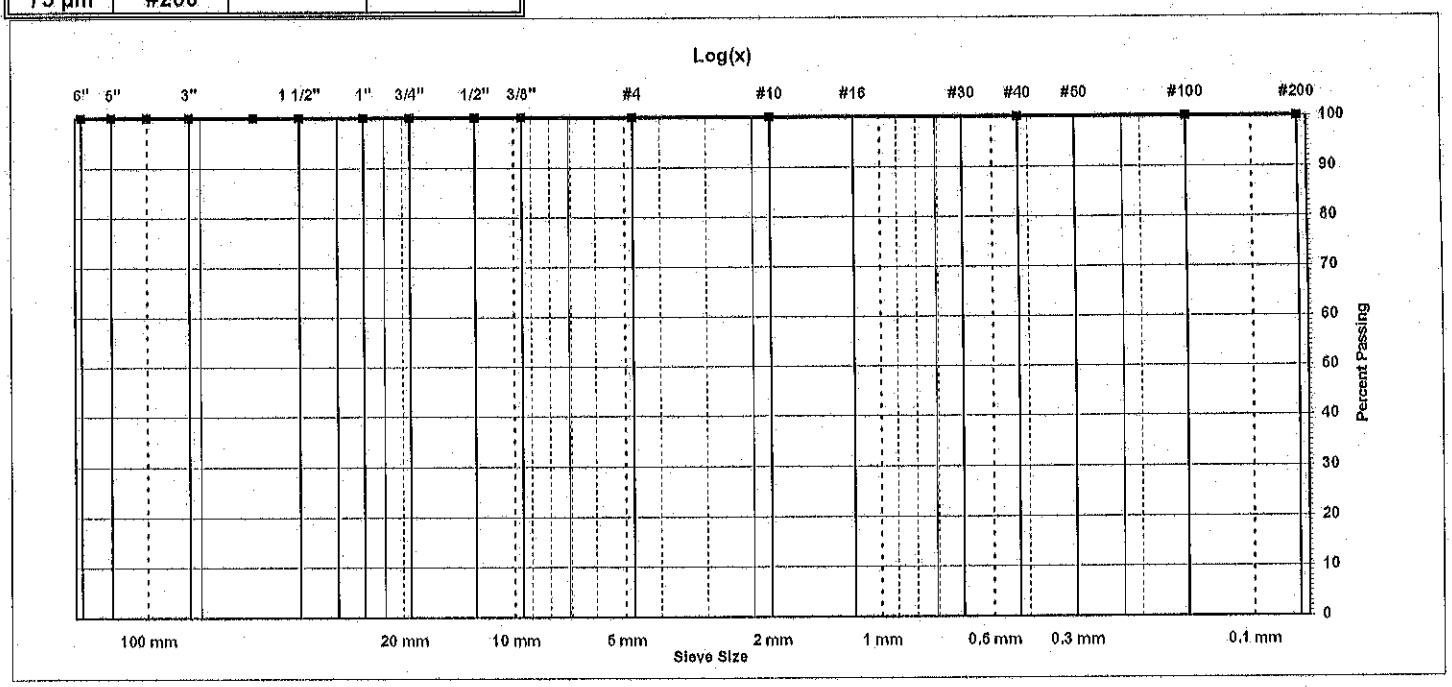
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	29		D 4318
Plasticity Index	11		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2150

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-4 @ 32.5' **Authorized By:** Client **Date:** 6/29/2007

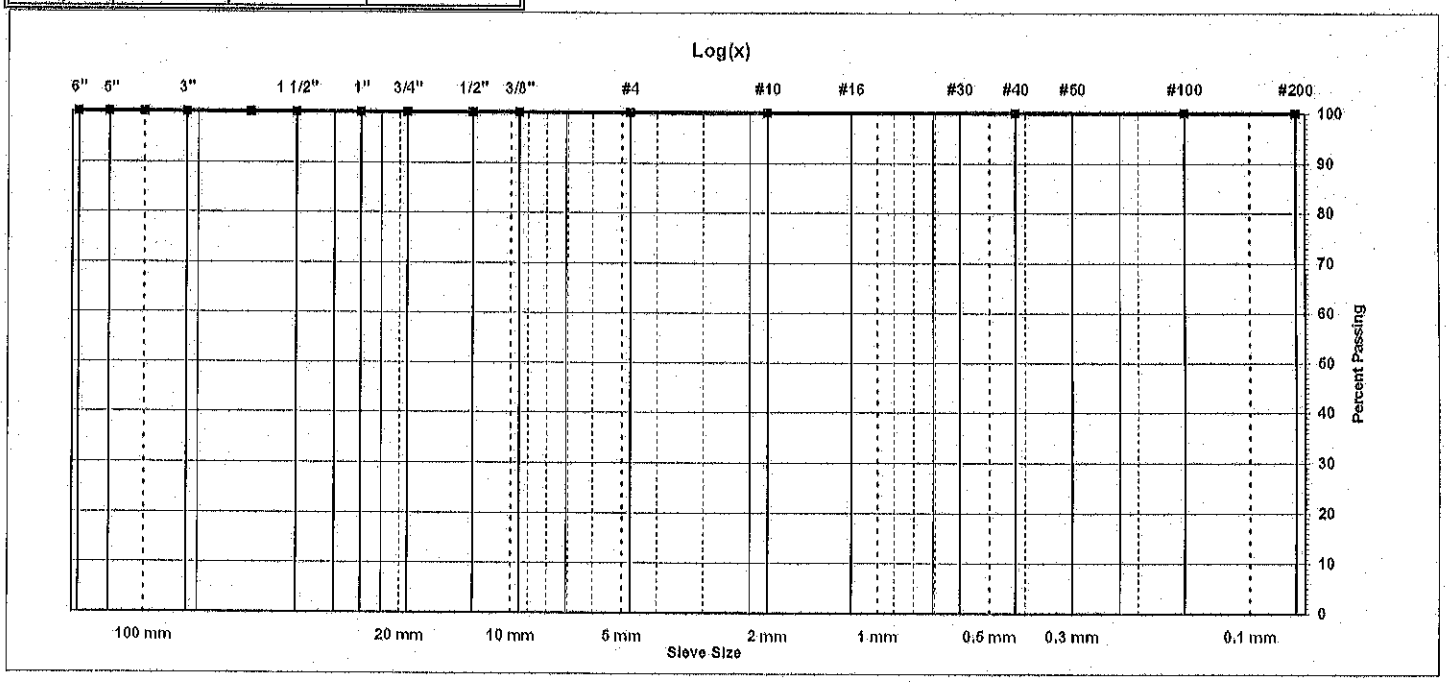
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	31		D 4318
Plasticity Index	12		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2151

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-5 @ 2' **Authorized By:** Client **Date:** 6/29/2007

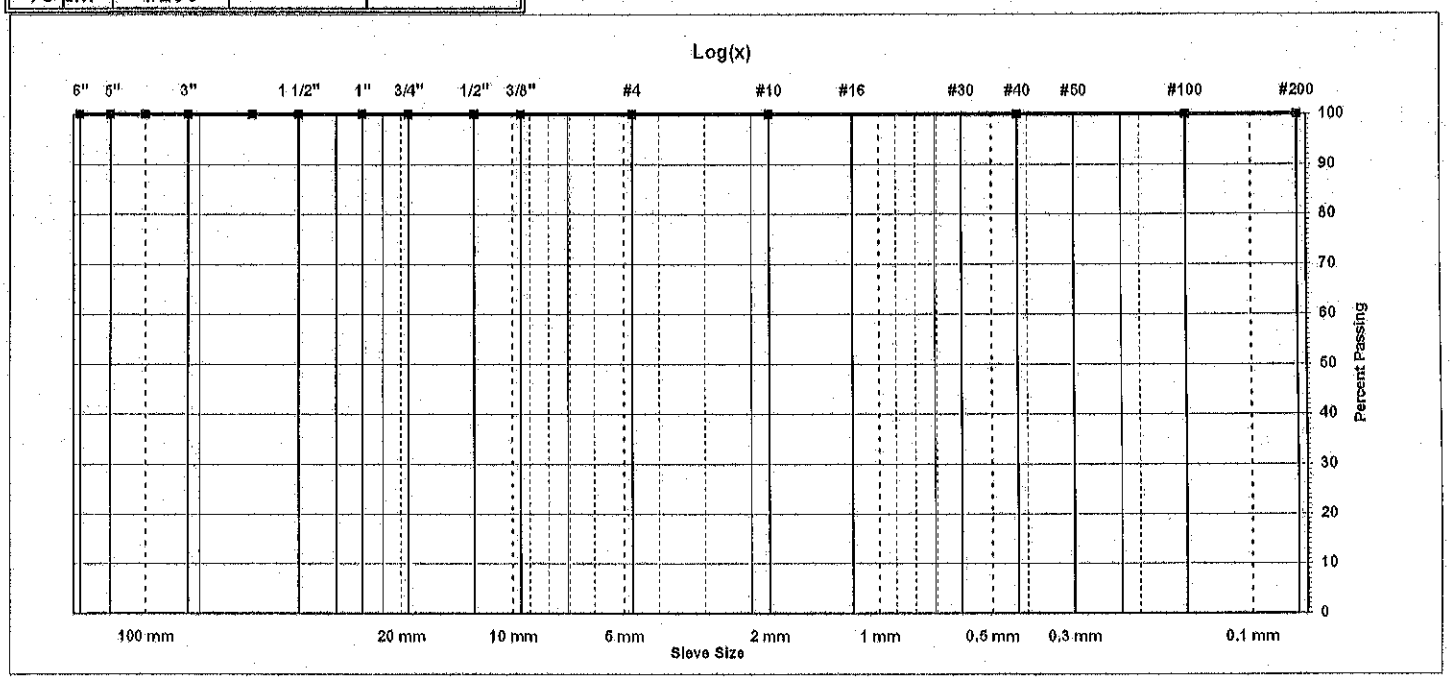
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2153

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-5 @ 17' **Authorized By:** Client **Date:** 6/29/2007

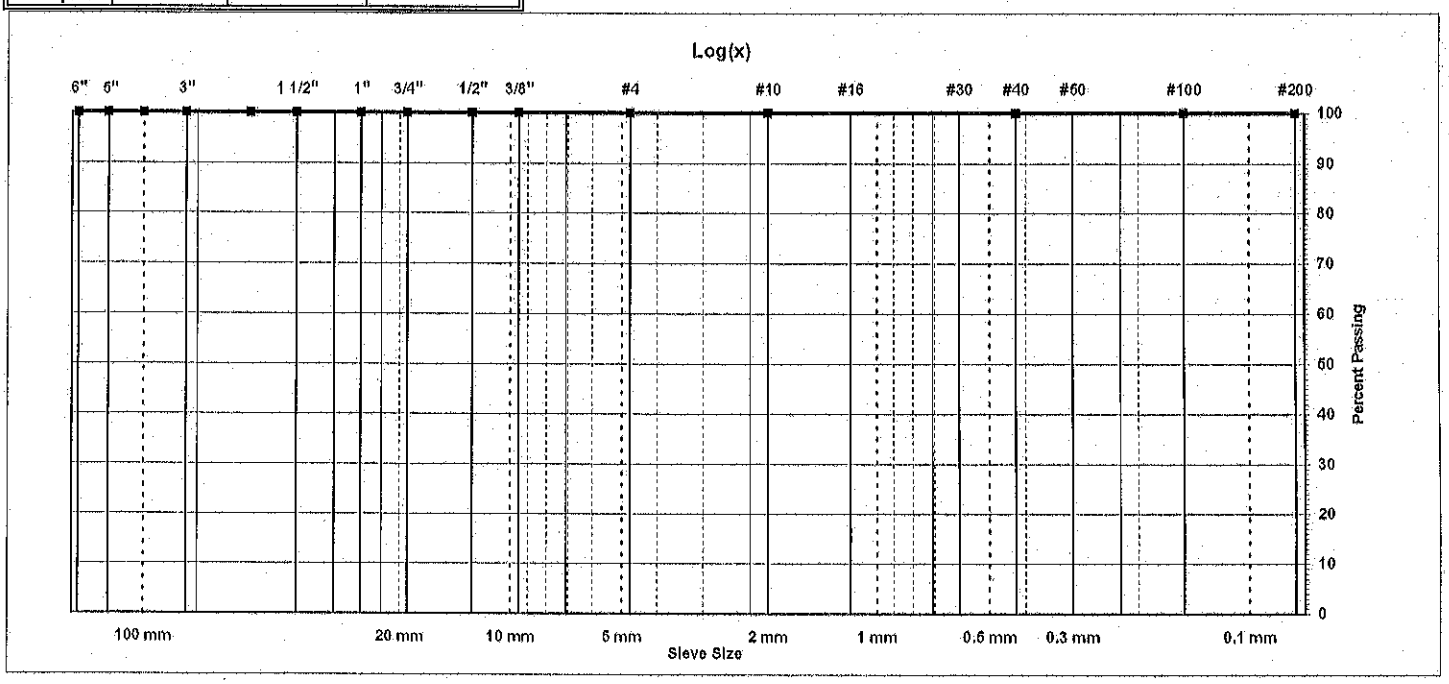
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	45		D 4318
Plasticity Index	21		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2154

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-5 @ 22' **Authorized By:** Client **Date:** 6/29/2007

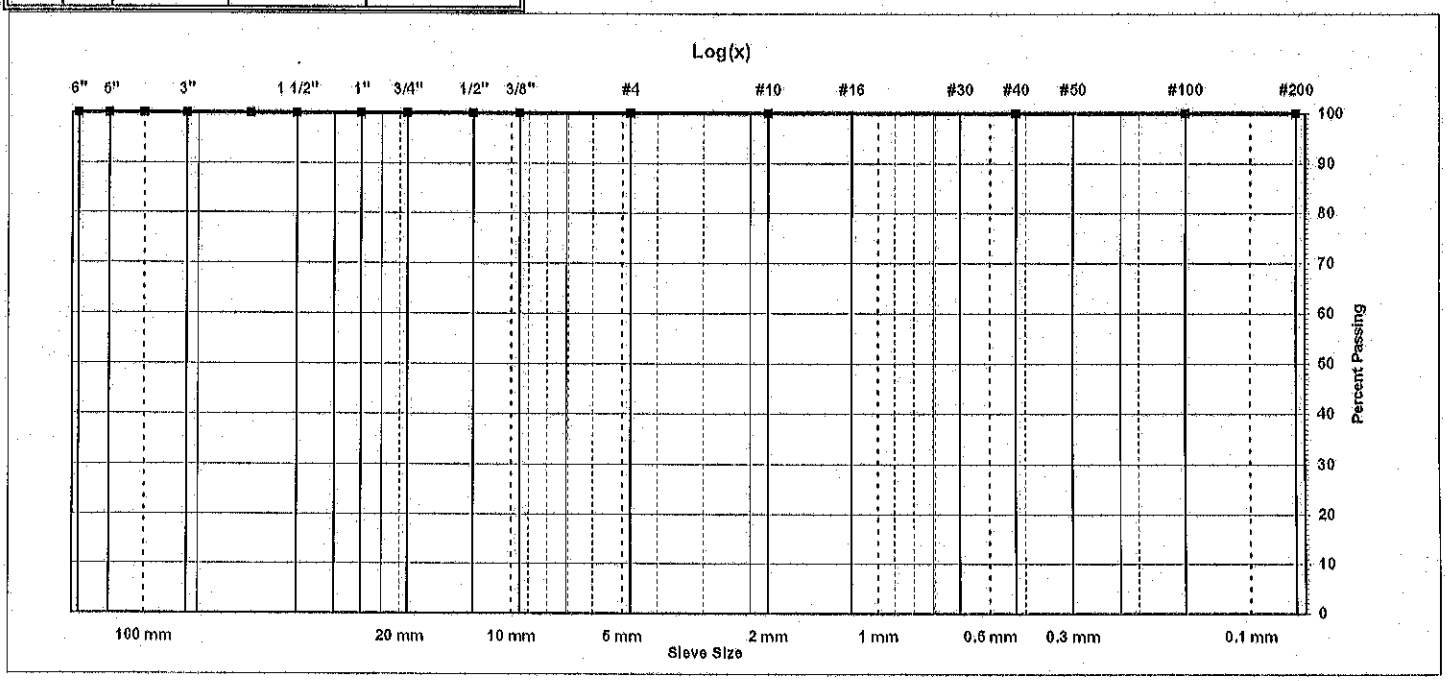
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	40		D 4318
Plasticity Index	18		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2204

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 17' **Authorized By:** Client **Date:** 6/29/2007

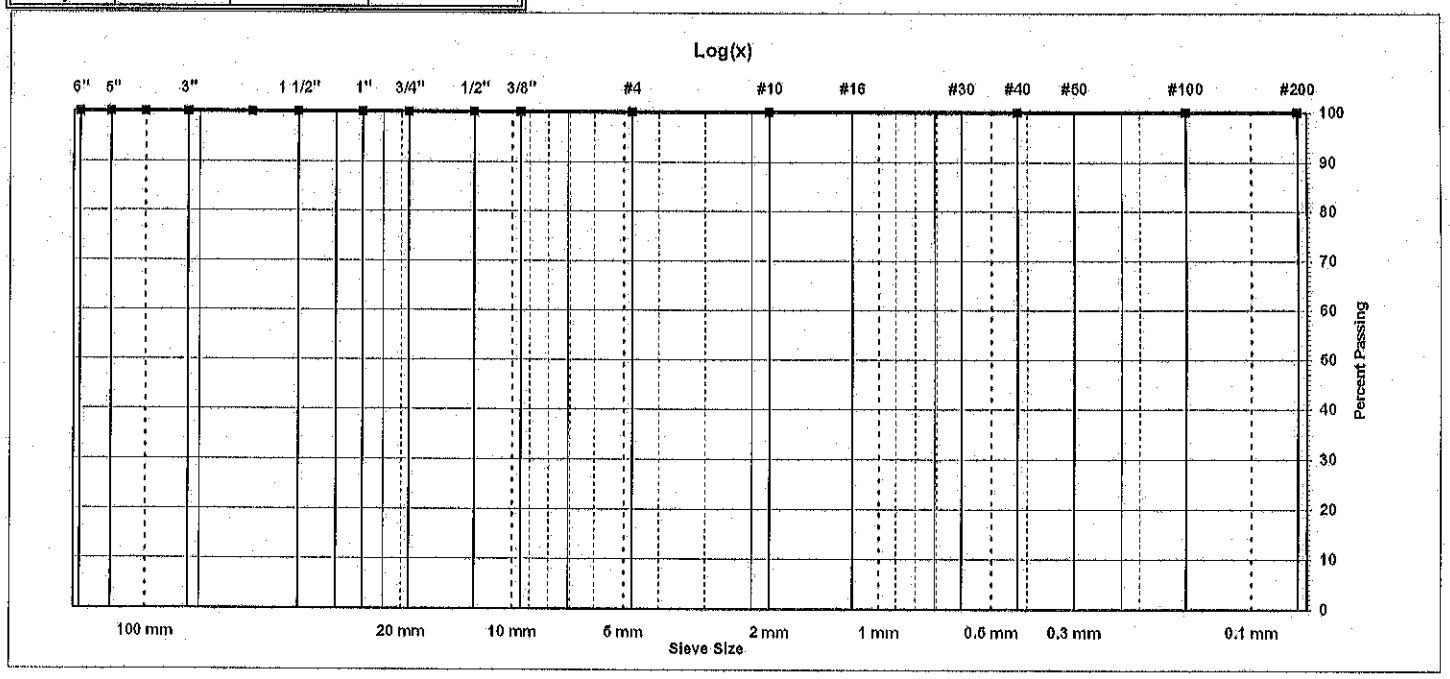
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	20.1		D2216
Liquid Limit	54		D 4318
Plasticity Index	27		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2204

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 17' **Authorized By:** Client **Date:** 6/29/2007

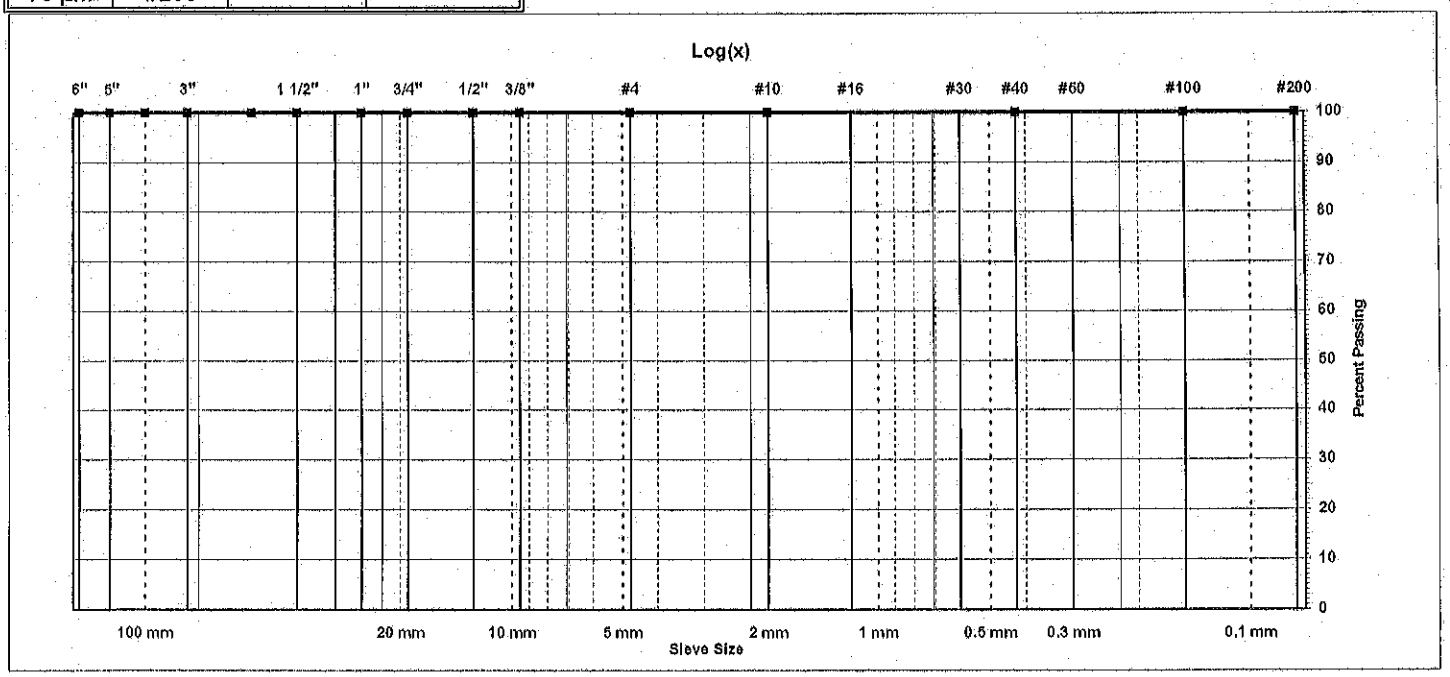
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	20.1		D2216
Liquid Limit	54		D 4318
Plasticity Index	27		D 4318
Dry Unit Weight, pcf	60.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2206

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 27'
Authorized By: Client **Date:** 6/29/2007

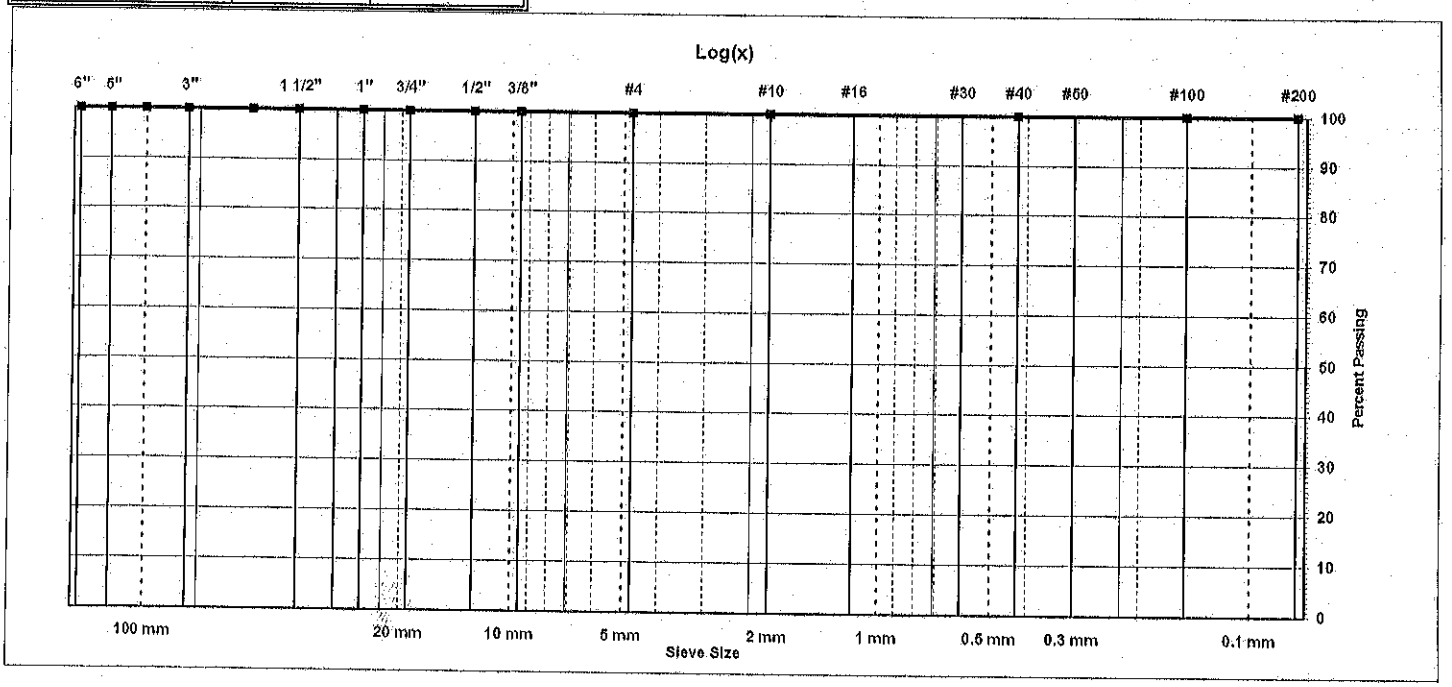
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	57		D 4318
Plasticity Index	30		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2208

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 37' **Authorized By:** Client **Date:** 6/29/2007

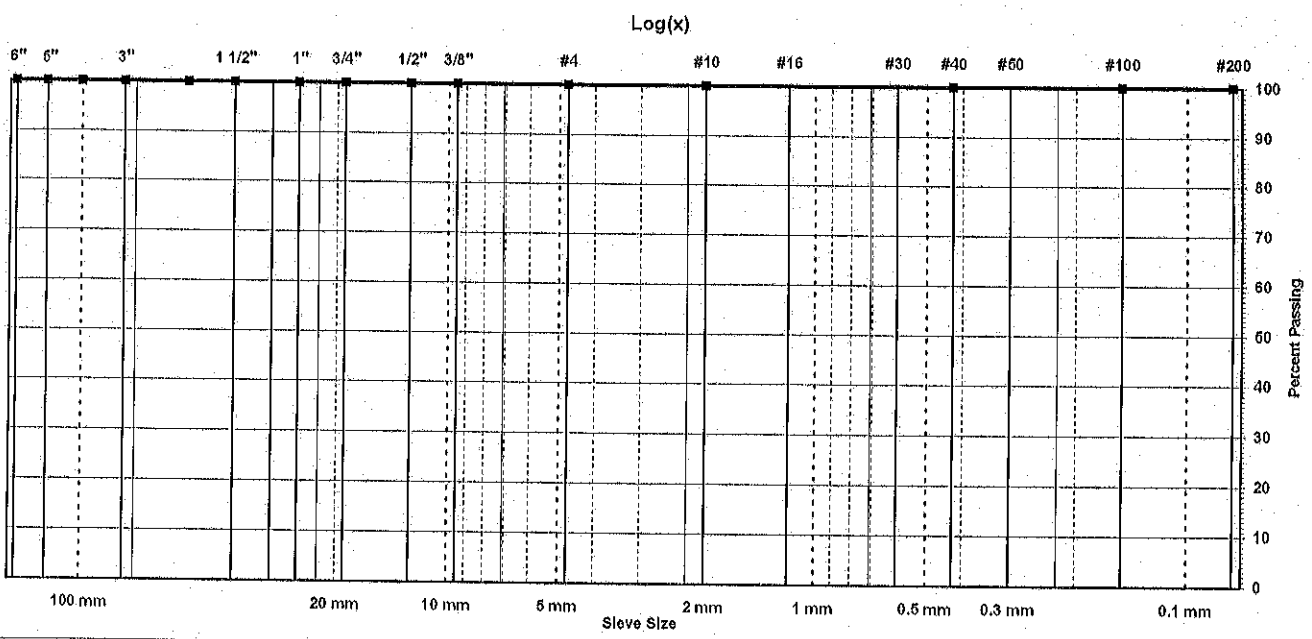
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	57		D 4318
Plasticity Index	30		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2211

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-7 @ 12' **Authorized By:** Client **Date:** 6/29/2007

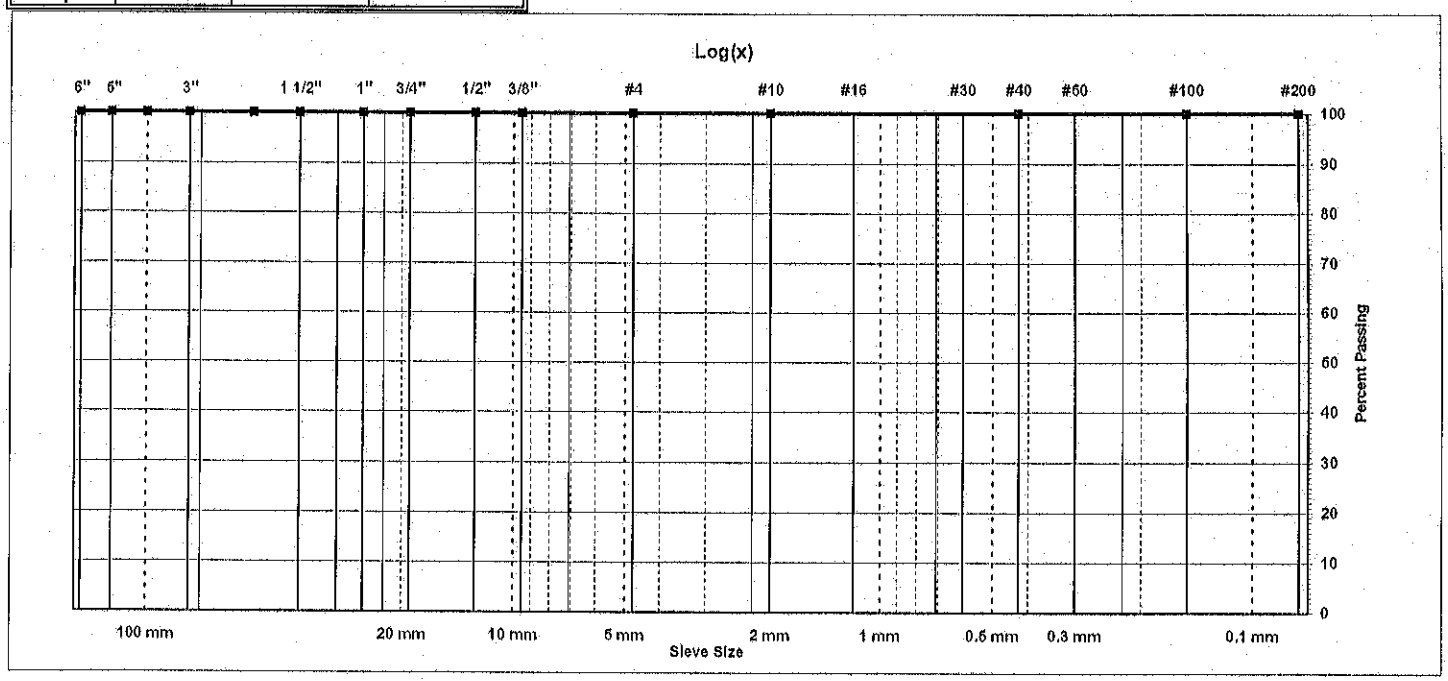
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	37		D 4318
Plasticity Index	15		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2213

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-8 @ 7' **Authorized By:** Client **Date:** 6/29/2007

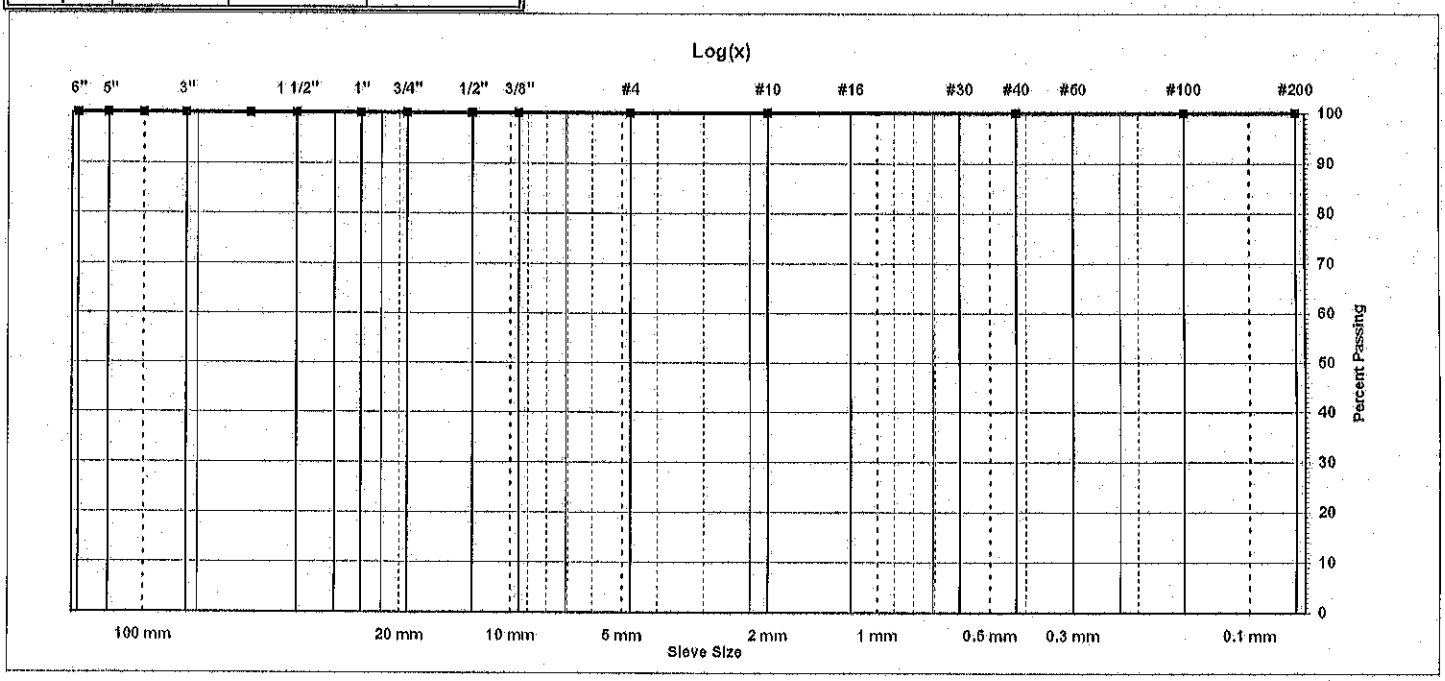
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	30		D 4318
Plasticity Index	12		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2215

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-9 @ 7' **Authorized By:** Client **Date:** 6/29/2007

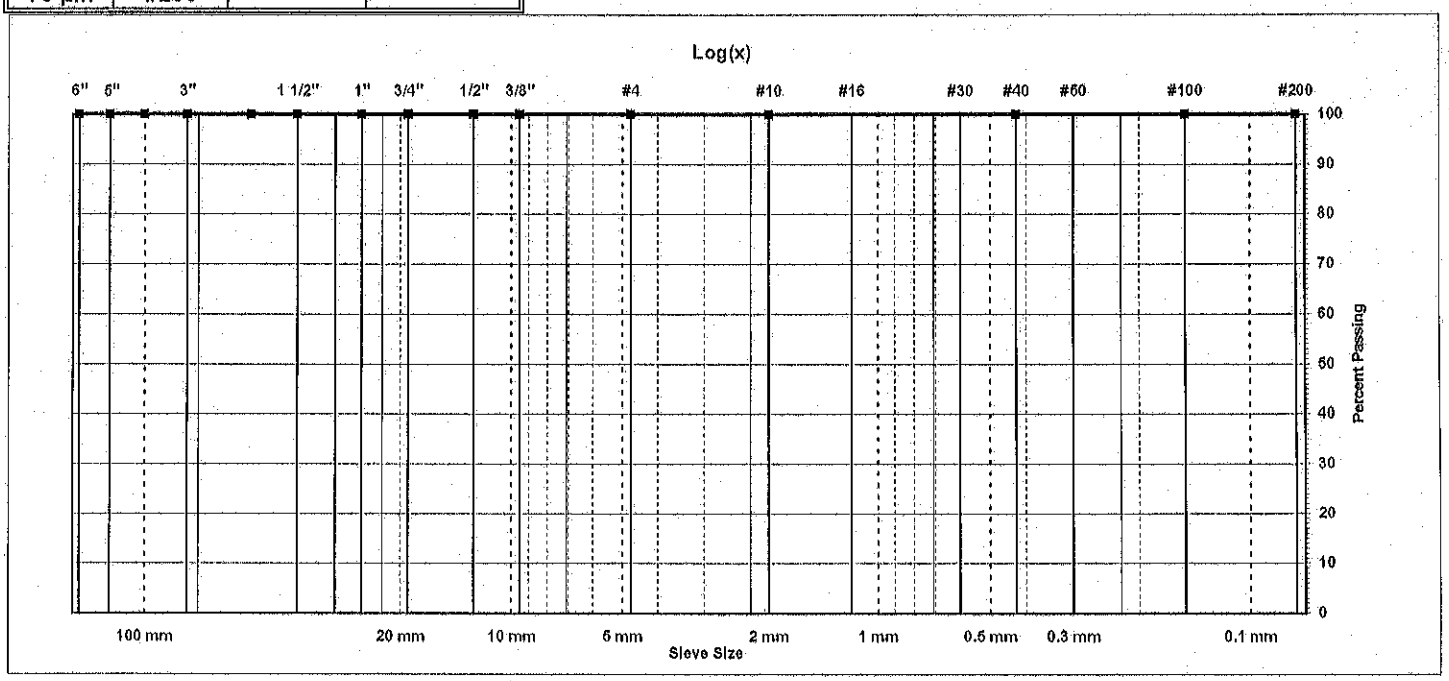
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	33		D 4318
Plasticity Index	15		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2226

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-4 @ 10' **Authorized By:** Client **Date:** 6/29/2007

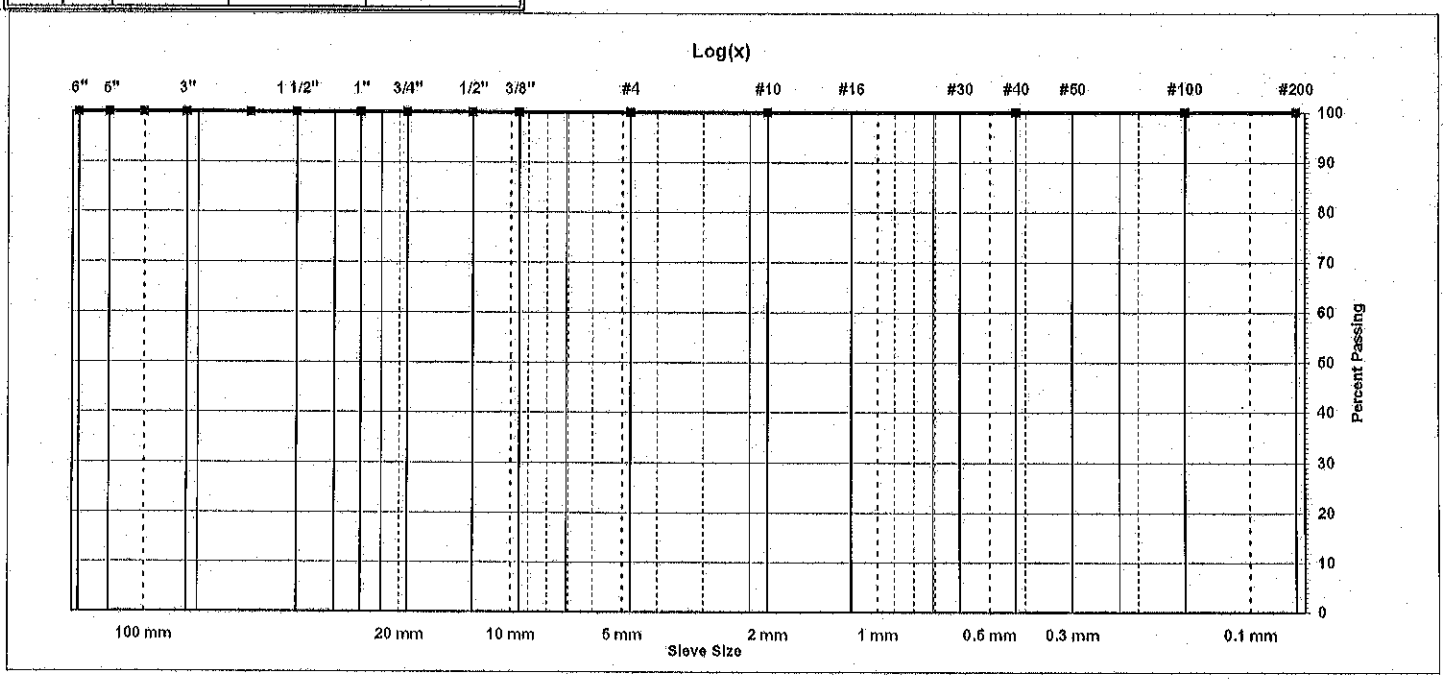
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	NP		D 4318
Plasticity Index	NP		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2227

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Silty
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: A-4 @ 15'
Authorized By: Client **Date:** 6/29/2007

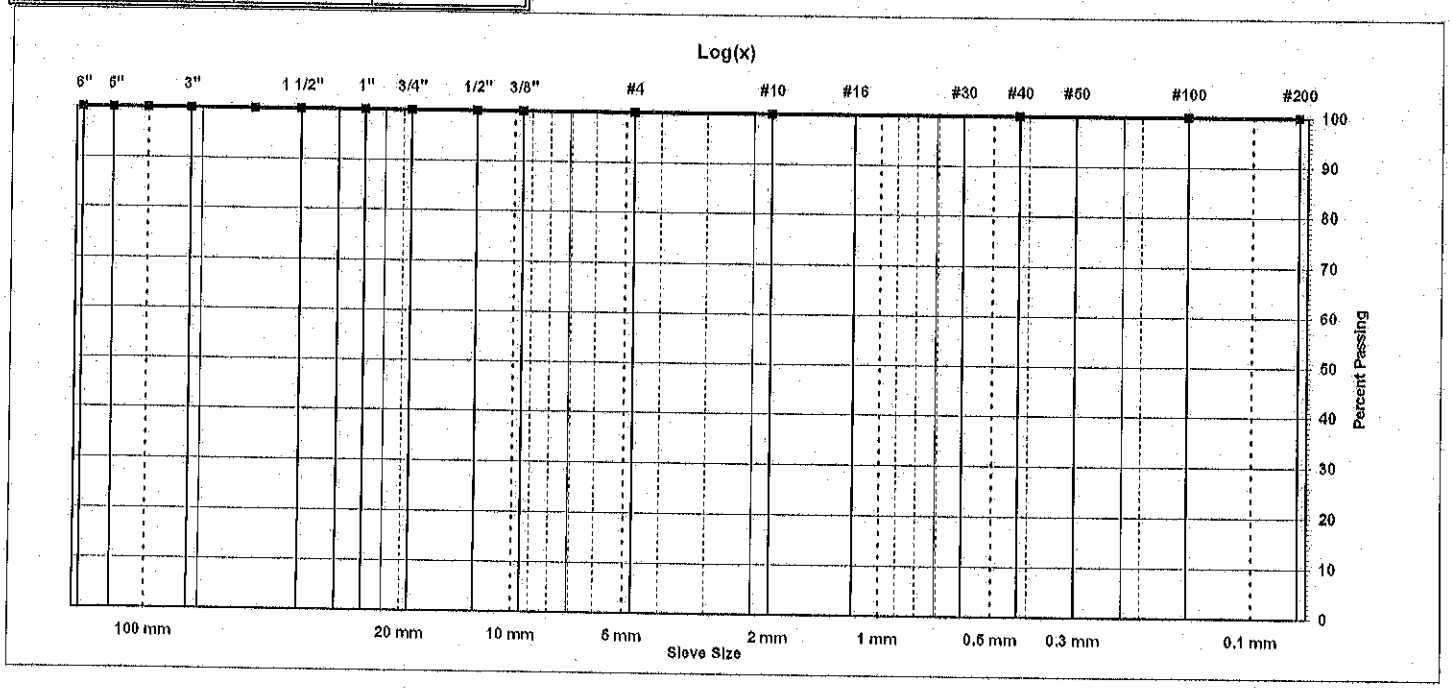
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	NP		D 4318
Plasticity Index	NP		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2228

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-4 @ 28' **Authorized By:** Client **Date:** 6/29/2007

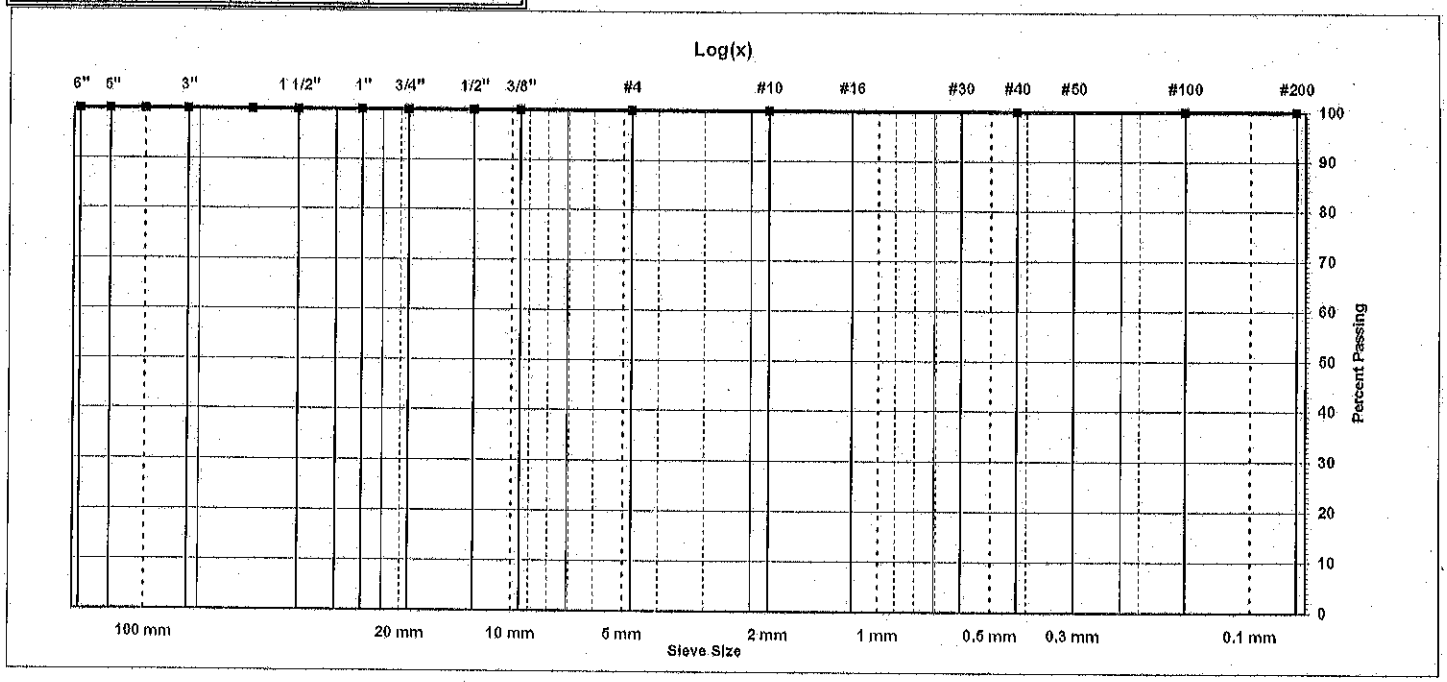
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	NP		D 4318
Plasticity Index	NP		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2229

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Silty
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: A-4 @ 33'
Authorized By: Client **Date:** 6/29/2007

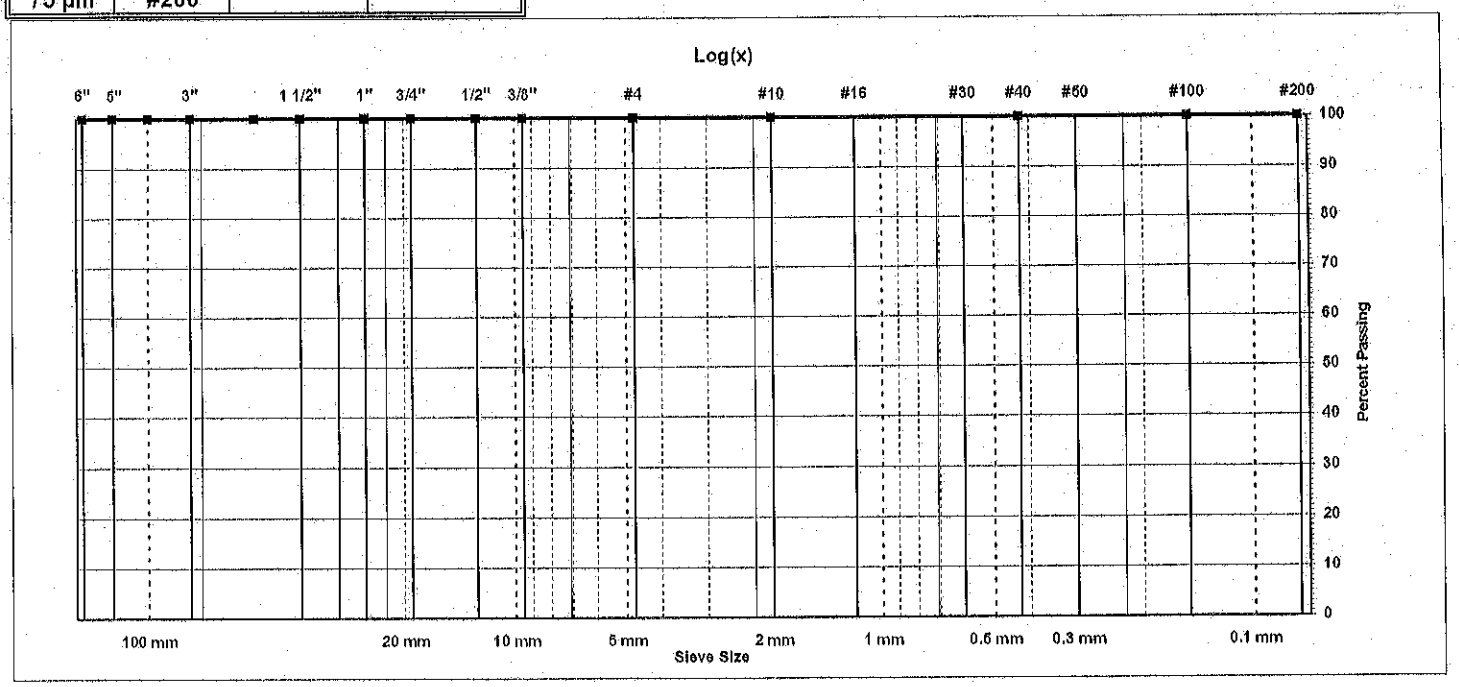
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	NP		D 4318
Plasticity Index	NP		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2232

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-5 @ 10' **Authorized By:** Client **Date:** 6/29/2007

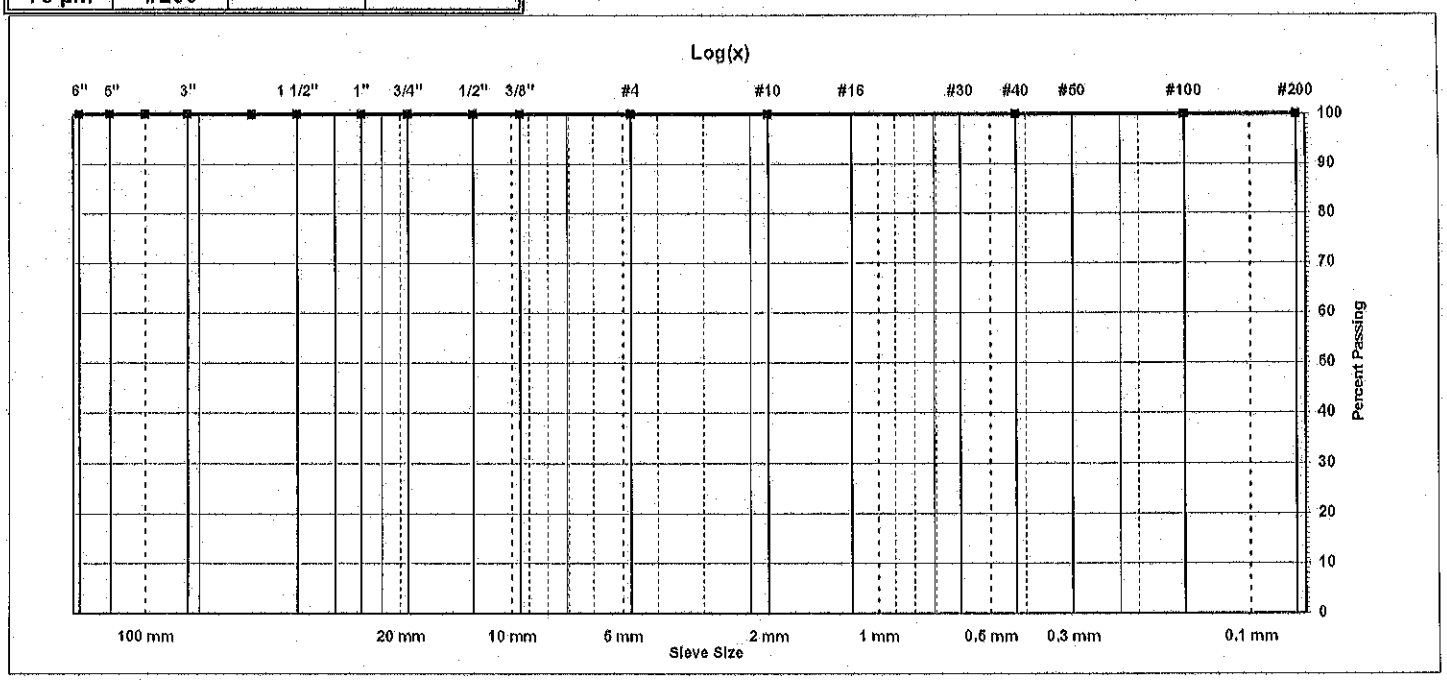
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	20.1		D2216
Liquid Limit	56		D 4318
Plasticity Index	33		D 4318
Dry Unit Weight, pcf	46.6		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2235

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-6 @ 10' **Authorized By:** Client **Date:** 6/29/2007

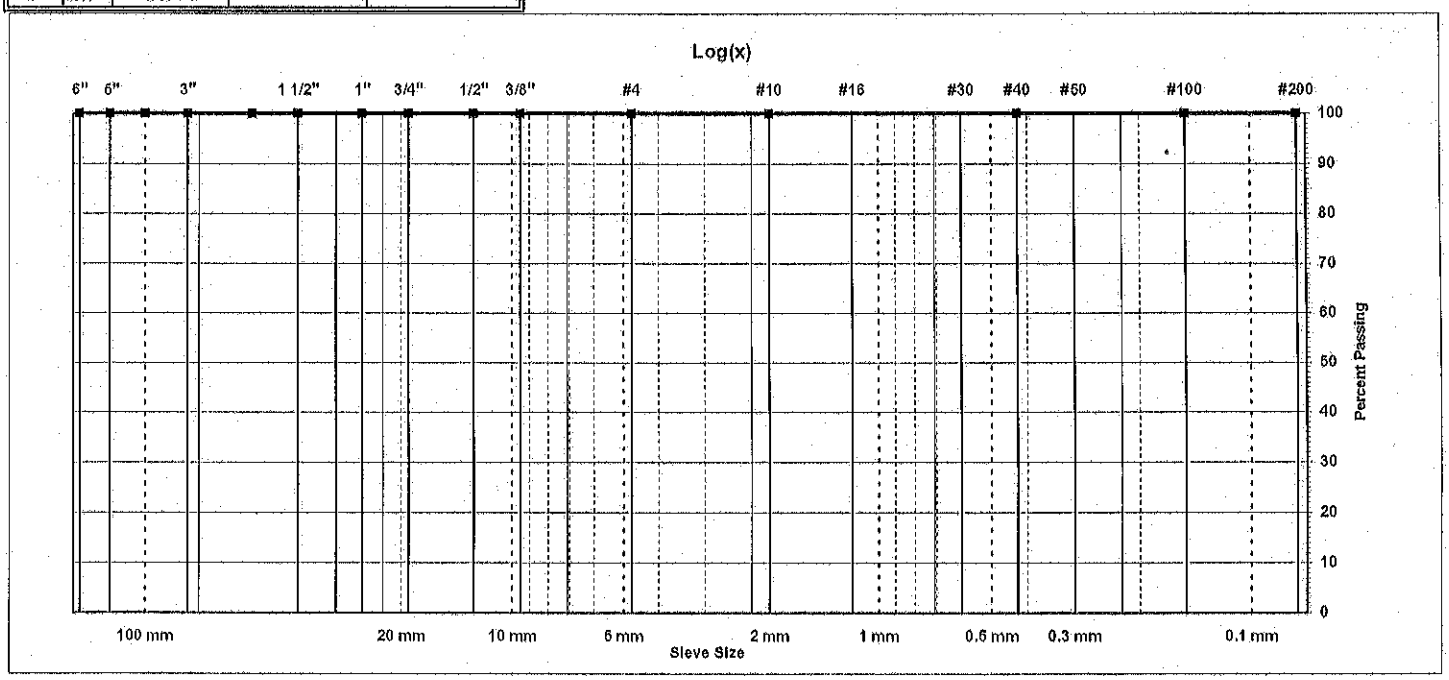
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	39		D 4318
Plasticity Index	17		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2237

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: A-7 @ 5'
Authorized By: Client **Date:** 6/29/2007

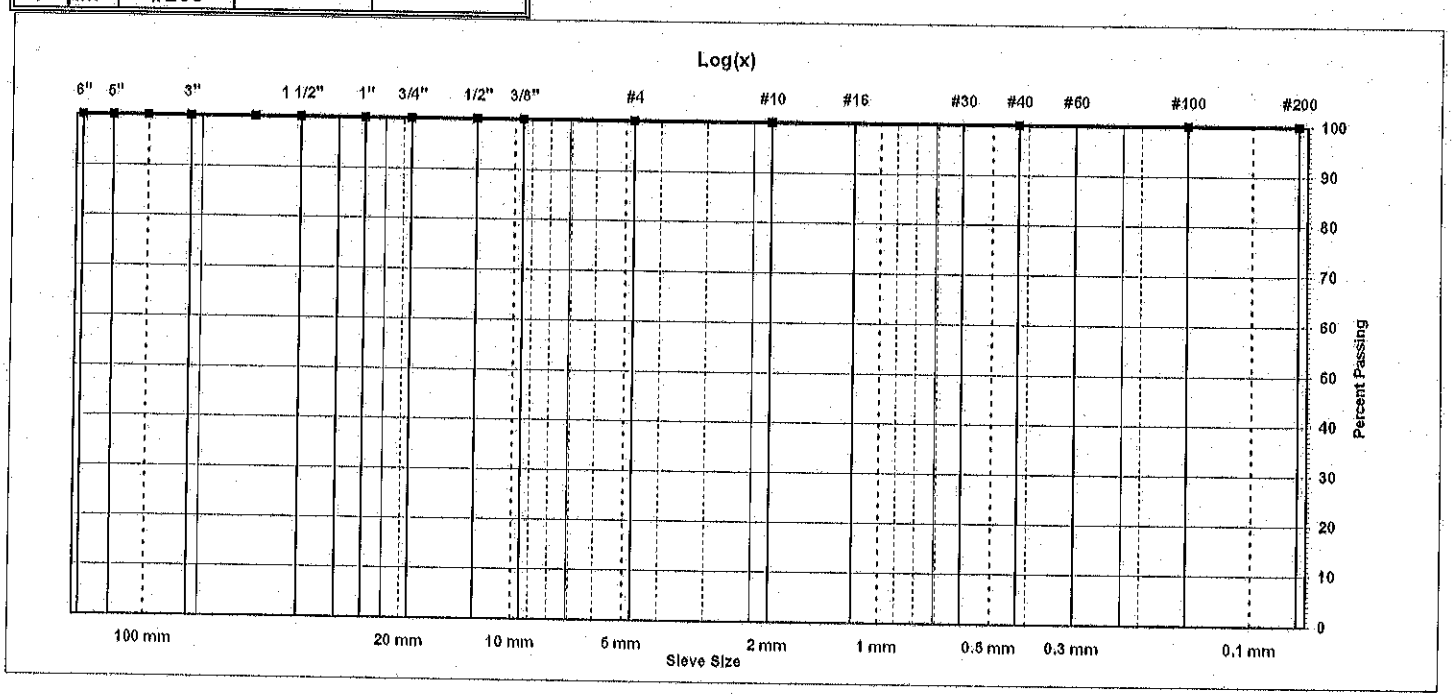
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	29		D 4318
Plasticity Index	16		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2263

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-2 @ 10' **Authorized By:** Client **Date:** 6/29/2007

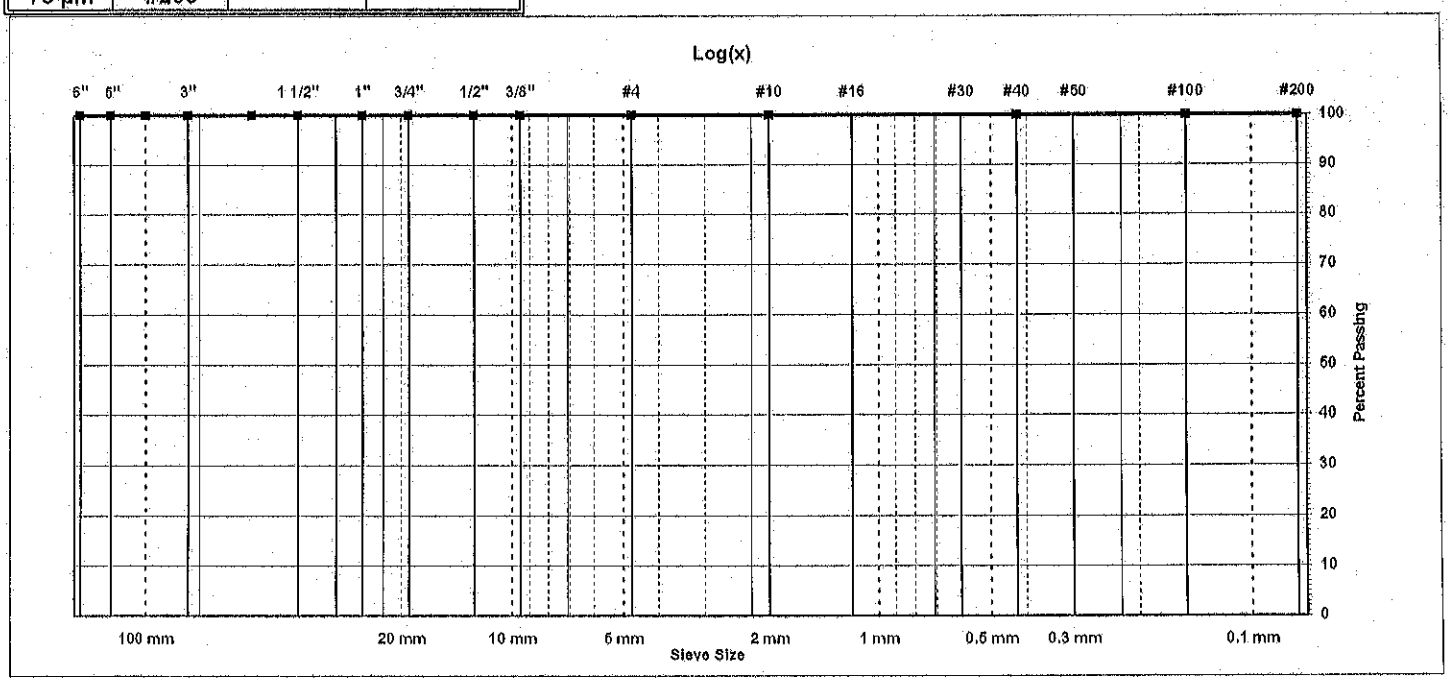
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	29		D 4318
Plasticity Index	9		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2270

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-5 @ 10' **Authorized By:** Client **Date:** 6/29/2007

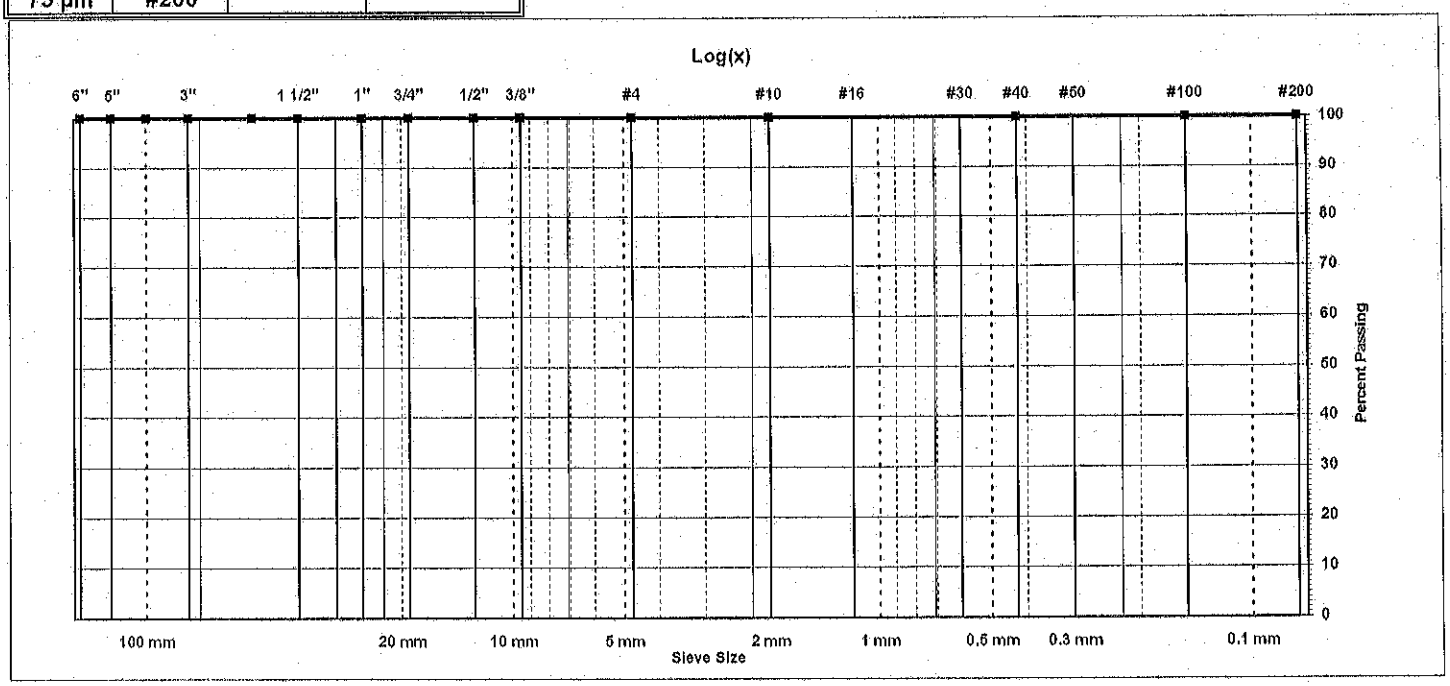
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	42		D 4318
Plasticity Index	23		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2271

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-5 @ 15' **Authorized By:** Client **Date:** 6/29/2007

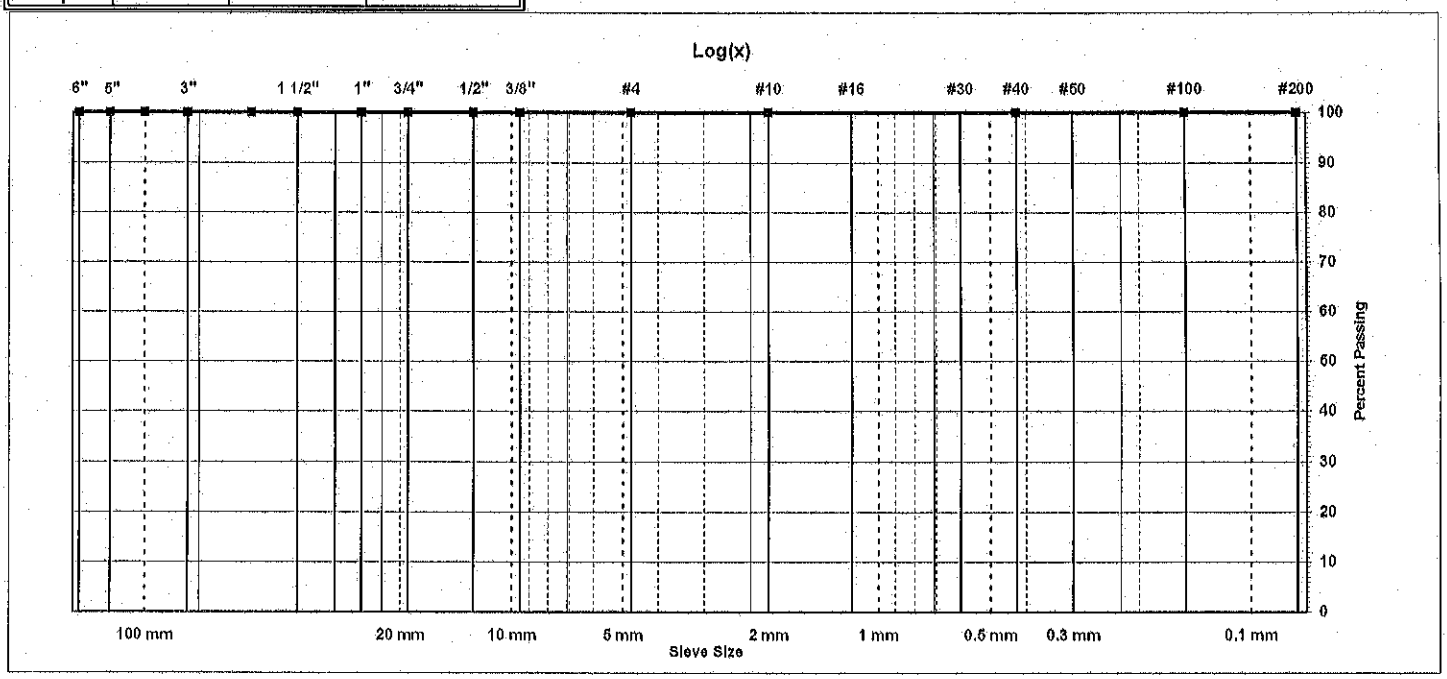
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	37		D 4318
Plasticity Index	15		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2274

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Fat clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-6 @ 15' **Authorized By:** Client **Date:** 6/29/2007

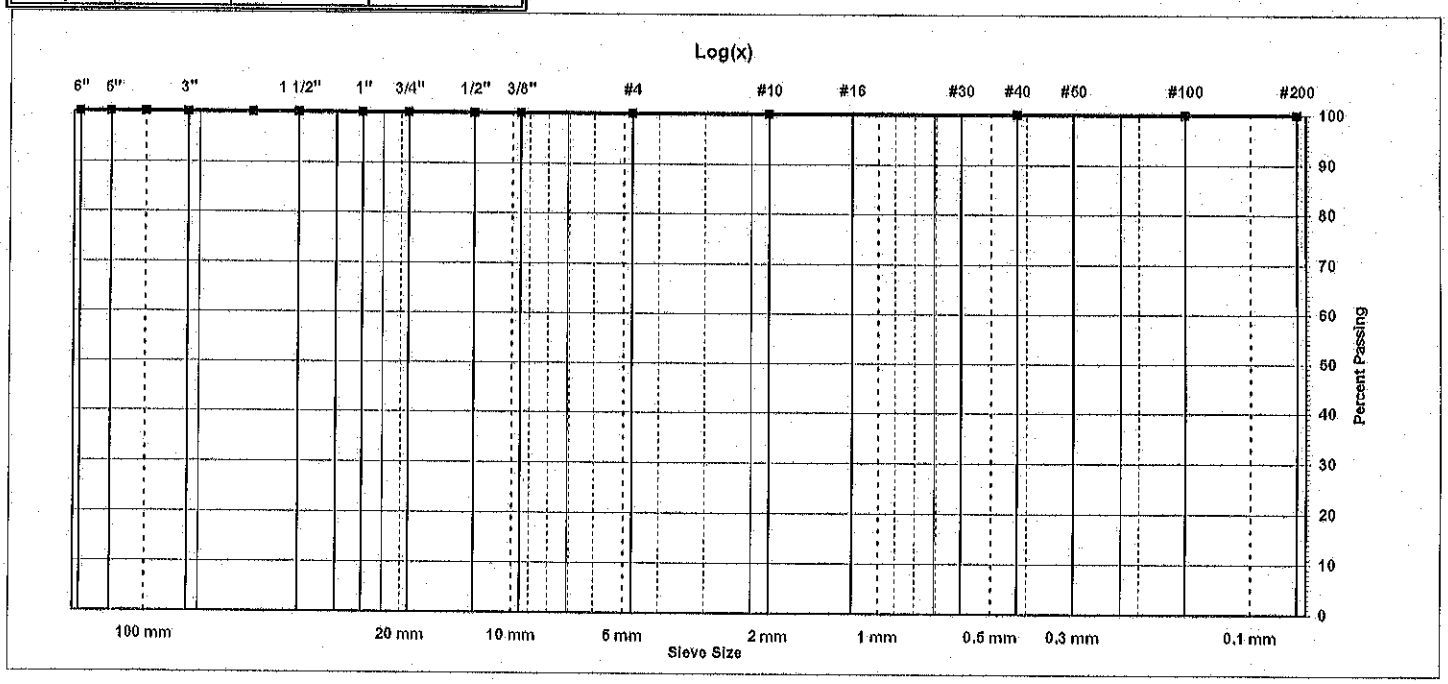
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	50		D 4318
Plasticity Index	23		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2275

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-6 @ 20' **Authorized By:** Client **Date:** 6/29/2007

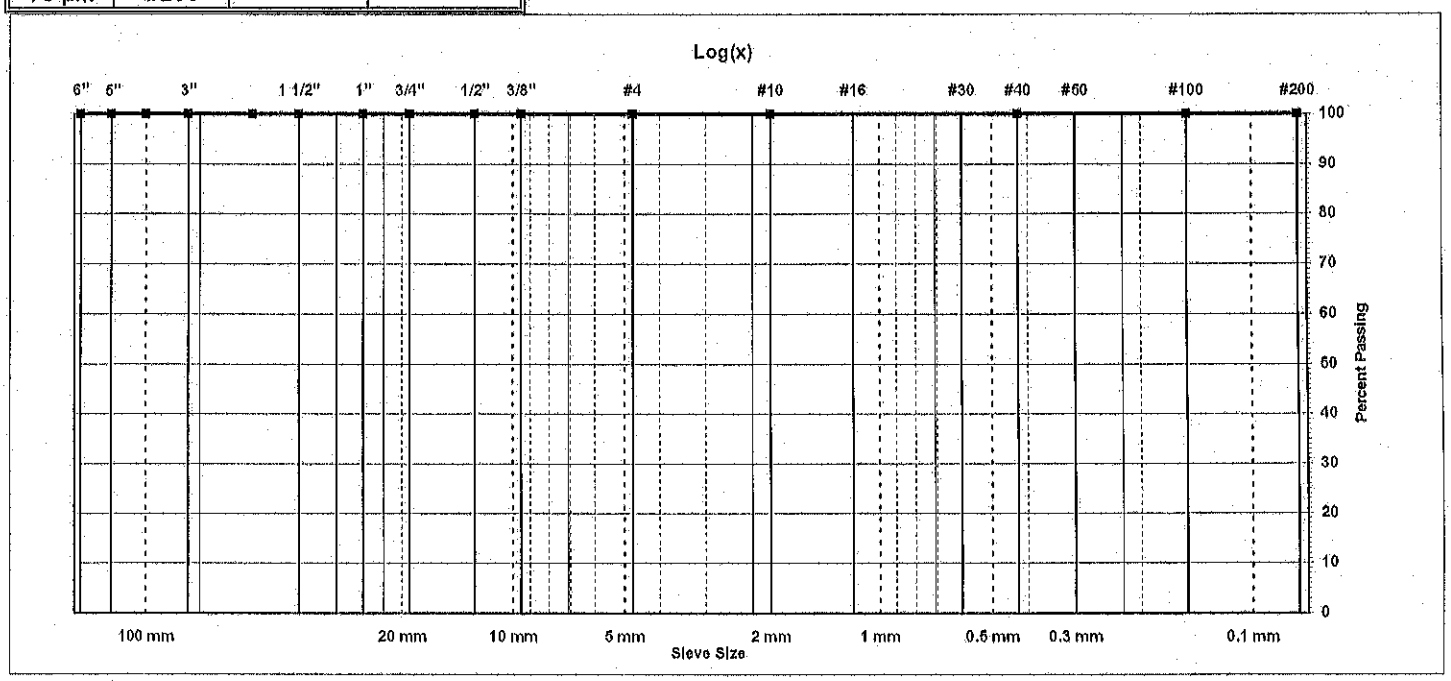
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	44		D 4318
Plasticity Index	18		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2277

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-7 @ 5' **Authorized By:** Client **Date:** 6/29/2007

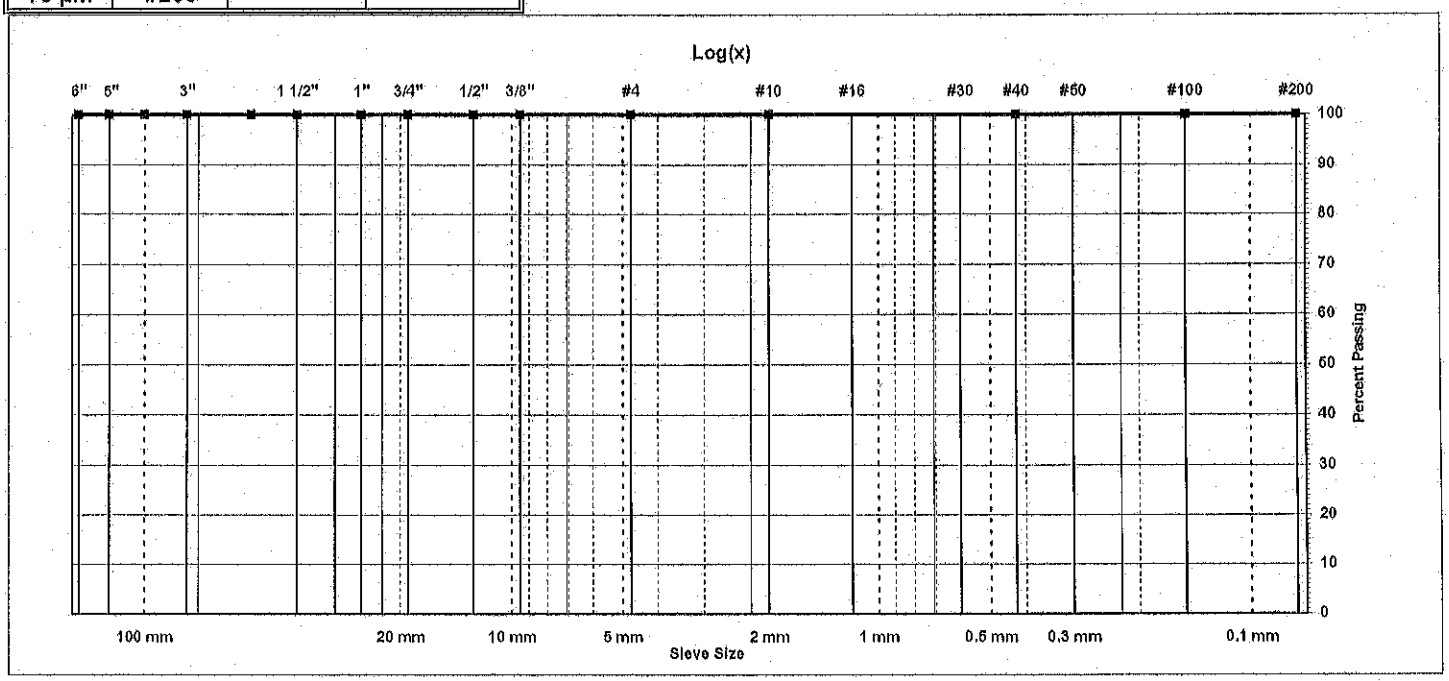
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	34		D 4318
Plasticity Index	11		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2281

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-9 @ 17' **Authorized By:** Client **Date:** 6/29/2007

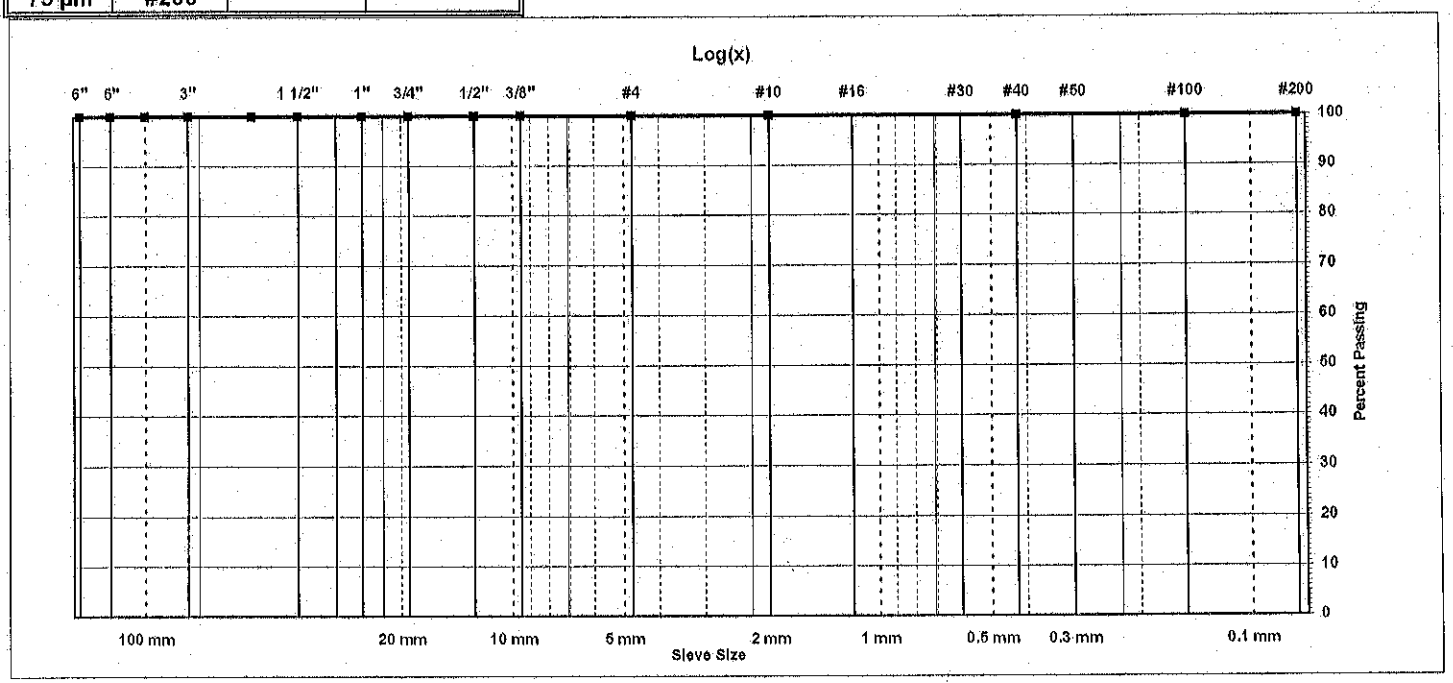
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	44		D 4318
Plasticity Index	21		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2282

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Lean clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-9 @ 27' **Authorized By:** Client **Date:** 6/29/2007

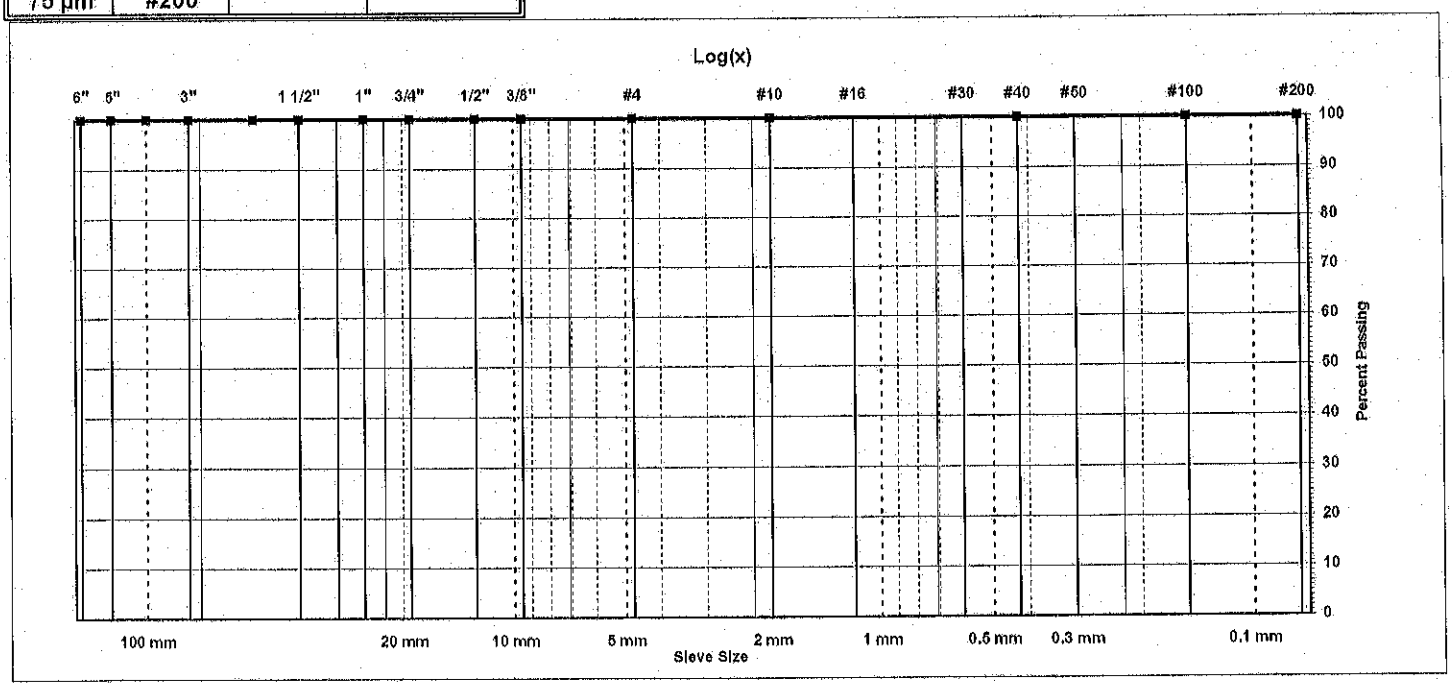
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	49		D 4318
Plasticity Index	24		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2193

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 8' **Authorized By:** Client **Date:** 6/29/2007

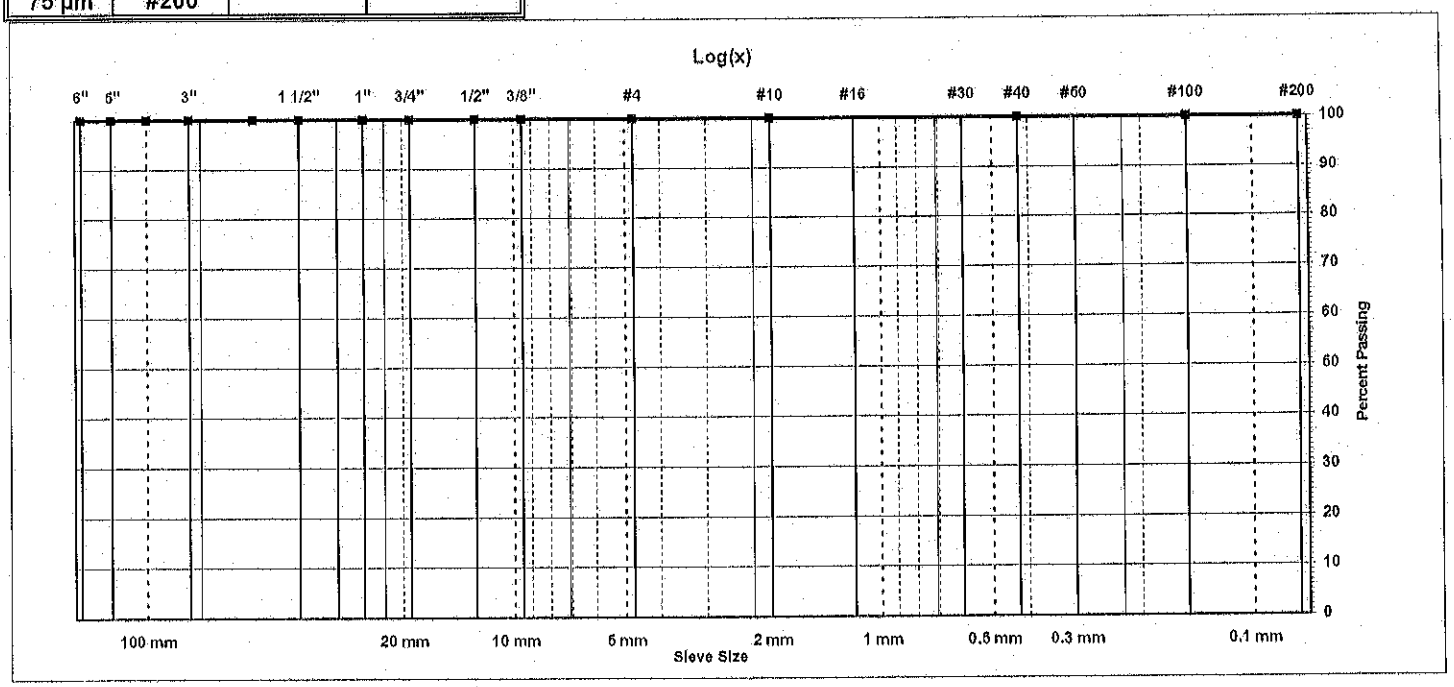
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.2		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2192

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 5' **Authorized By:** Client **Date:** 6/29/2007

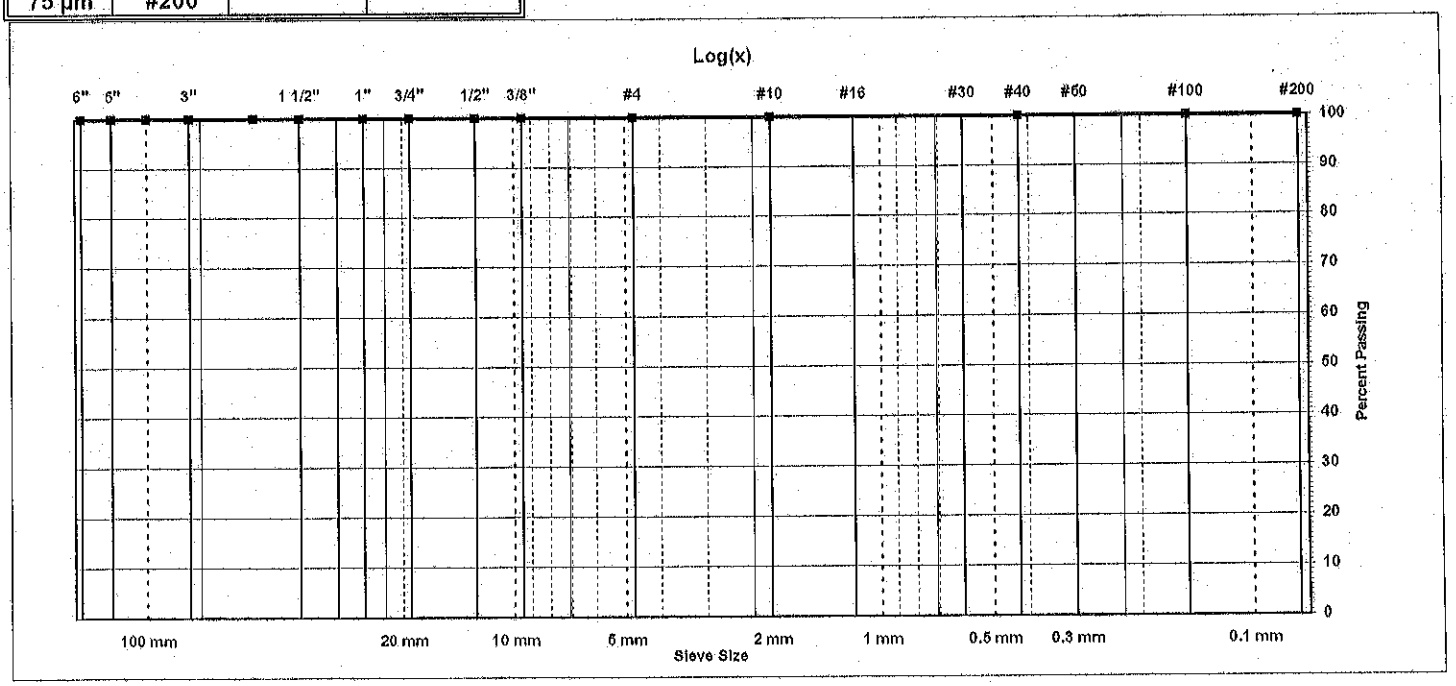
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2045

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-2 @ 5' **Authorized By:** Client **Date:** 6/29/2007

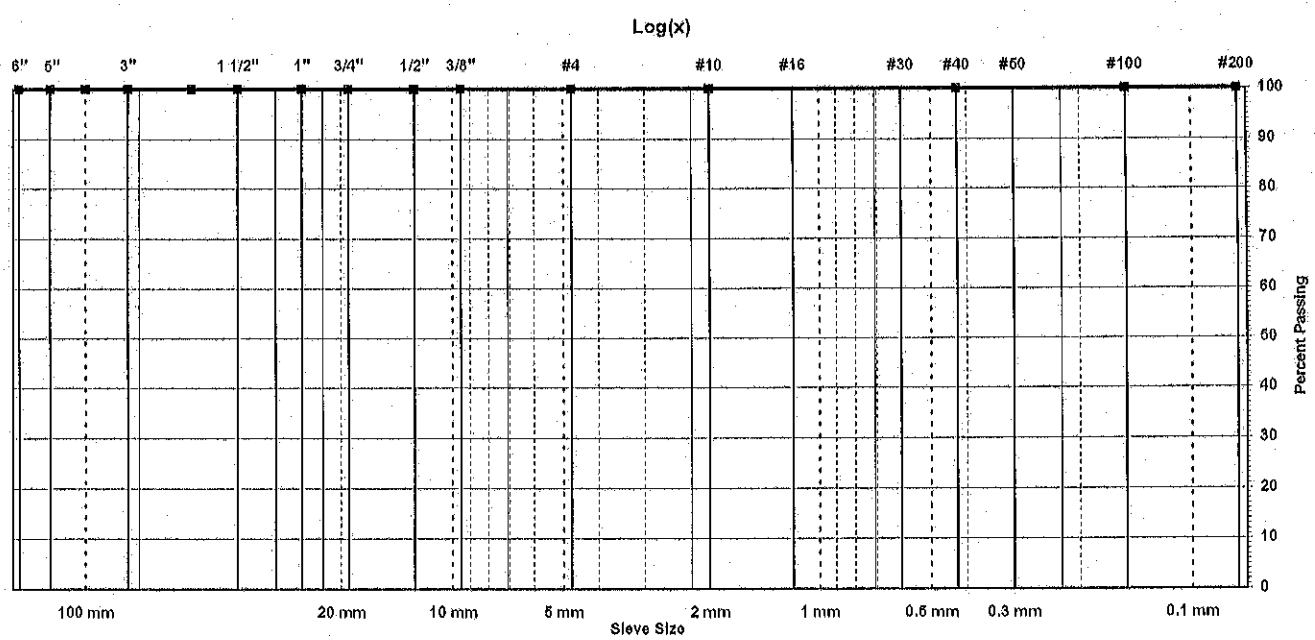
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.5		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	99.3		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2047

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-3 @ 2' **Authorized By:** Client **Date:** 6/29/2007

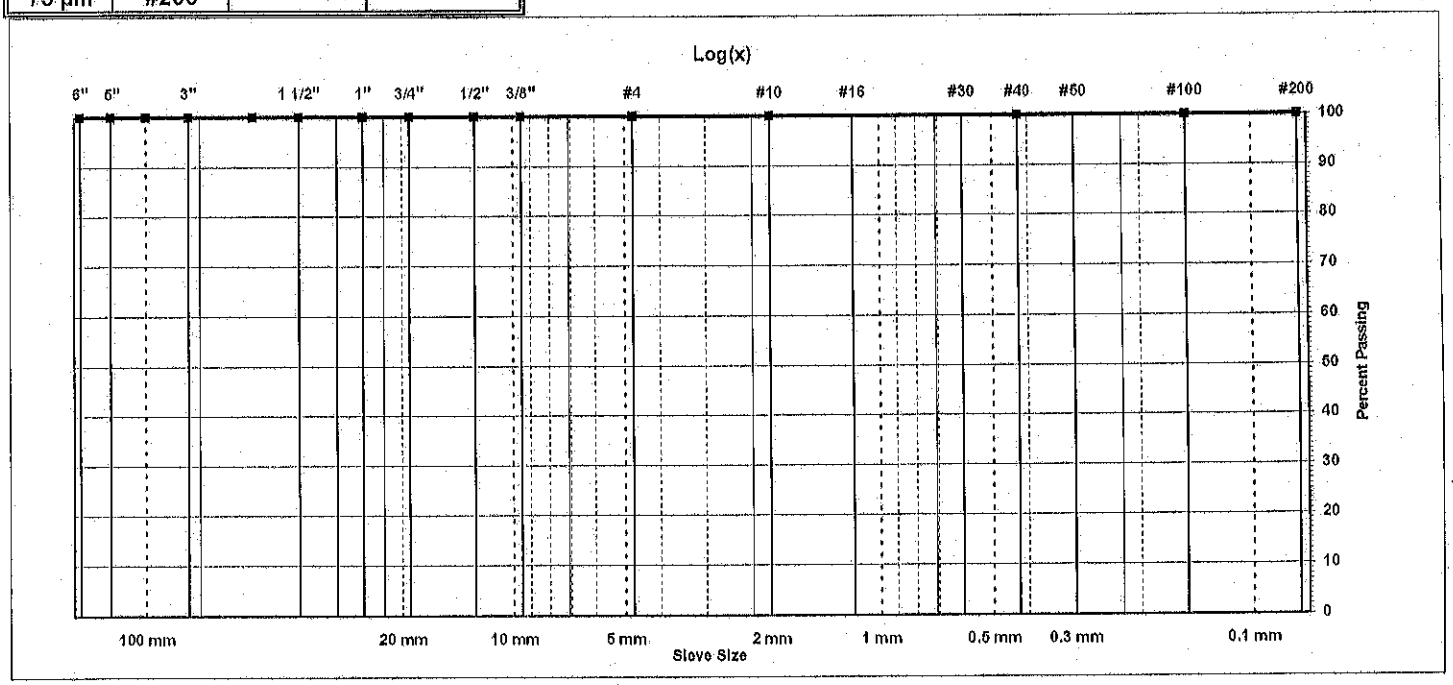
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	109.5		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2285

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 1' **Authorized By:** Client **Date:** 6/29/2007

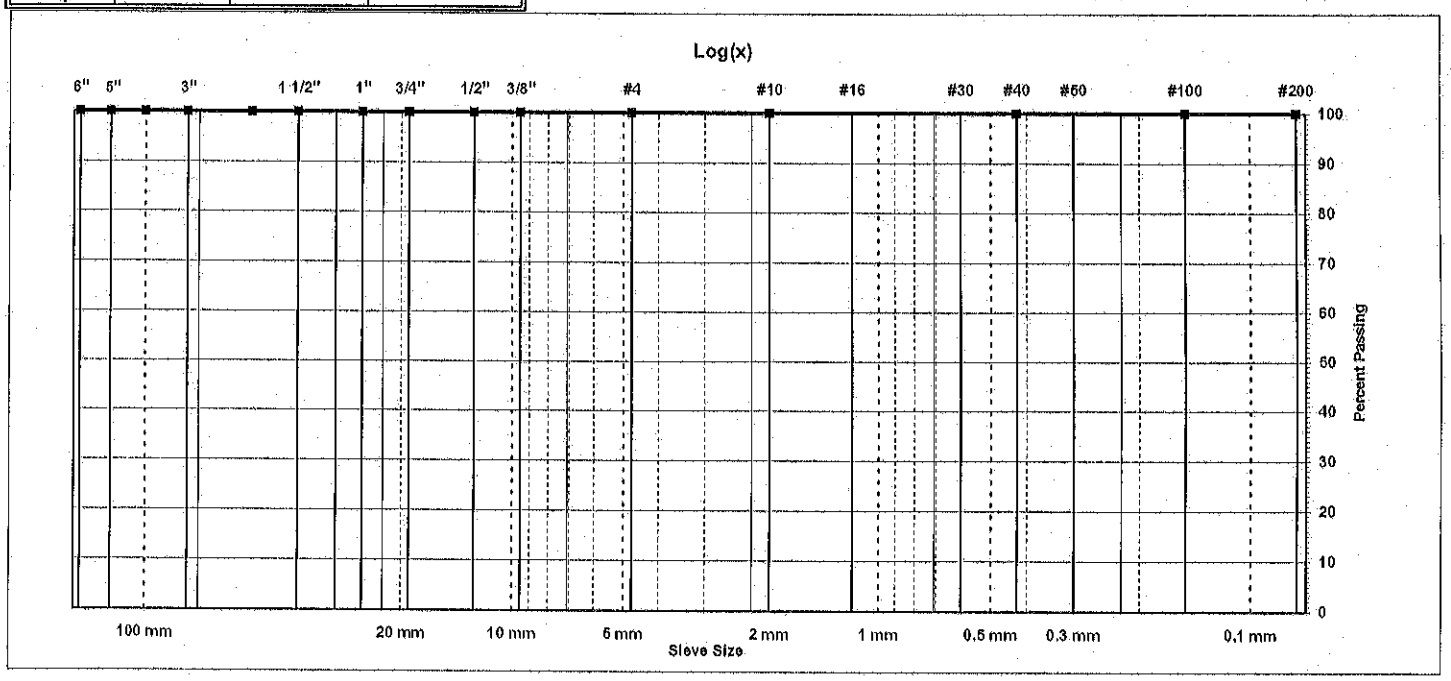
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2286

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 6' **Authorized By:** Client **Date:** 6/29/2007

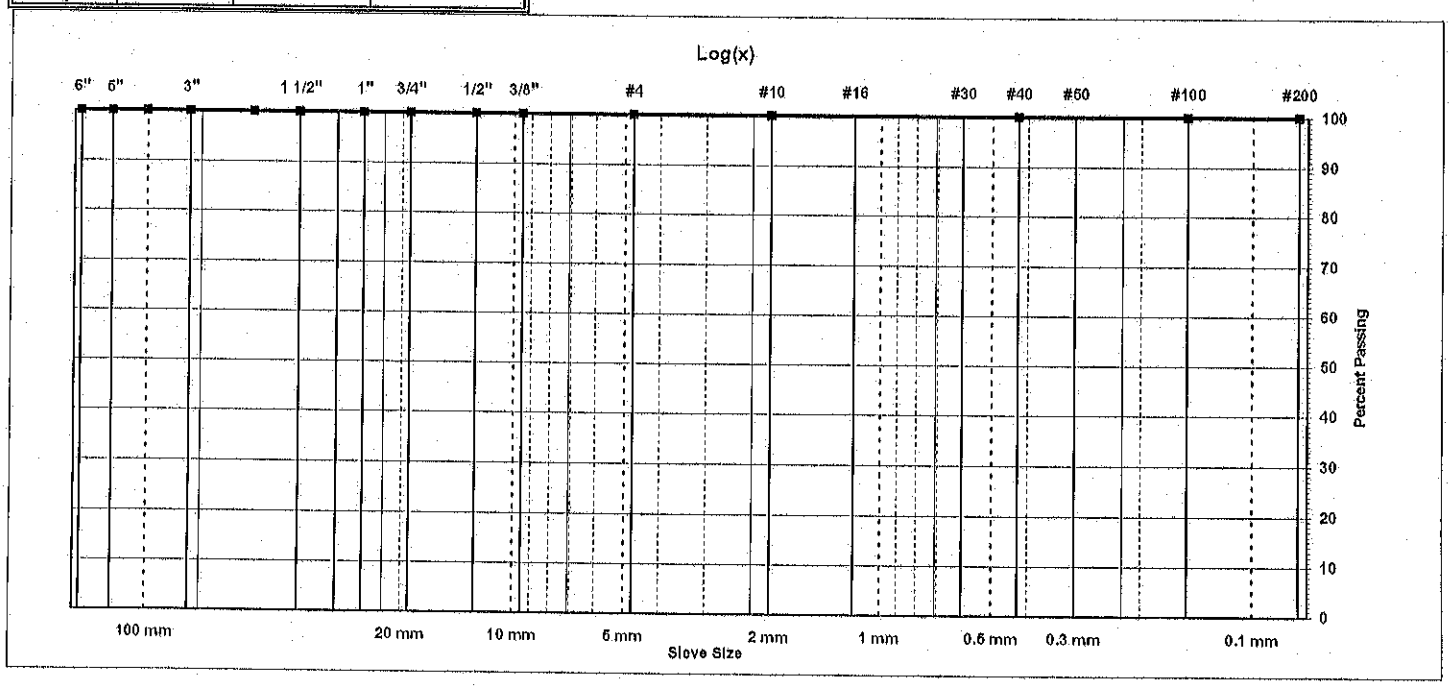
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	19.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2289

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample:
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: WT-4 @ 12'
Authorized By: Client **Date:** 6/29/2007

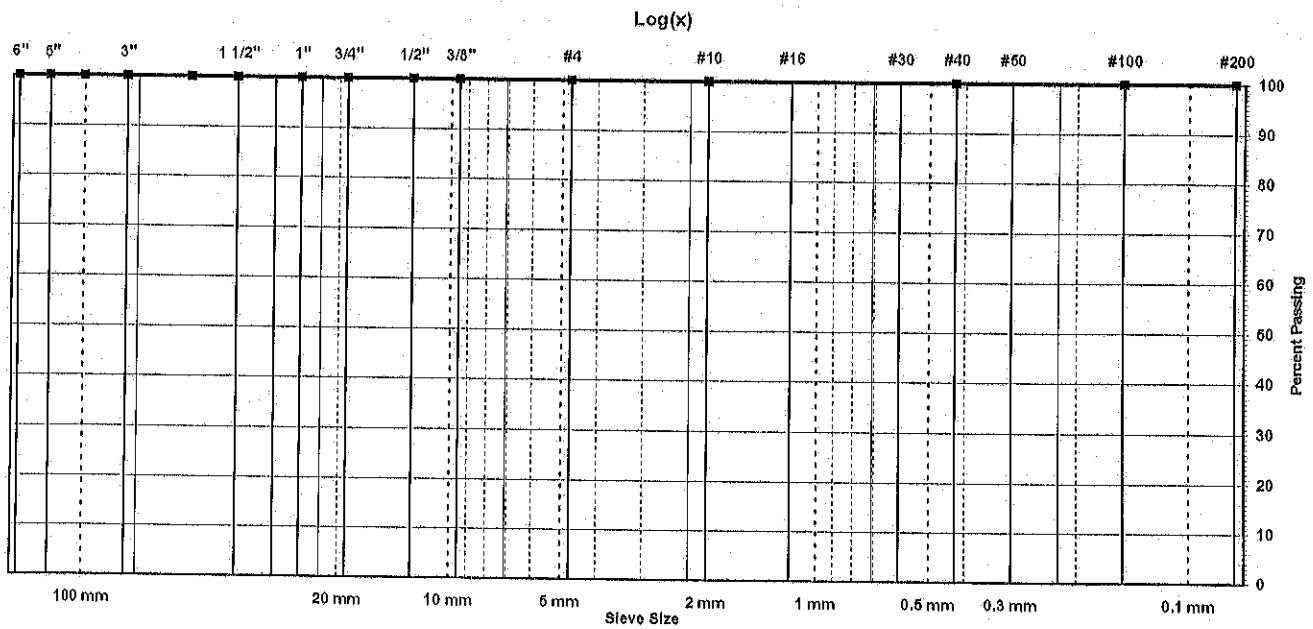
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	10.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2058

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-5 @ 42' **Authorized By:** Client **Date:** 6/29/2007

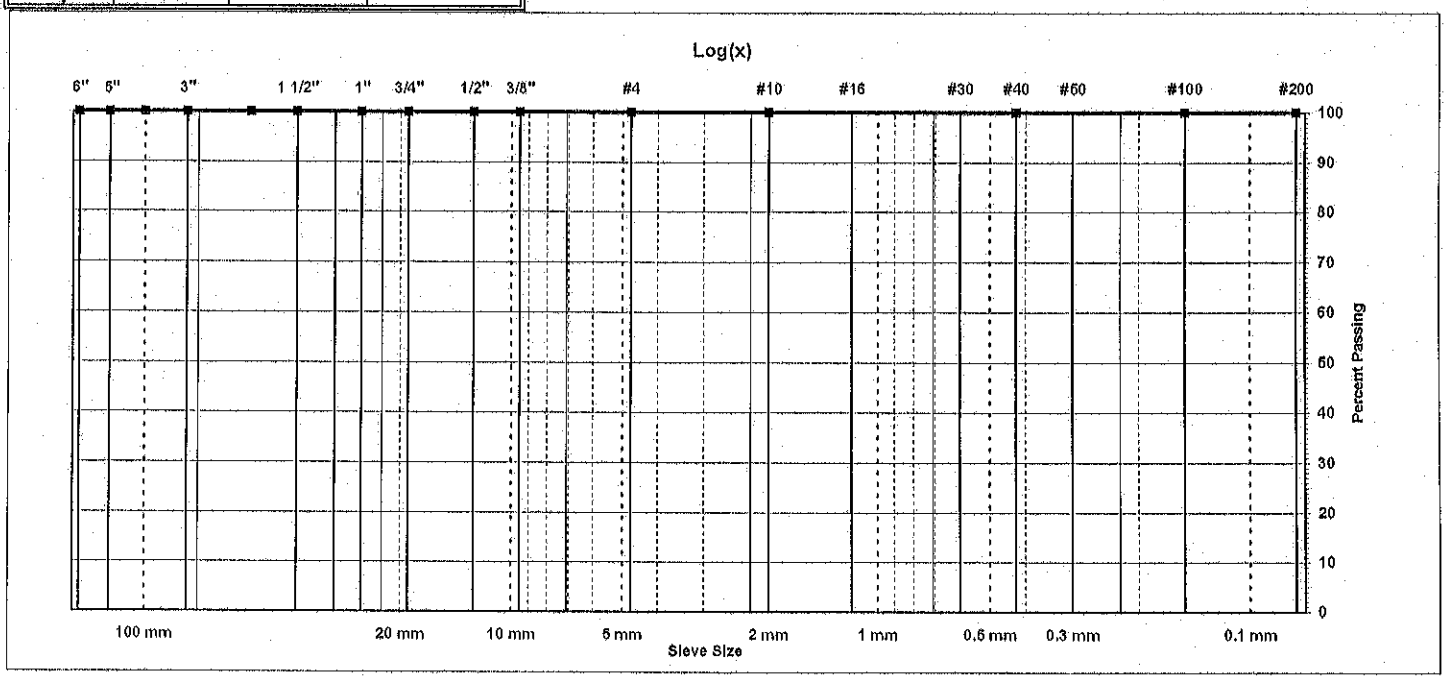
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	18.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	104.0		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2059

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-6 @ 7' **Authorized By:** Client **Date:** 6/29/2007

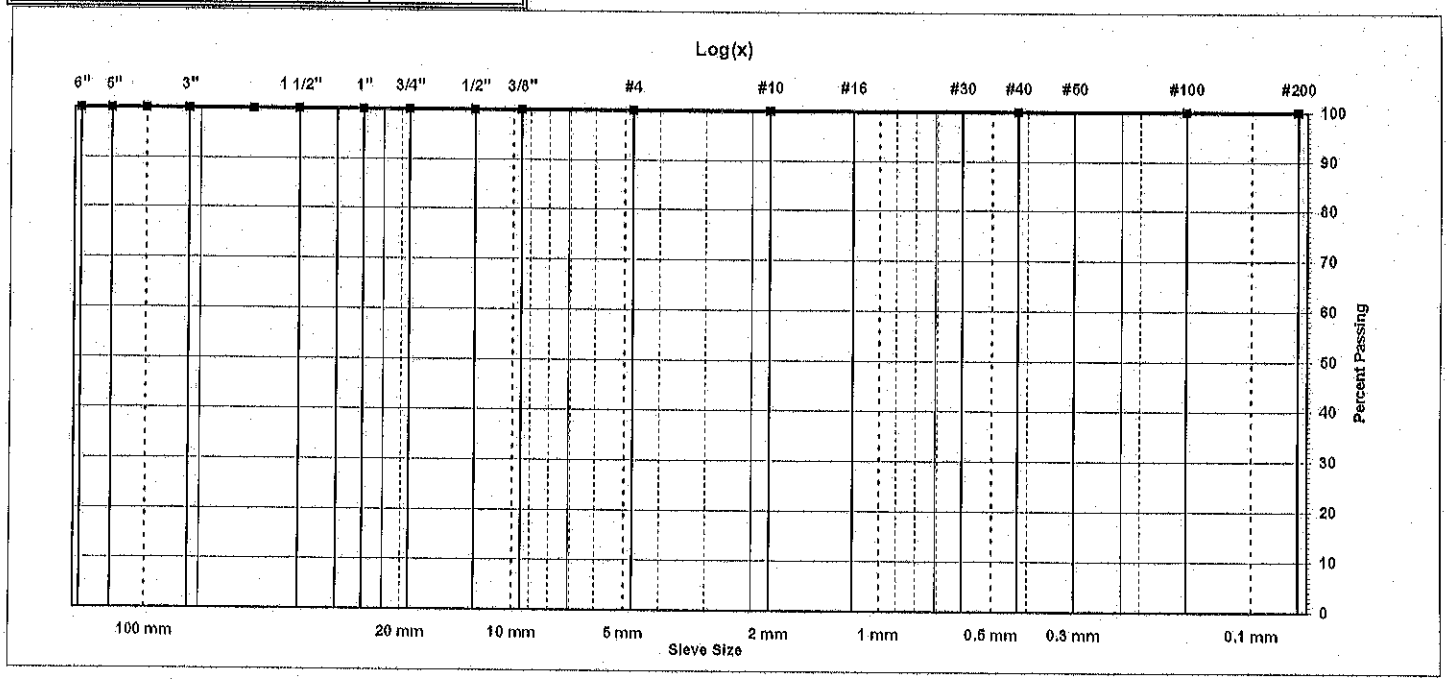
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	15.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	103.0		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2199

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample:
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: WT-8 @ 2'
Authorized By: Client **Date:** 6/29/2007

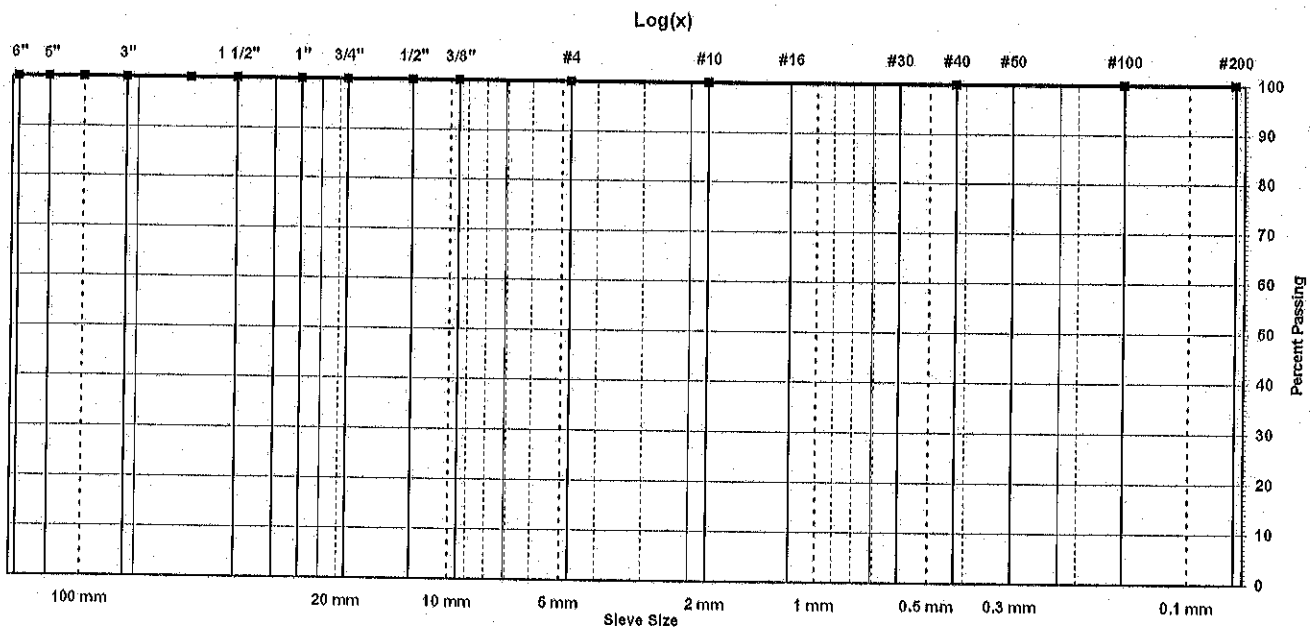
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.5		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2135

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-4 @ 27' **Authorized By:** Client **Date:** 6/29/2007

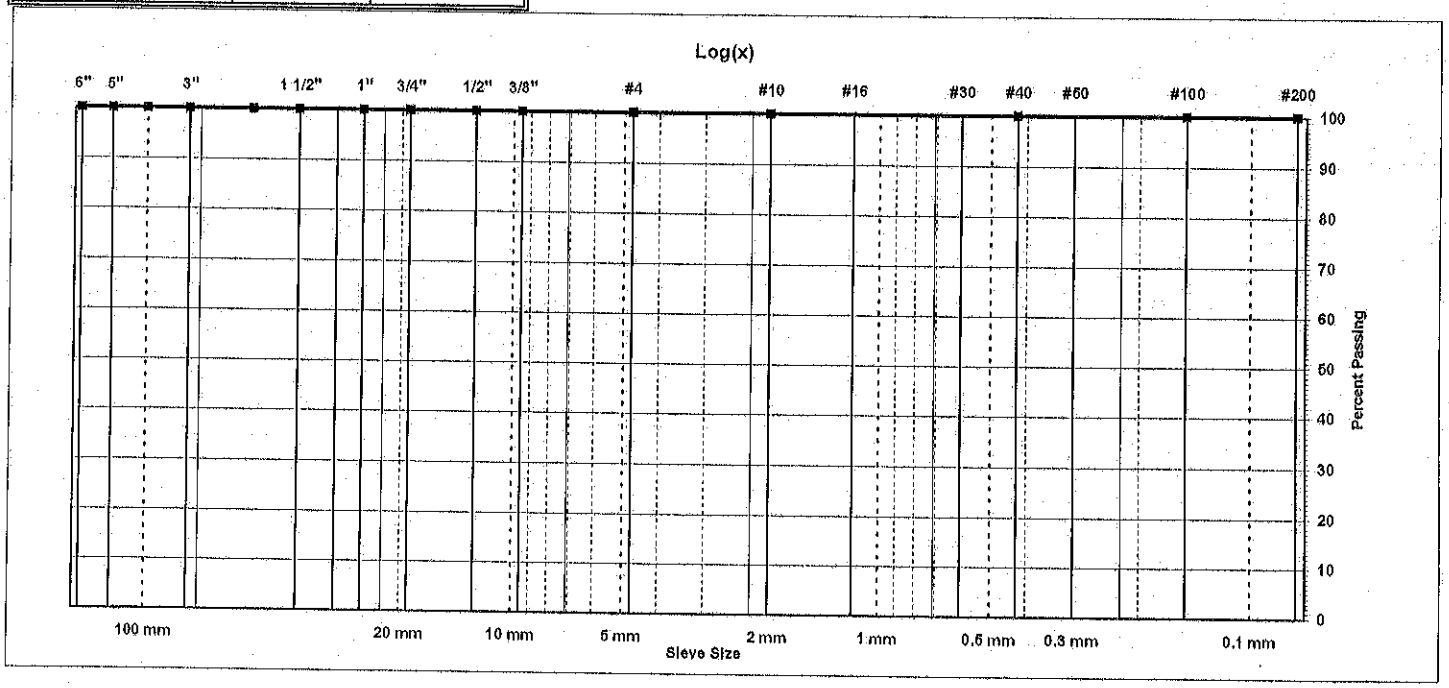
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	14.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	102.6		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2138

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 6/29/2007
Type of Sample:
Tested By: A. Whipple **Date:** 7/2/2007
Location of Sample: RW-5 @ 7'
Authorized By: Client **Date:** 6/29/2007

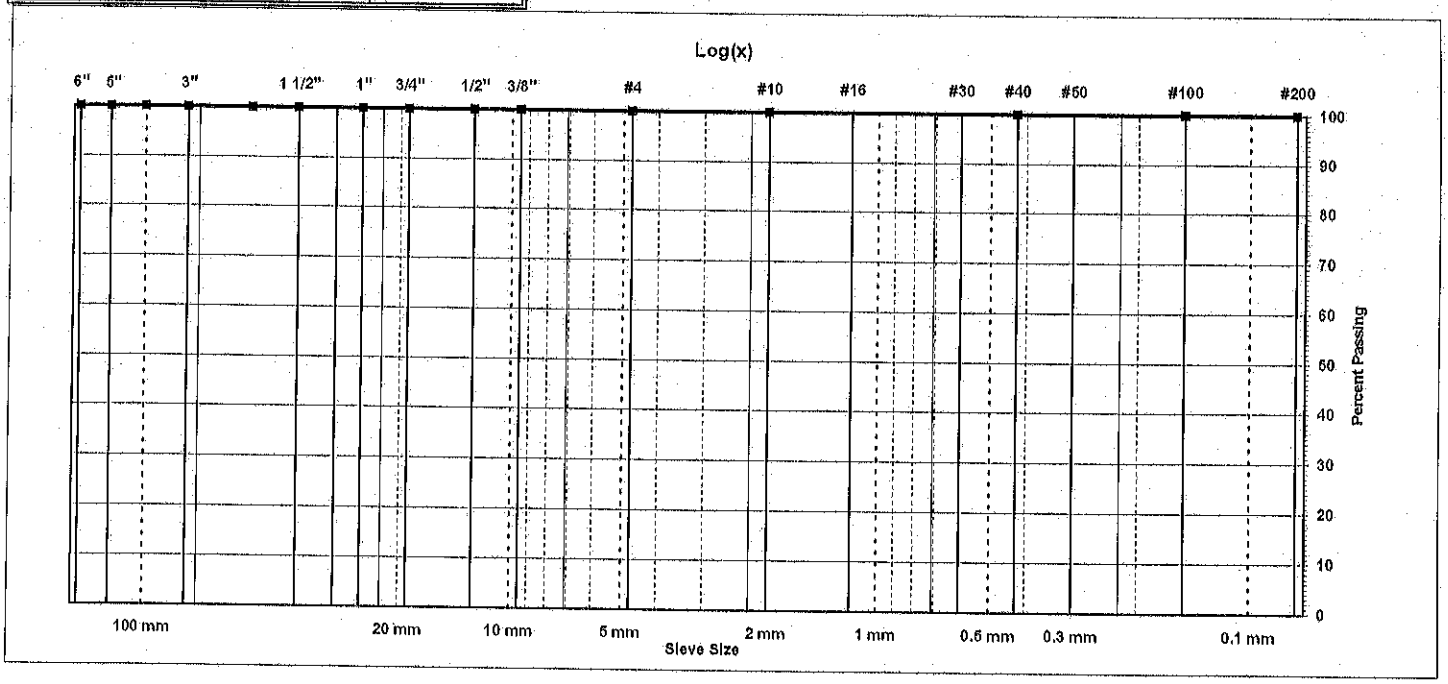
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.2		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	102.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2198

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-8 @ surface **Authorized By:** Client **Date:** 6/29/2007

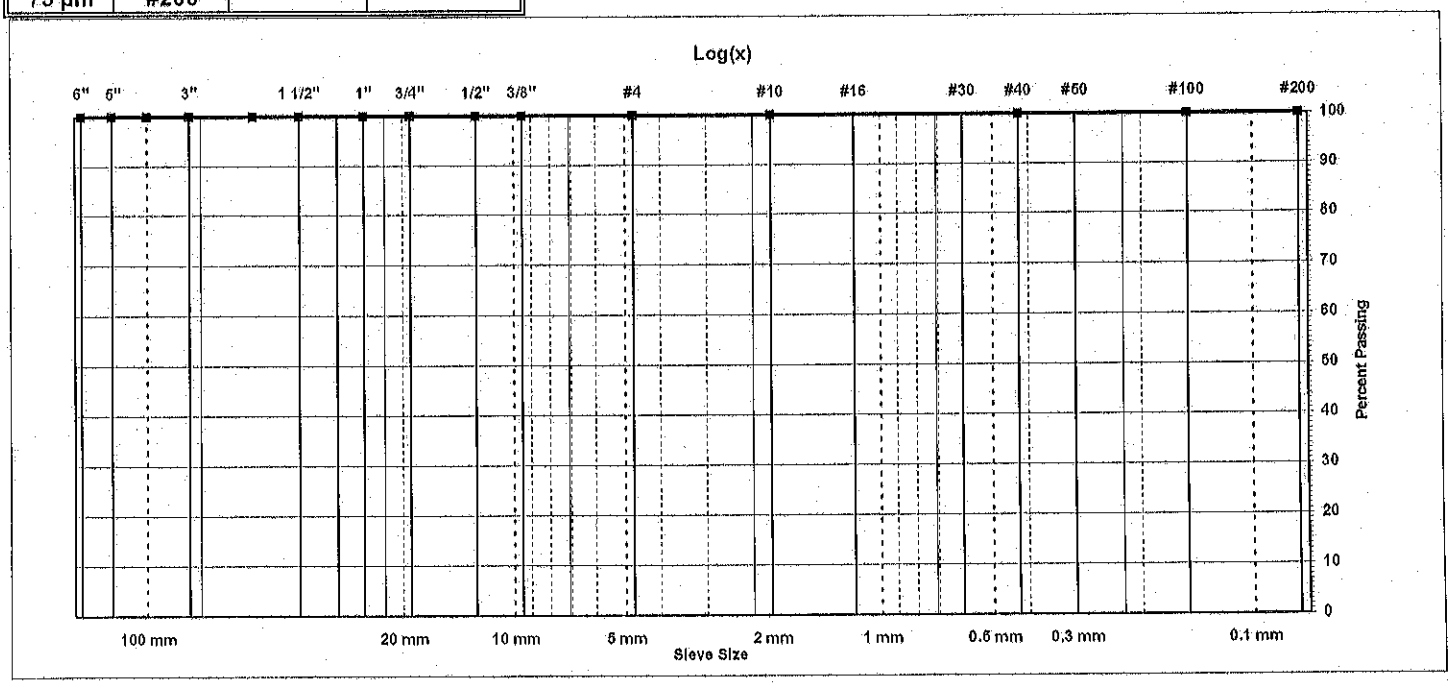
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	0.9		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2194

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-2 @ 2' **Authorized By:** Client **Date:** 6/29/2007

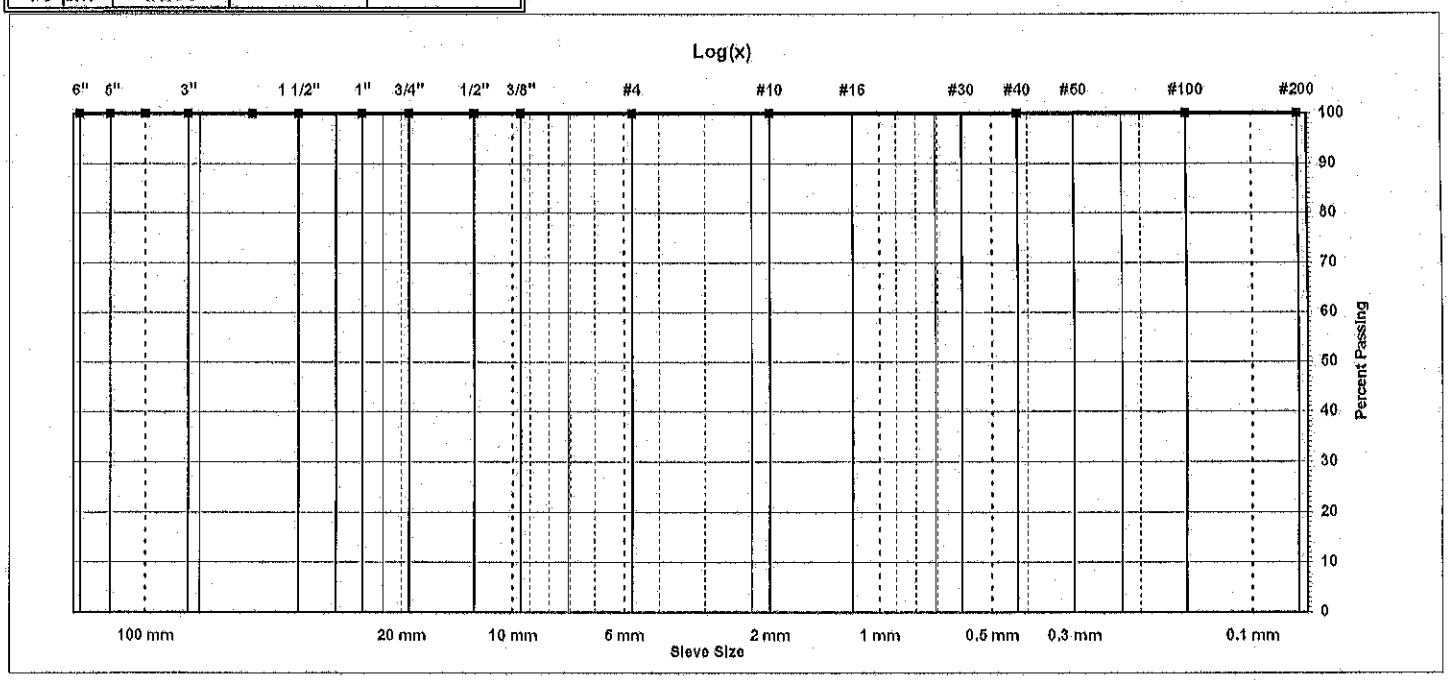
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2195

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-2 @ 5' **Authorized By:** Client **Date:** 6/29/2007

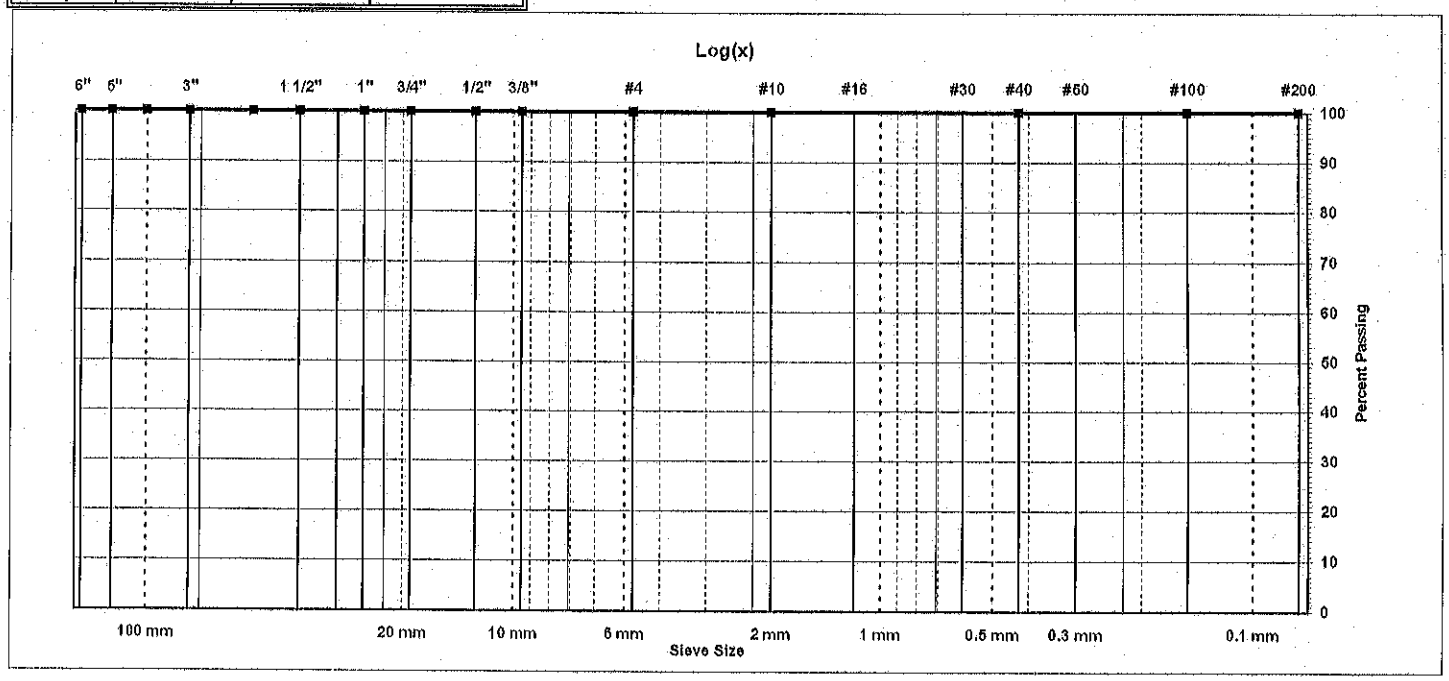
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2201

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 2' **Authorized By:** Client **Date:** 6/29/2007

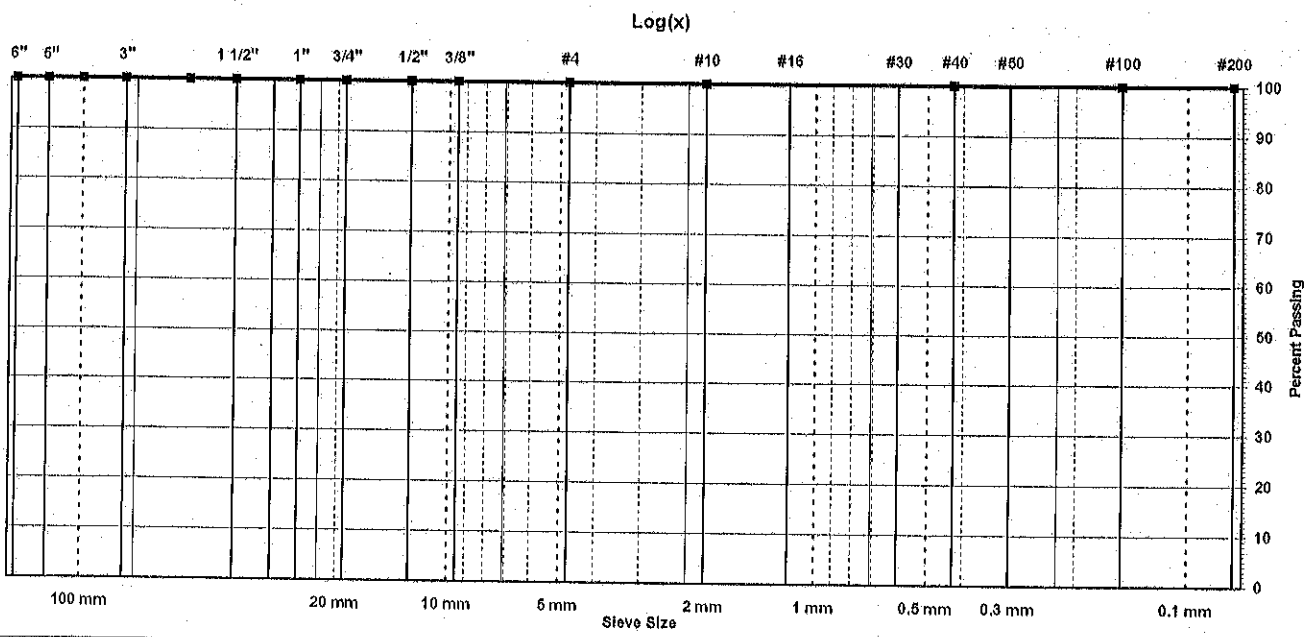
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	79.0		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2203

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 12' **Authorized By:** Client **Date:** 6/29/2007

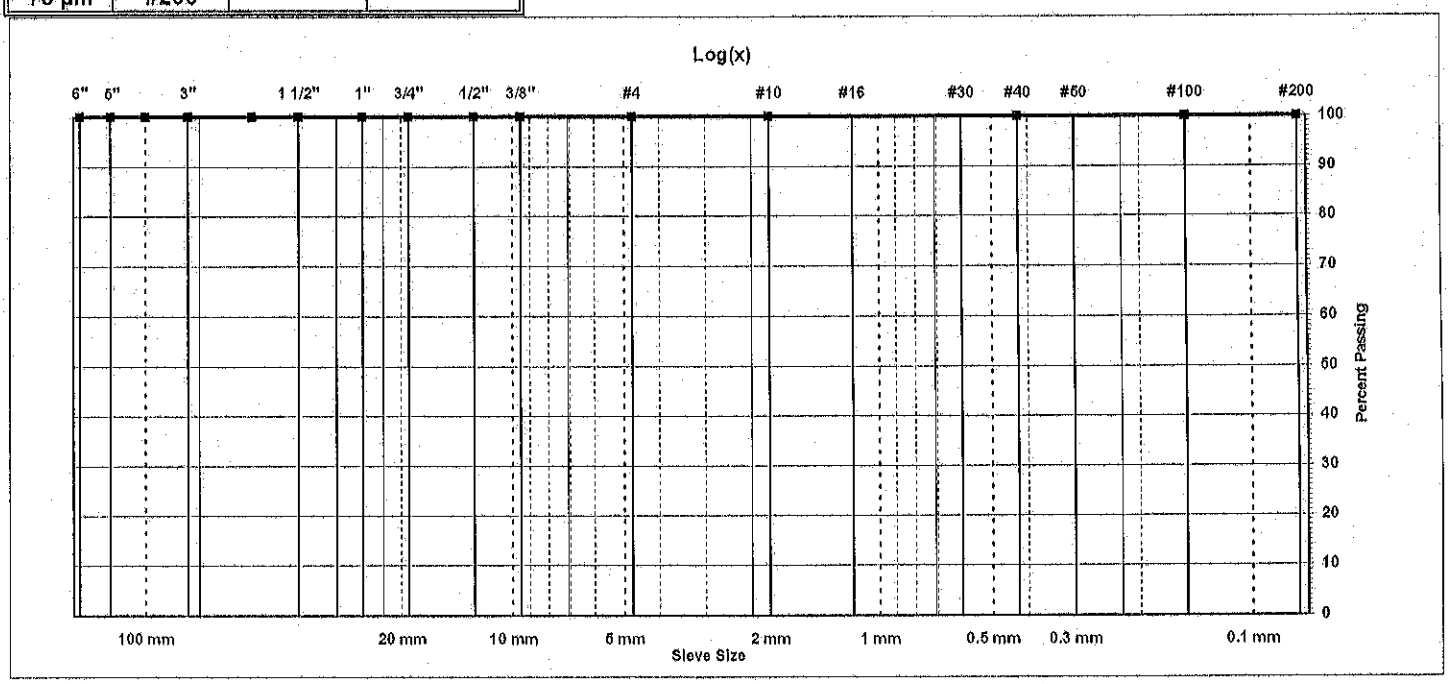
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	22.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	95.1		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2207

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-6 @ 32' **Authorized By:** Client **Date:** 6/29/2007

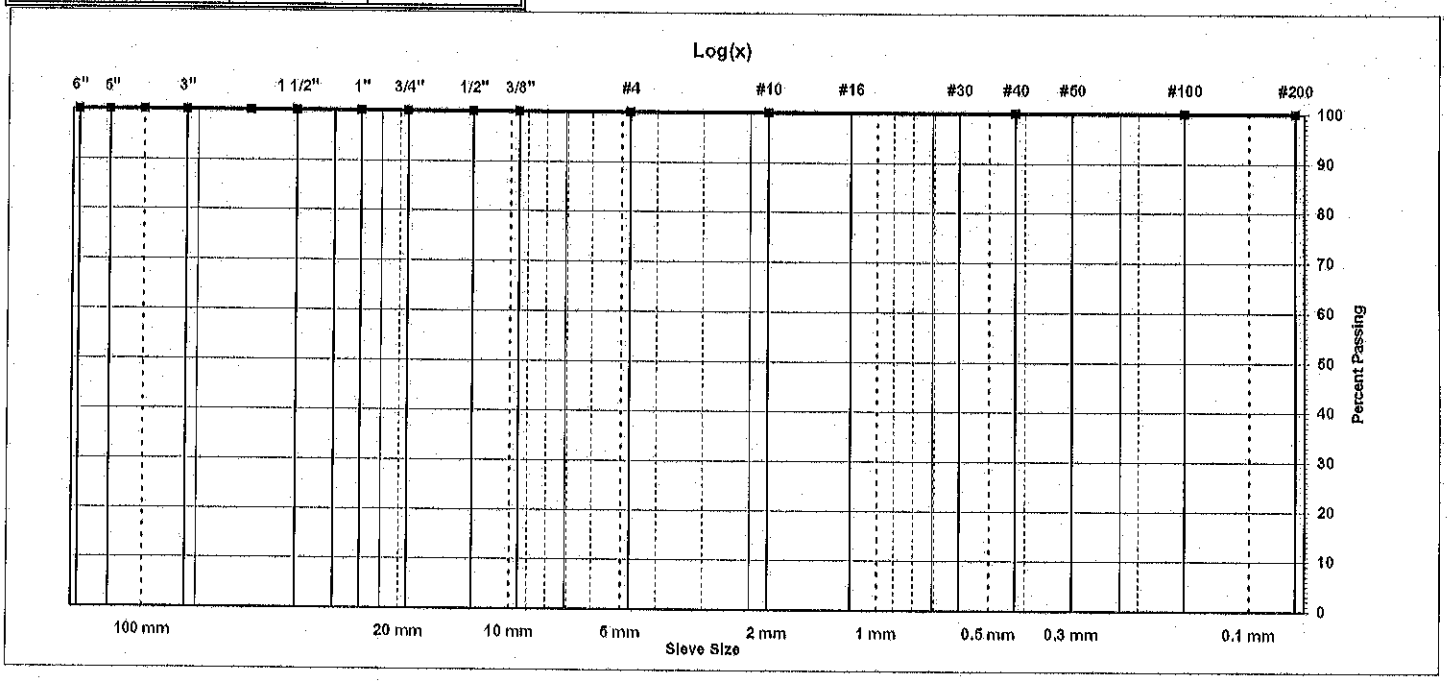
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	21.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	96.6		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2196

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-7 @ surface **Authorized By:** Client **Date:** 6/29/2007

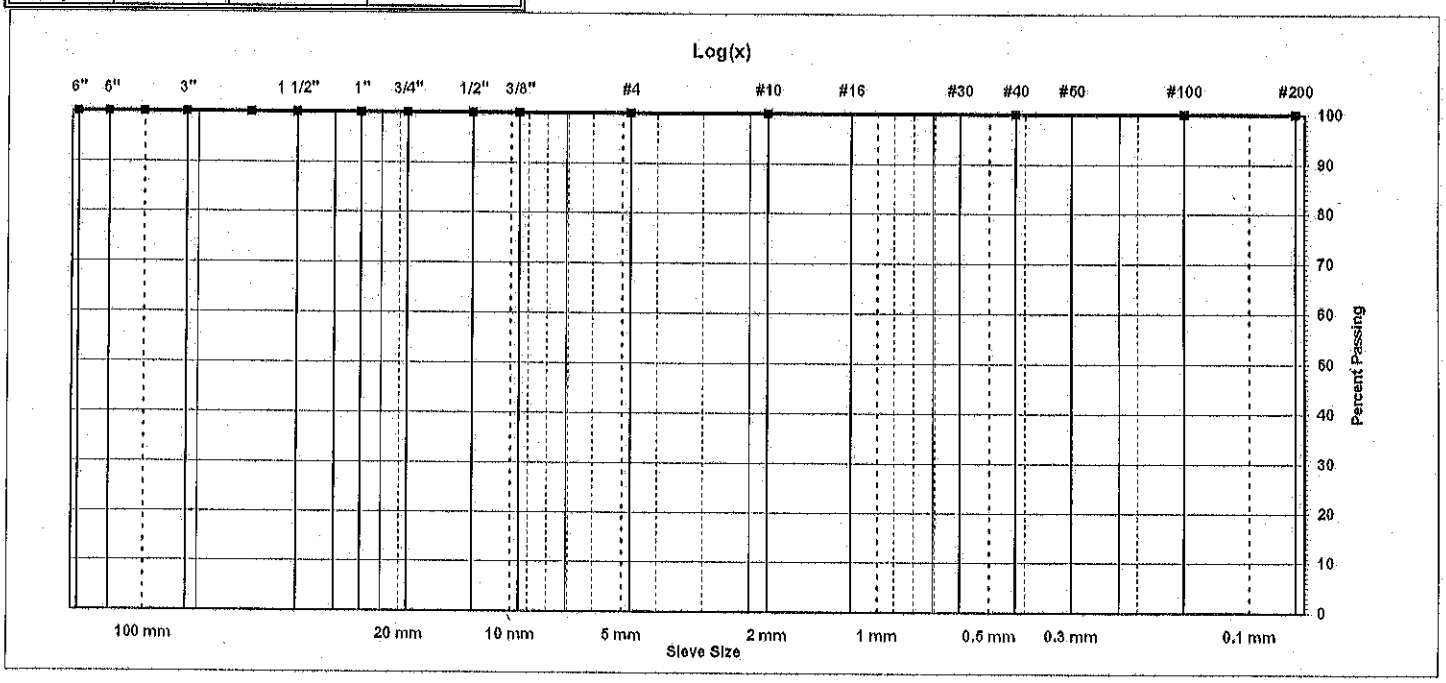
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	1.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2209

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silt / Clay with sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-7 @ 2' **Authorized By:** Client **Date:** 6/29/2007

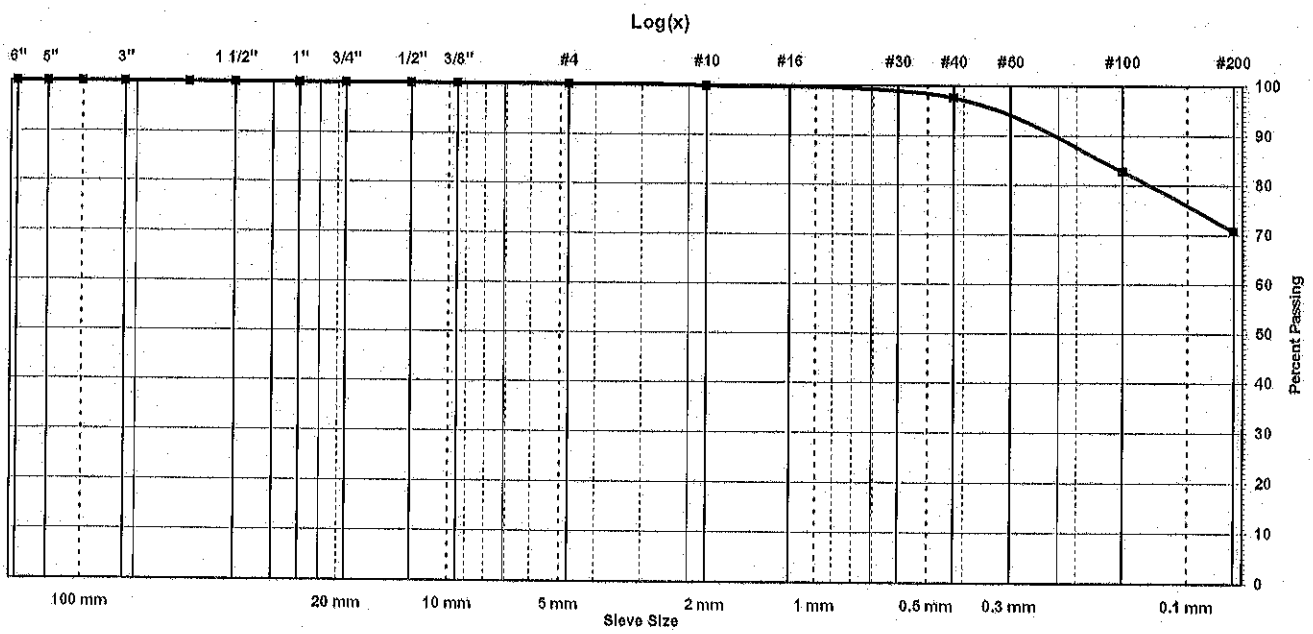
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	100	
2.00 mm	#10	100	
425 µm	#40	98	
150 µm	#100	83	
75 µm	#200	70.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	15.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	29.1	70.8



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2197

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-7 @ 5' **Authorized By:** Client **Date:** 6/29/2007

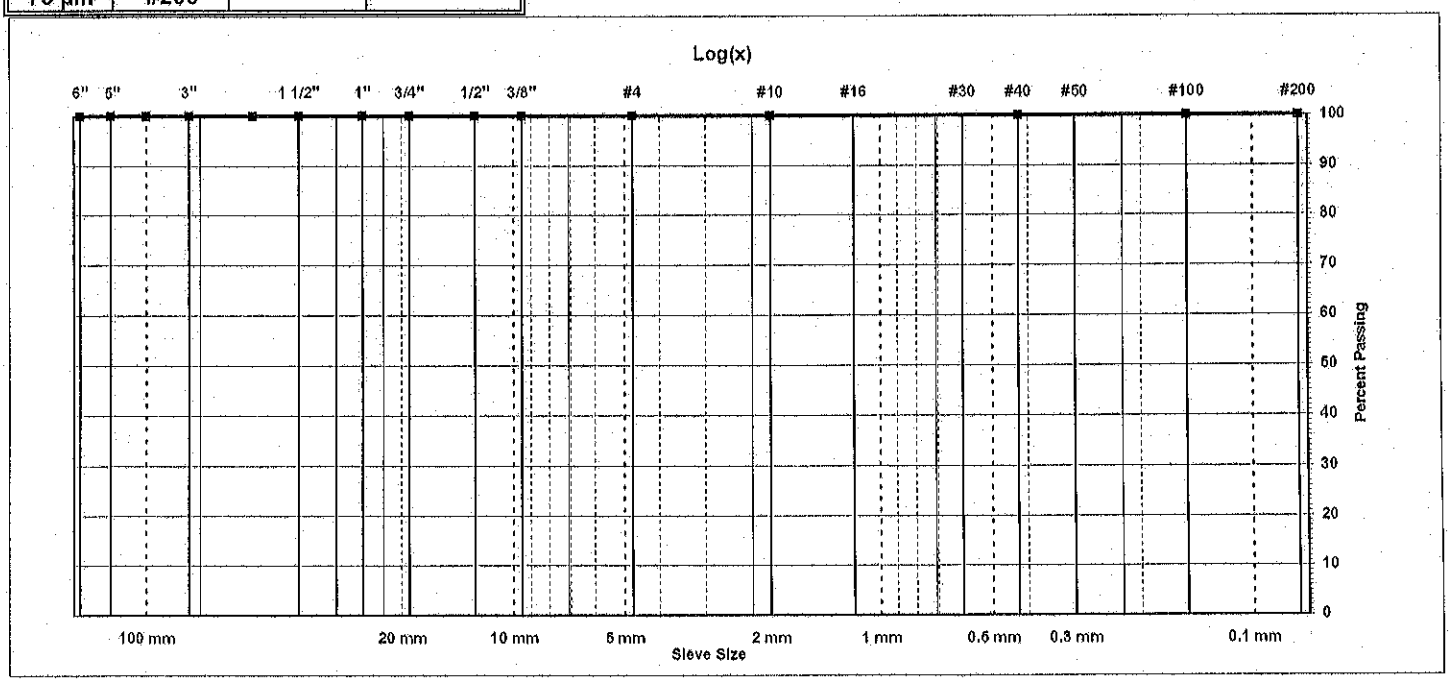
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	18.3		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2261

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Sample Spilled. No Test was able to be run. **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: LS-1 @ 10' **Authorized By:** Client **Date:** 6/29/2007

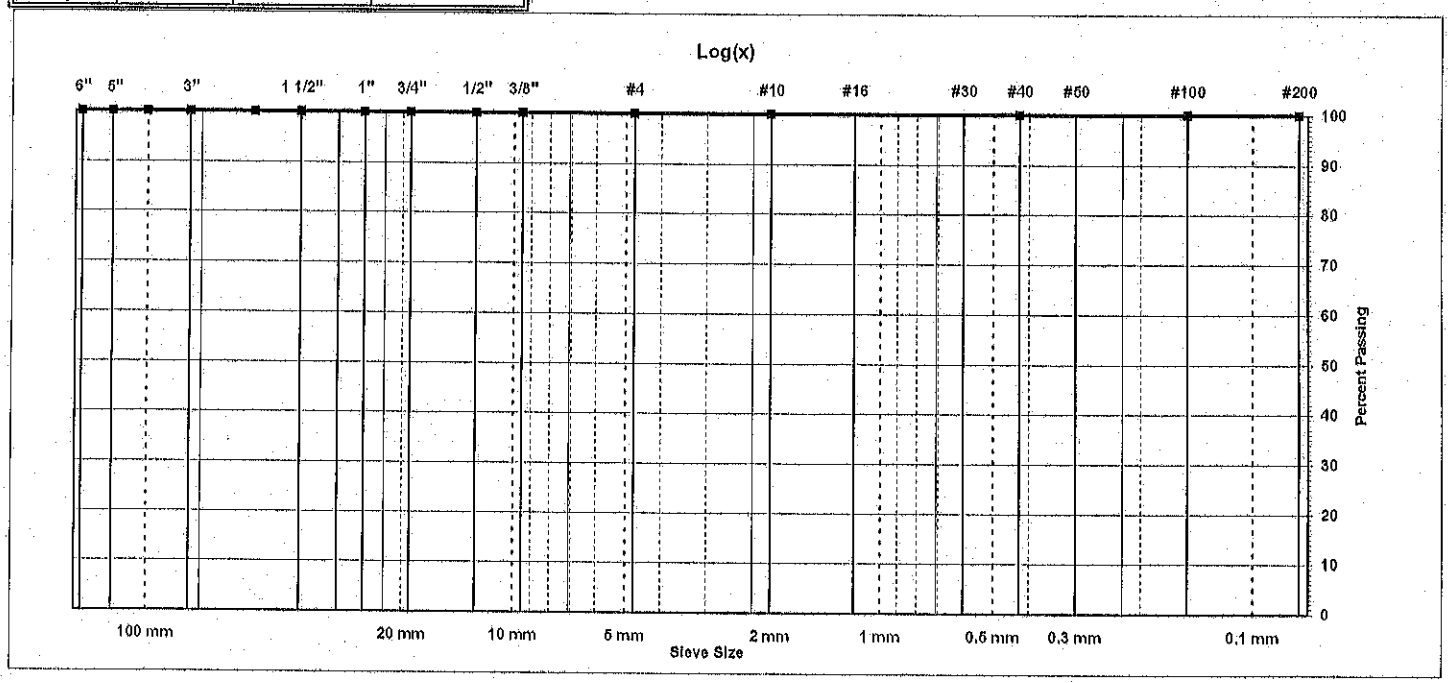
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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Moisture Content and Unit Weight of Soil

(In General Accordance with ASTM D2937 and D2216)

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Project: Landmark Testing
No: M00431-008
Location: St. George, UT
Date: 6/29/2007
By: BRR

Sample Info.	Boring No.	WT-5	WT-5	WT-6	WT-6	WT-8	RW-6	RW-6	RW-7
	Sample								
	Depth	27	37	22	27	2	12	17	7
	Split								
	Split sieve								
Total sample (g)									
Moist coarse fraction (g)									
Moist split fraction (g)									
Unit Weight Data	Sample height, H (in)	5.000	5.000	5.000	4.000	6.000	4.000	6.000	3.000
	Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
	Wt. rings + wet soil (g)	544.82	943.32	971.69	778.61	1172.75	754.48	1113.20	595.78
	Wt. rings/tare (g)	133.13	222.35	219.14	178.00	250.23	169.24	254.06	136.04
	Moist unit wt., γ_m (pcf)	114.0	119.8	125.1	124.8	127.8	121.6	119.0	127.3
	Wet soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Moisture content (%)								
Moisture Data	Wet soil + tare (g)	285.76	436.23	487.29	508.30	567.69	493.93	458.28	591.32
	Dry soil + tare (g)	255.21	374.61	442.50	469.02	546.45	452.57	426.97	549.67
	Tare (g)	140.31	140.54	223.69	224.09	225.15	211.23	226.36	151.54
	Moisture content (%)	26.6	26.3	18.2	16.0	6.6	17.1	15.6	10.5
Moisture Content, w (%)		**26.6**	**26.3**	**18.2**	**16.0**	**6.6**	**17.1**	**15.6**	**10.5**
Dry Unit Wt., γ_d (pcf)		**90.1**	**94.9**	**105.8**	**107.5**	**119.8**	**103.8**	**102.9**	**115.3**

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Moisture Content and Unit Weight of Soil

(In General Accordance with ASTM D2937 and D2216)

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Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/11/2007
By: BRR

Sample Info.	Boring No.	A-5	ET-6	ET-7	RW-4	RW-5	LS-9	A-5	A-6
	Sample								
	Depth	5	22	7	27	17	32	2	5
	Split	No	No	No	No	No	No	No	No
	Split sieve								
	Total sample (g)								
	Moist coarse fraction (g)								
	Moist split fraction (g)								
Unit Weight Data	Sample height, H (in)	5.000	5.850	5.300	5.050	4.000	3.000	6.000	5.860
	Sample diameter, D (in)	2.416	2.416	2.416	2.416	2.416	2.416	2.416	2.416
	Wt. rings + wet soil (g)	932.26	1090.75	949.00	974.40	762.48	543.97	1027.73	926.36
	Wt. rings/tare (g)	218.52	232.32	210.36	216.81	174.10	133.42	210.83	0.00
	Moist unit wt., γ_m (pcf)	118.6	121.9	115.8	124.7	122.2	113.7	113.1	131.4
	Wet soil + tare (g)								
	Dry soil + tare (g)								
	Tare (g)								
	Moisture content (%)								
Moisture Data	Wet soil + tare (g)	614.53	478.95	665.46	512.02	349.02	649.92	1015.50	985.55
	Dry soil + tare (g)	547.55	432.92	605.26	460.40	330.55	598.57	951.15	901.24
	Tare (g)	177.96	212.10	221.69	208.49	212.11	195.59	226.36	181.32
	Moisture content (%)	18.1	20.8	15.7	20.5	15.6	12.7	8.9	11.7
Moisture Content, w (%)		**18.1**	**20.8**	**15.7**	**20.5**	**15.6**	**12.7**	**8.9**	**11.7**
Dry Unit Wt., γ_d (pcf)		**100.4**	**100.9**	**100.1**	**103.5**	**105.7**	**100.9**	**103.9**	**117.6**

Entered by: BRR
Reviewed: [illegible]

Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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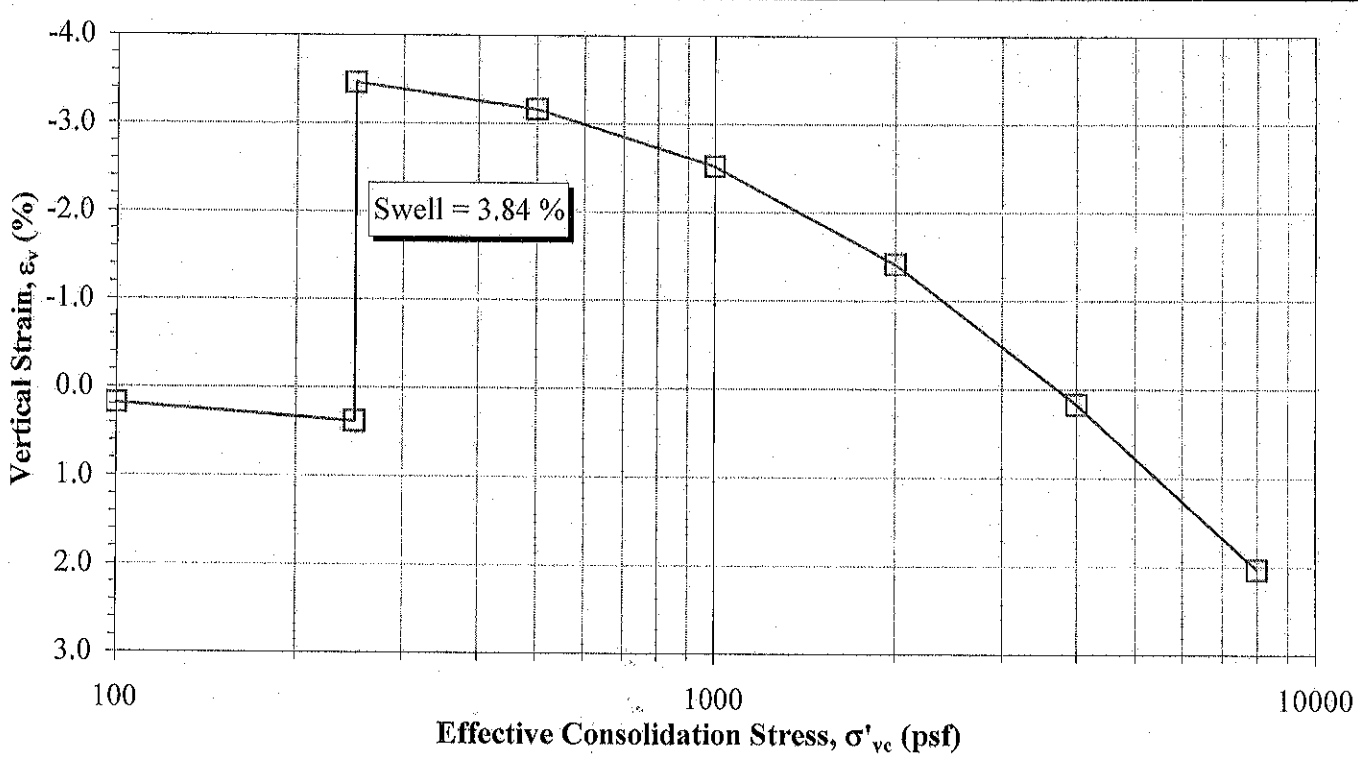
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: WT-5
Sample:
Depth: 27
Sample Description: clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	3.84	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9797
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	181.43	185.81
Wt. rings/tare (g)	42.59	42.59
Moist unit wt., γ_m (pcf)	115.4	121.5
Wet soil + tare (g)	285.76	
Dry soil + tare (g)	255.21	
Tare (g)	140.31	
Moisture content, w (%)	26.6	30.6
Dry unit wt., γ_d (pcf)	91.1	93.0
Saturation	0.91	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_o (in.)	e
Seating	0.0000	0.00	1.0000	0.815
100	0.0018	0.18	0.9982	0.812
250	0.0038	0.38	0.9962	0.808
250	-0.0346	-3.46	1.0346	0.878
500	-0.0316	-3.16	1.0316	0.872
1000	-0.0252	-2.52	1.0252	0.861
2000	-0.0141	-1.41	1.0141	0.841
4000	0.0017	0.17	0.9983	0.812
8000	0.0203	2.03	0.9797	0.778



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

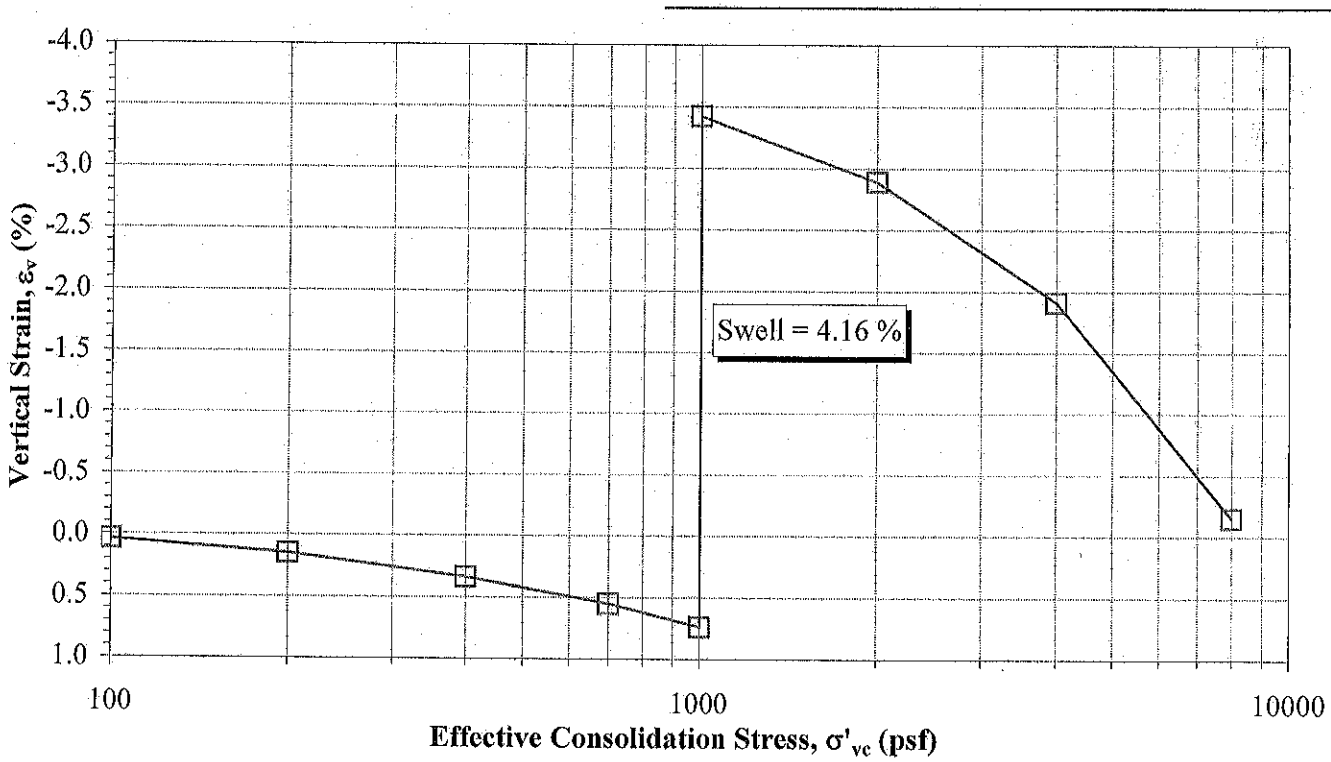
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: WT-5
Sample:
Depth: 37
Sample Description: clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	4.16	
Swell stress (psf)	1000	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	1.0015
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	188.24	191.22
Wt. rings/tare (g)	45.16	45.16
Moist unit wt., γ_m (pcf)	118.9	121.2
Wet soil + tare (g)	436.23	
Dry soil + tare (g)	374.61	
Tare (g)	140.54	
Moisture content, w (%)	26.3	29.0
Dry unit wt., γ_d (pcf)	94.1	94.0
Saturation	0.92	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1200	0.00	1.0000	0.758
100	0.1204	0.04	0.9996	0.757
200	0.1215	0.15	0.9985	0.755
400	0.1234	0.34	0.9966	0.752
700	0.1255	0.55	0.9945	0.748
1000	0.1274	0.74	0.9926	0.745
1000	0.0858	-3.42	1.0342	0.818
2000	0.0911	-2.89	1.0289	0.808
4000	0.1009	-1.91	1.0191	0.791
8000	0.1185	-0.15	1.0015	0.760



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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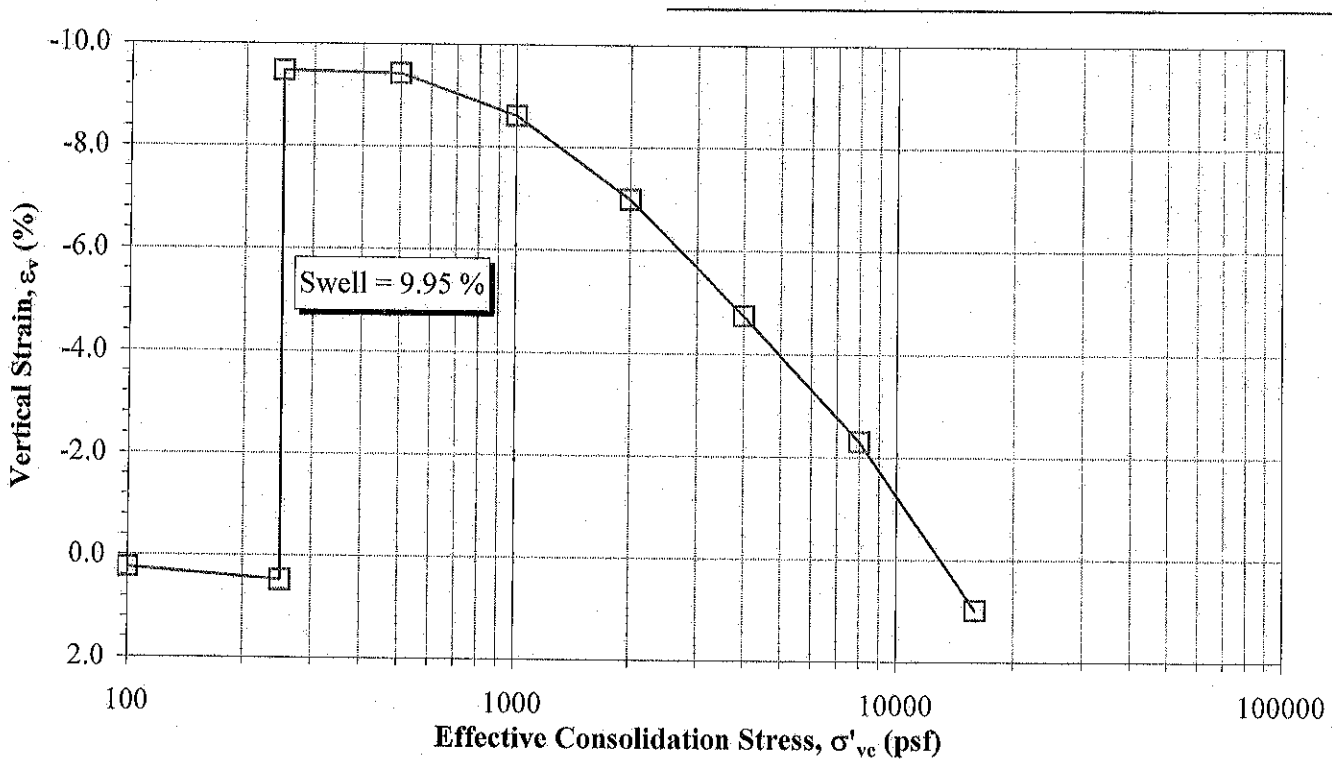
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: WT-6
Sample:
Depth: 22
Sample Description: purple/ brown gray clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	9.95	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9902
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	193.66	199.63
Wt. rings/tare (g)	45.15	45.15
Moist unit wt., γ_m (pcf)	123.4	129.6
Wet soil + tare (g)	482.29	
Dry soil + tare (g)	442.50	
Tare (g)	223.69	
Moisture content, w (%)	18.2	22.9
Dry unit wt., γ_d (pcf)	104.4	105.5
Saturation	0.85	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.2132	0.00	1.0000	0.584
100	0.2157	0.25	0.9975	0.580
250	0.2180	0.48	0.9952	0.577
250	0.1185	-9.47	1.0947	0.734
500	0.1190	-9.42	1.0942	0.734
1000	0.1271	-8.61	1.0861	0.721
2000	0.1433	-6.99	1.0699	0.695
4000	0.1658	-4.74	1.0474	0.659
8000	0.1901	-2.31	1.0231	0.621
16000	0.2230	0.98	0.9902	0.569



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

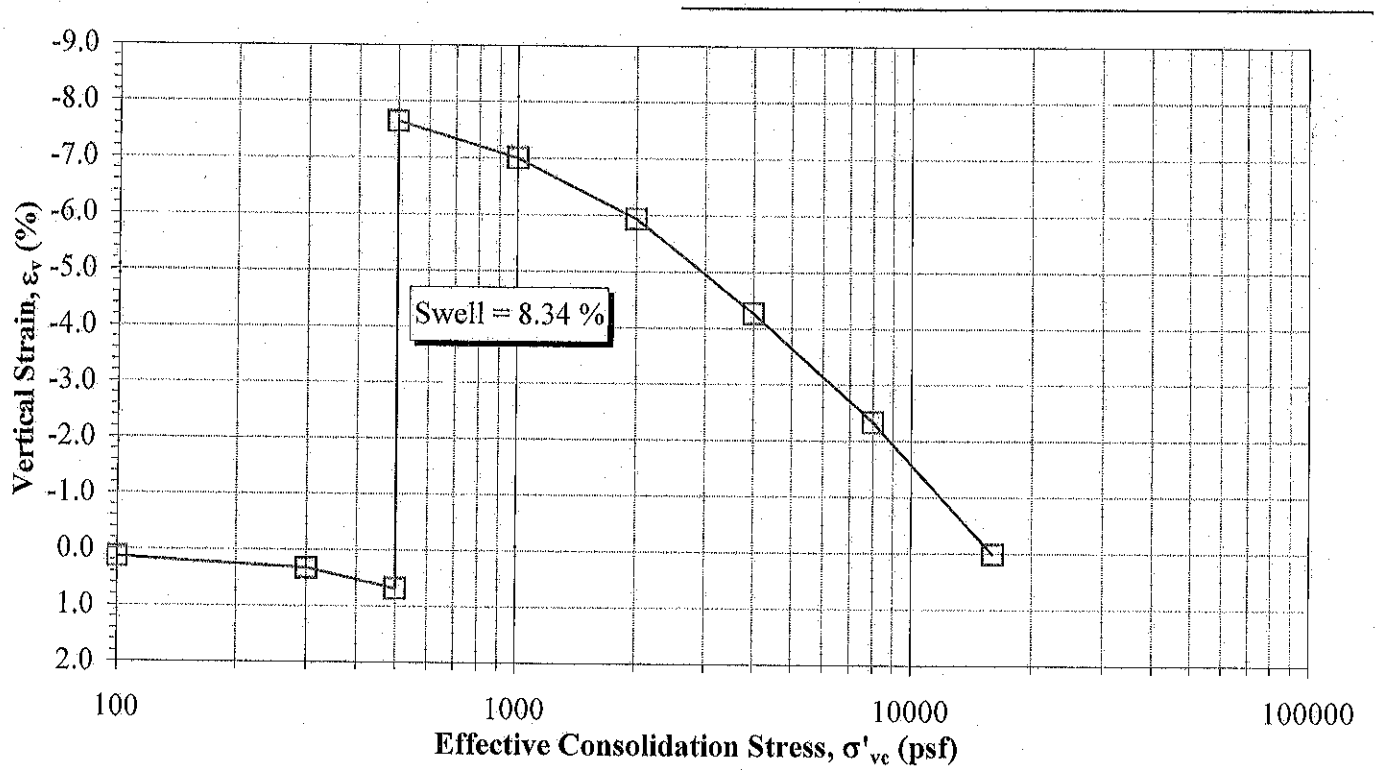
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: WT-6
Sample:
Depth: 27
Sample Description: gray/ tan clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	8.34	
Swell stress (psf)	500	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9998
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	196.67	201.62
Wt. rings/tare (g)	45.14	45.14
Moist unit wt., γ_m (pcf)	125.9	130.1
Wet soil + tare (g)	508.30	
Dry soil + tare (g)	469.02	
Tare (g)	224.09	
Moisture content, w (%)	16.0	19.8
Dry unit wt., γ_d (pcf)	108.5	108.5
Saturation	0.81	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_0 (in.)	e
Seating	0.0000	0.00	1.0000	0.525
100	0.0014	0.14	0.9986	0.522
300	0.0033	0.33	0.9967	0.519
500	0.0069	0.69	0.9931	0.514
500	-0.0765	-7.65	1.0765	0.641
1000	-0.0700	-7.00	1.0700	0.631
2000	-0.0593	-5.93	1.0593	0.615
4000	-0.0427	-4.27	1.0427	0.590
8000	-0.0233	-2.33	1.0233	0.560
16000	0.0002	0.02	0.9998	0.524



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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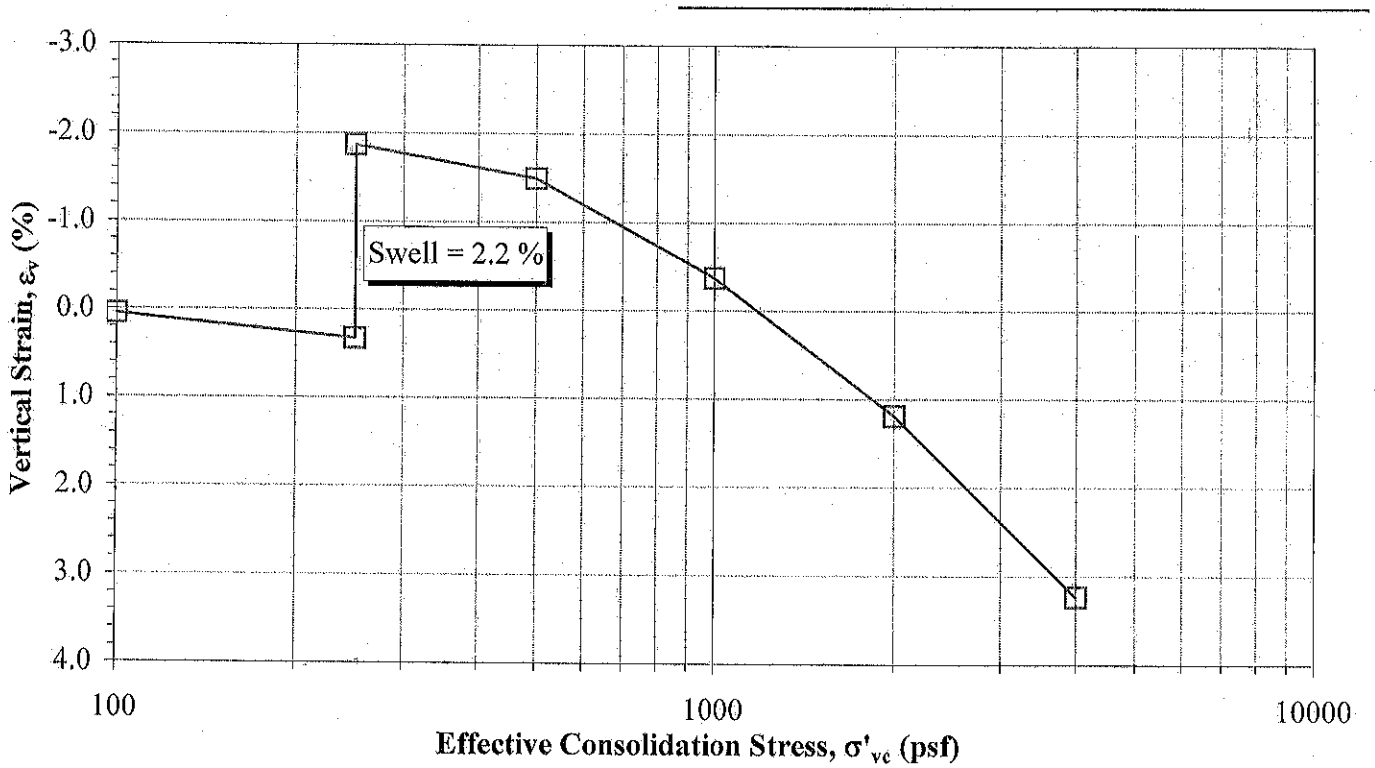
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: WT-8
Sample:
Depth: 2
Sample Description: reddish brown clay with gravel
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	2.20	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9677
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	189.40	200.82
Wt. rings/tare (g)	42.29	42.29
Moist unit wt., γ_m (pcf)	122.2	136.1
Wet soil + tare (g)	567.69	
Dry soil + tare (g)	546.45	
Tare (g)	225.15	
Moisture content, w (%)	6.6	14.9
Dry unit wt., γ_d (pcf)	114.7	118.5
Saturation	0.44	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0675	0.00	1.0000	0.443
100	0.0680	0.05	0.9995	0.442
250	0.0708	0.33	0.9967	0.438
250	0.0488	-1.87	1.0187	0.470
500	0.0526	-1.49	1.0149	0.464
1000	0.0638	-0.37	1.0037	0.448
2000	0.0794	1.19	0.9881	0.426
4000	0.0998	3.23	0.9677	0.396



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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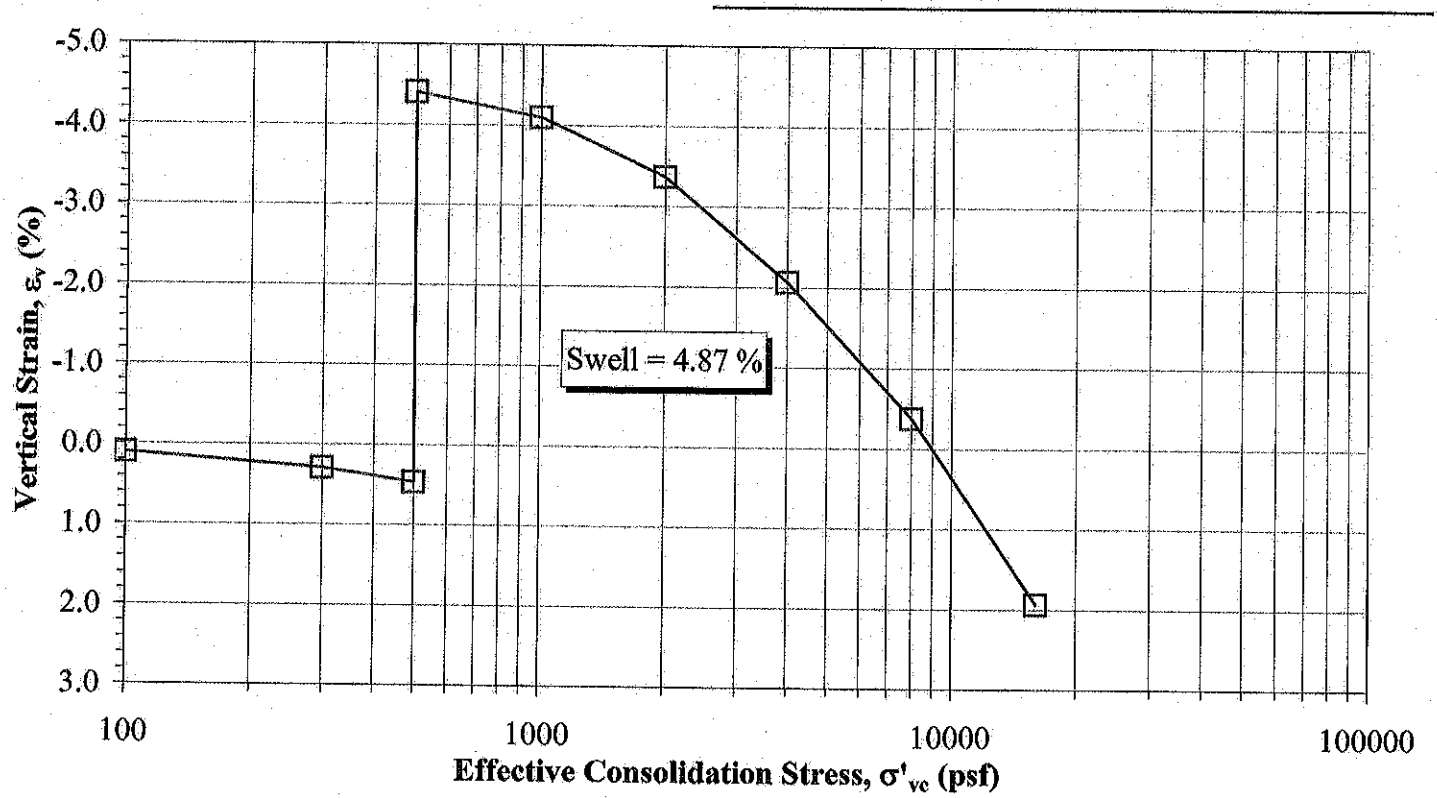
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/11/2007
By: BRR

Boring No.: RW-4
Sample:
Depth: 27
Sample Description: red clay w/ silt gravel and sand
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	4.87	
Swell stress (psf)	500	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9807
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	195.22	198.30
Wt. rings/tare (g)	43.22	43.22
Moist unit wt., γ_m (pcf)	126.3	131.4
Wet soil + tare (g)	512.02	
Dry soil + tare (g)	460.40	
Tare (g)	208.49	
Moisture content, w (%)	20.5	22.9
Dry unit wt., γ_d (pcf)	104.8	106.9
Saturation	0.99	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.2217	0.00	1.0000	0.578
100	0.2227	0.10	0.9990	0.577
300	0.2246	0.29	0.9971	0.574
500	0.2263	0.46	0.9954	0.571
500	0.1776	-4.41	1.0441	0.648
1000	0.1807	-4.10	1.0410	0.643
2000	0.1880	-3.37	1.0337	0.631
4000	0.2010	-2.07	1.0207	0.611
8000	0.2179	-0.38	1.0038	0.584
16000	0.2410	1.93	0.9807	0.548



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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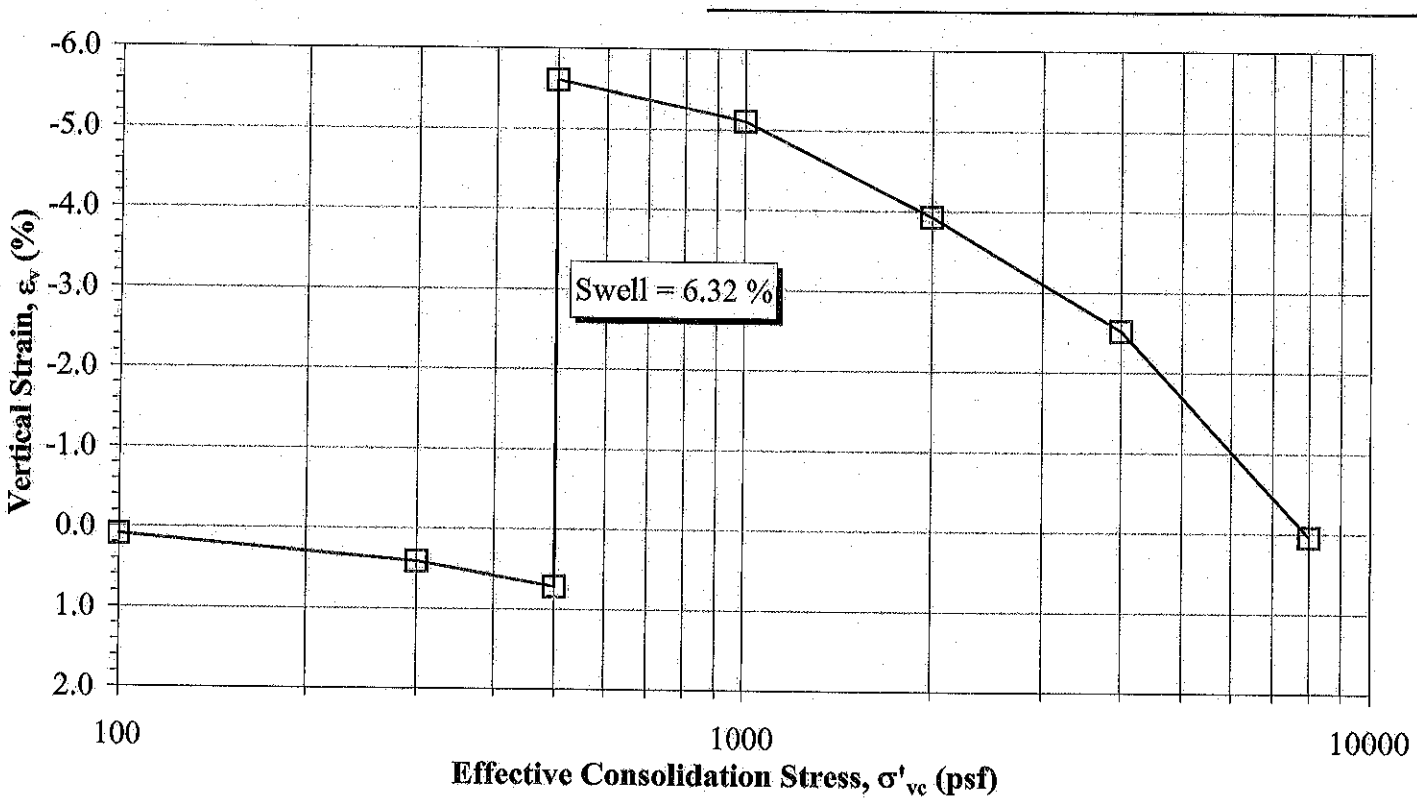
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/10/2007
By: BRR

Boring No.: RW-5
Sample:
Depth: 17
Sample Description: red clay w/ gravel
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	6.32	
Swell stress (psf)	500	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9996
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	191.21	199.41
Wt. rings/tare (g)	42.76	42.76
Moist unit wt., γ_m (pcf)	123.4	130.2
Wet soil + tare (g)	349.02	
Dry soil + tare (g)	330.55	
Tare (g)	212.11	
Moisture content, w (%)	15.6	22.0
Dry unit wt., γ_d (pcf)	106.7	106.8
Saturation	0.75	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_o (in.)	e
Seating	0.2355	0.00	1.0000	0.550
100	0.2364	0.09	0.9991	0.549
300	0.2396	0.41	0.9959	0.544
500	0.2426	0.71	0.9929	0.539
500	0.1794	-5.61	1.0561	0.637
1000	0.1844	-5.11	1.0511	0.629
2000	0.1962	-3.93	1.0393	0.611
4000	0.2103	-2.52	1.0252	0.589
8000	0.2359	0.04	0.9996	0.550



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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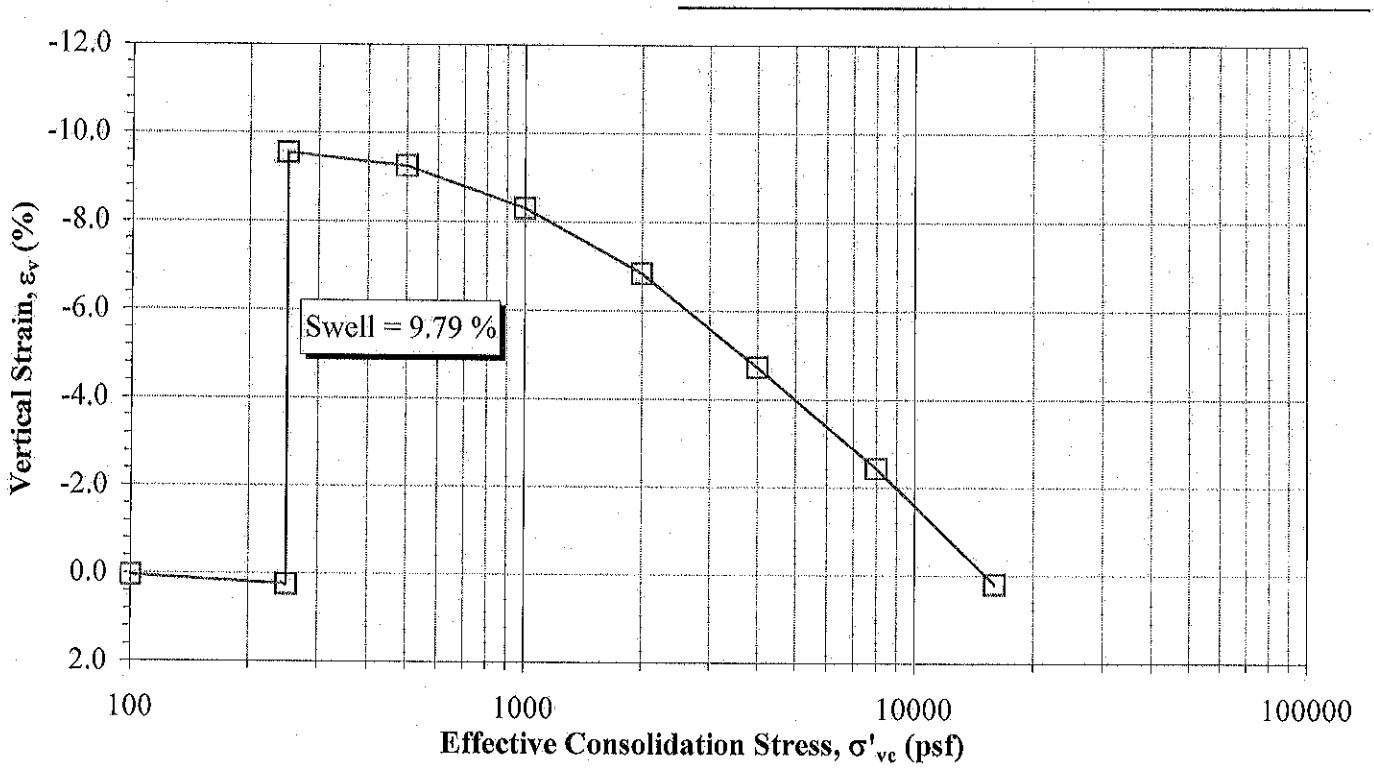
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: RW-6
Sample:
Depth: 12
Sample Description: gray clay w/ mineral deposit
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	9.79	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9980
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	188.90	194.47
Wt. rings/tare (g)	42.26	42.26
Moist unit wt., γ_m (pcf)	121.9	126.7
Wet soil + tare (g)	493.93	
Dry soil + tare (g)	452.57	
Tare (g)	211.23	
Moisture content, w (%)	17.1	21.6
Dry unit wt., γ_d (pcf)	104.0	104.2
Saturation	0.77	0.97

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.2167	0.00	1.0000	0.590
100	0.2172	0.05	0.9995	0.589
250	0.2192	0.25	0.9975	0.586
250	0.1213	-9.54	1.0954	0.742
500	0.1242	-9.25	1.0925	0.737
1000	0.1337	-8.30	1.0830	0.722
2000	0.1483	-6.84	1.0684	0.699
4000	0.1694	-4.73	1.0473	0.666
8000	0.1923	-2.44	1.0244	0.629
16000	0.2187	0.20	0.9980	0.587



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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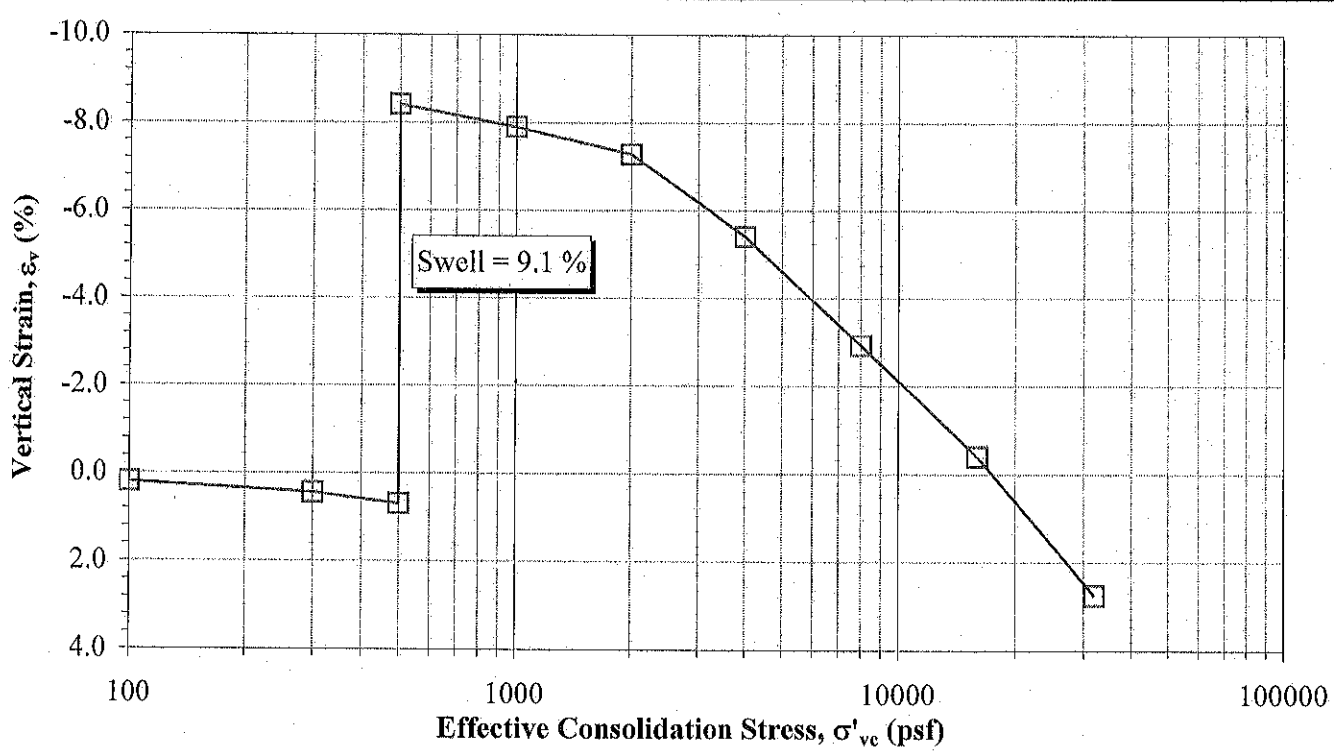
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: RW-6
Sample:
Depth: 17
Sample Description: clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	9.10	
Swell stress (psf)	500	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9726
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	188.28	193.01
Wt. rings/tare (g)	42.33	42.33
Moist unit wt., γ_m (pcf)	121.3	128.7
Wet soil + tare (g)	458.28	
Dry soil + tare (g)	426.97	
Tare (g)	226.36	
Moisture content, w (%)	15.6	19.4
Dry unit wt., γ_d (pcf)	104.9	107.9
Saturation	0.77	0.96

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.0000	0.00	1.0000	0.577
100	0.0020	0.20	0.9980	0.574
300	0.0044	0.44	0.9956	0.570
500	0.0069	0.69	0.9931	0.566
500	-0.0841	-8.41	1.0841	0.710
1000	-0.0790	-7.90	1.0790	0.702
2000	-0.0728	-7.28	1.0728	0.692
4000	-0.0540	-5.40	1.0540	0.662
8000	-0.0293	-2.93	1.0293	0.623
16000	-0.0040	-0.40	1.0040	0.583
32000	0.0274	2.74	0.9726	0.534



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

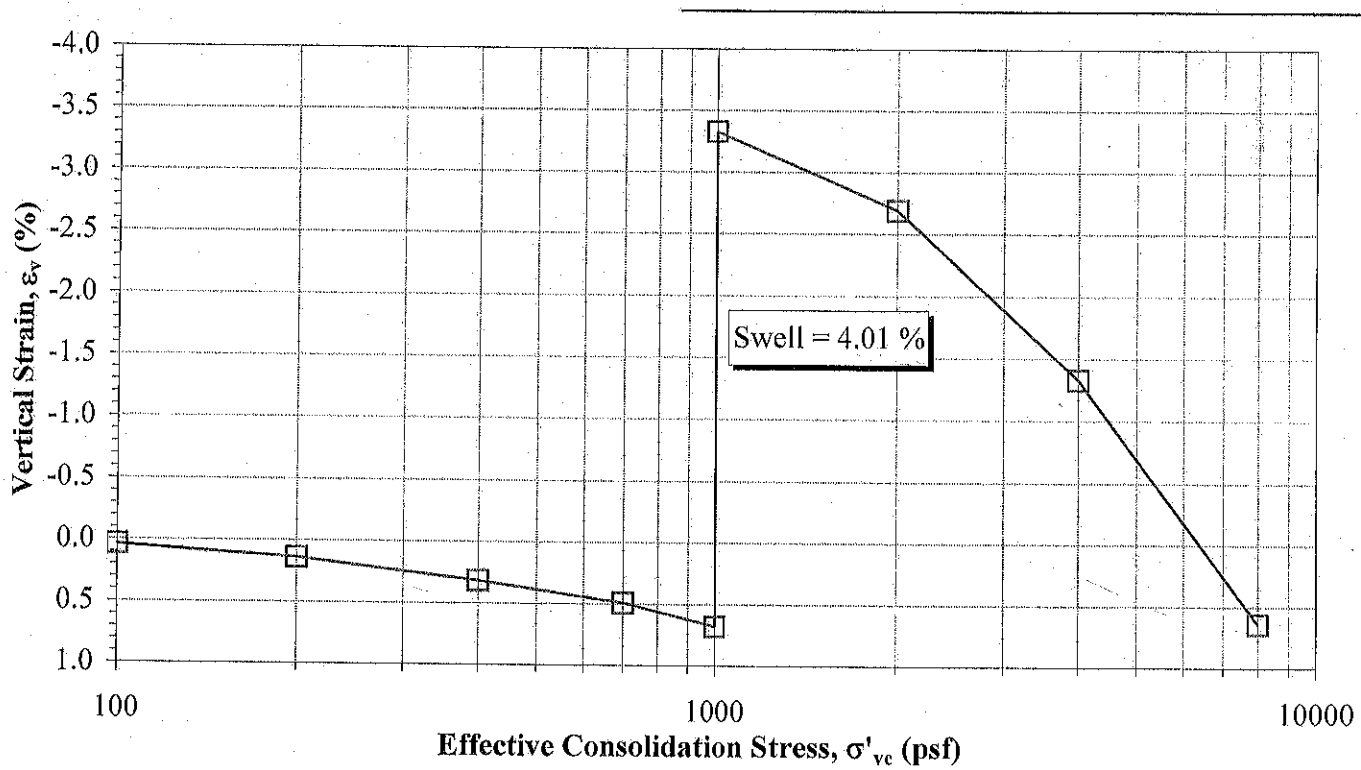
Project: Landmark Testing
No: M00431-008
Location: St. George Replacement Airport
Date: 7/2/2007
By: BRR

Boring No.: RW-7
Sample:
Depth: 7
Sample Description: reddish brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

Specific gravity, G_s	2.65	Assumed
Swell (%)	4.01	
Swell stress (psf)	1000	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9936
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	196.16	205.89
Wt. rings/tare (g)	43.40	43.40
Moist unit wt., γ_m (pcf)	126.9	135.9
Wet soil + tare (g)	591.32	
Dry soil + tare (g)	549.67	
Tare (g)	151.54	
Moisture content, w (%)	10.5	17.5
Dry unit wt., γ_d (pcf)	114.9	115.7
Saturation	0.64	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1028	0.00	1.0000	0.440
100	0.1032	0.04	0.9996	0.439
200	0.1042	0.14	0.9986	0.438
400	0.1060	0.32	0.9968	0.435
700	0.1077	0.49	0.9951	0.433
1000	0.1096	0.68	0.9932	0.430
1000	0.0695	-3.33	1.0333	0.488
2000	0.0759	-2.69	1.0269	0.478
4000	0.0895	-1.33	1.0133	0.459
8000	0.1092	0.64	0.9936	0.430



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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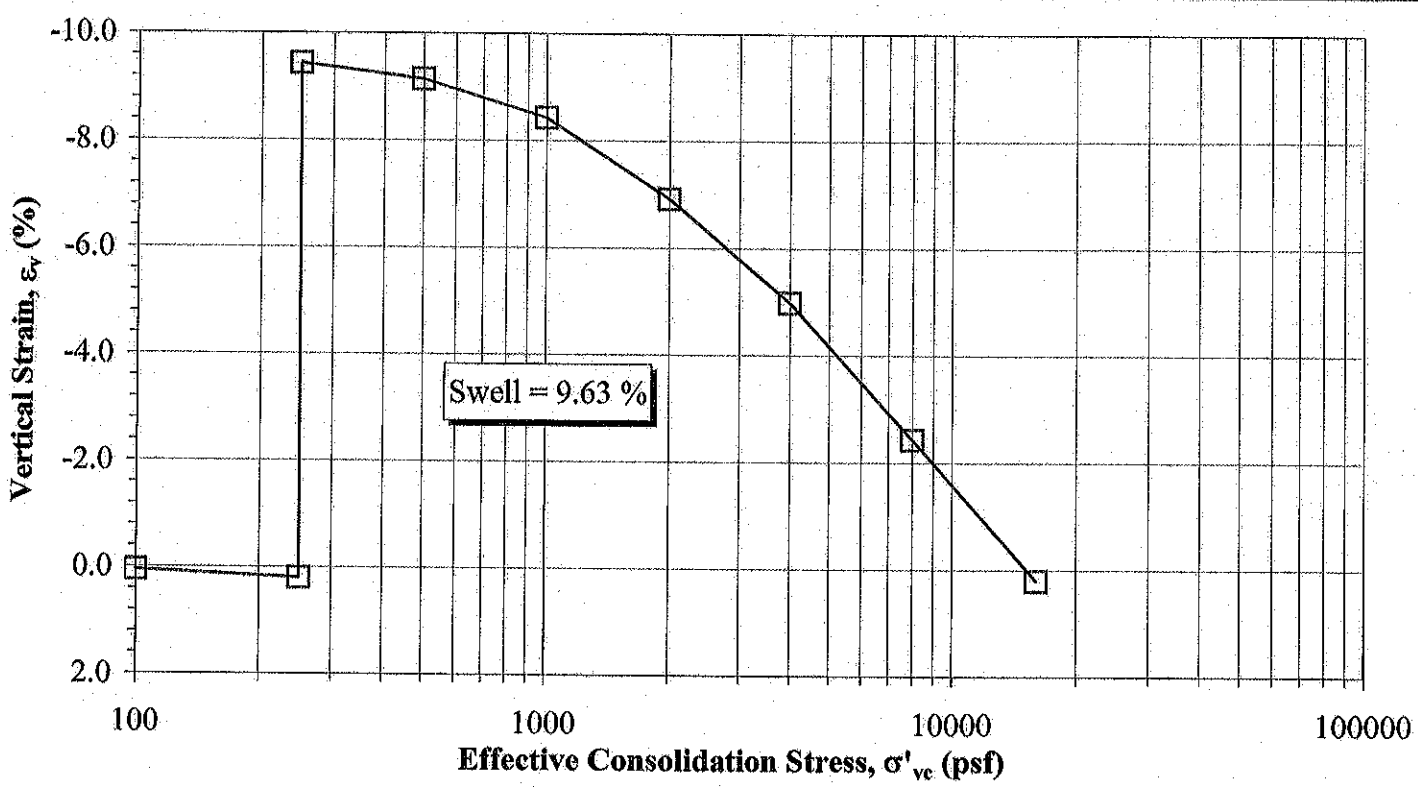
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/11/2007
By: BRR

Boring No.: ET-6
Sample:
Depth: 22
Sample Description: tan/ gray clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	9.63	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9980
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	191.19	196.72
Wt. rings/tare (g)	42.30	42.30
Moist unit wt., γ_m (pcf)	123.7	128.6
Wet soil + tare (g)	478.95	
Dry soil + tare (g)	432.92	
Tare (g)	212.10	
Moisture content, w (%)	20.8	25.3
Dry unit wt., γ_d (pcf)	102.4	102.6
Saturation	0.90	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_o (in.)	e
Seating	0.2454	0.00	1.0000	0.616
100	0.2459	0.05	0.9995	0.615
250	0.2473	0.19	0.9981	0.613
250	0.1510	-9.44	1.0944	0.768
500	0.1539	-9.15	1.0915	0.764
1000	0.1610	-8.44	1.0844	0.752
2000	0.1762	-6.92	1.0692	0.728
4000	0.1955	-4.99	1.0499	0.696
8000	0.2210	-2.44	1.0244	0.655
16000	0.2474	0.20	0.9980	0.613



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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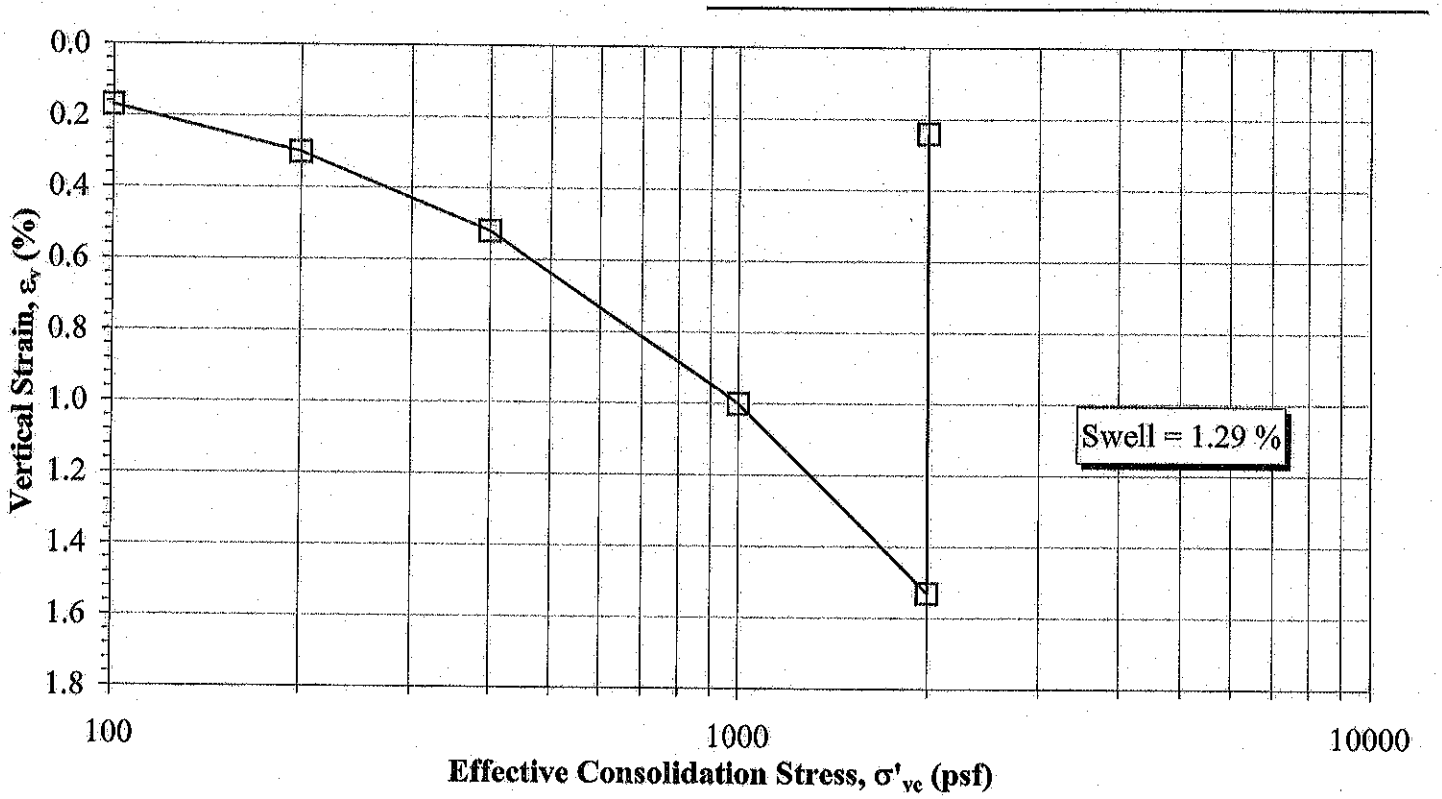
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/11/2007
By: BRR

Boring No.: ET-7
Sample:
Depth: 7
Sample Description: red clay w/ silt gravel and sand
Engineering Classification: Not requested
Sample type: Disturbed

Specific gravity, G_s	2.65	Assumed
Swell (%)	1.29	
Swell stress (psf)	2000	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9976
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	195.82	203.98
Wt. rings/tare (g)	46.39	46.39
Moist unit wt., γ_m (pcf)	124.2	131.3
Wet soil + tare (g)	665.46	
Dry soil + tare (g)	605.26	
Tare (g)	221.69	
Moisture content, w (%)	15.7	22.0
Dry unit wt., γ_d (pcf)	107.3	107.6
Saturation	0.77	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1642	0.00	1.0000	0.541
100	0.1659	0.17	0.9983	0.539
200	0.1672	0.30	0.9970	0.537
400	0.1694	0.52	0.9948	0.533
1000	0.1742	1.00	0.9900	0.526
2000	0.1795	1.53	0.9847	0.518
2000	0.1666	0.24	0.9976	0.538



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/19/2007
By: BRR

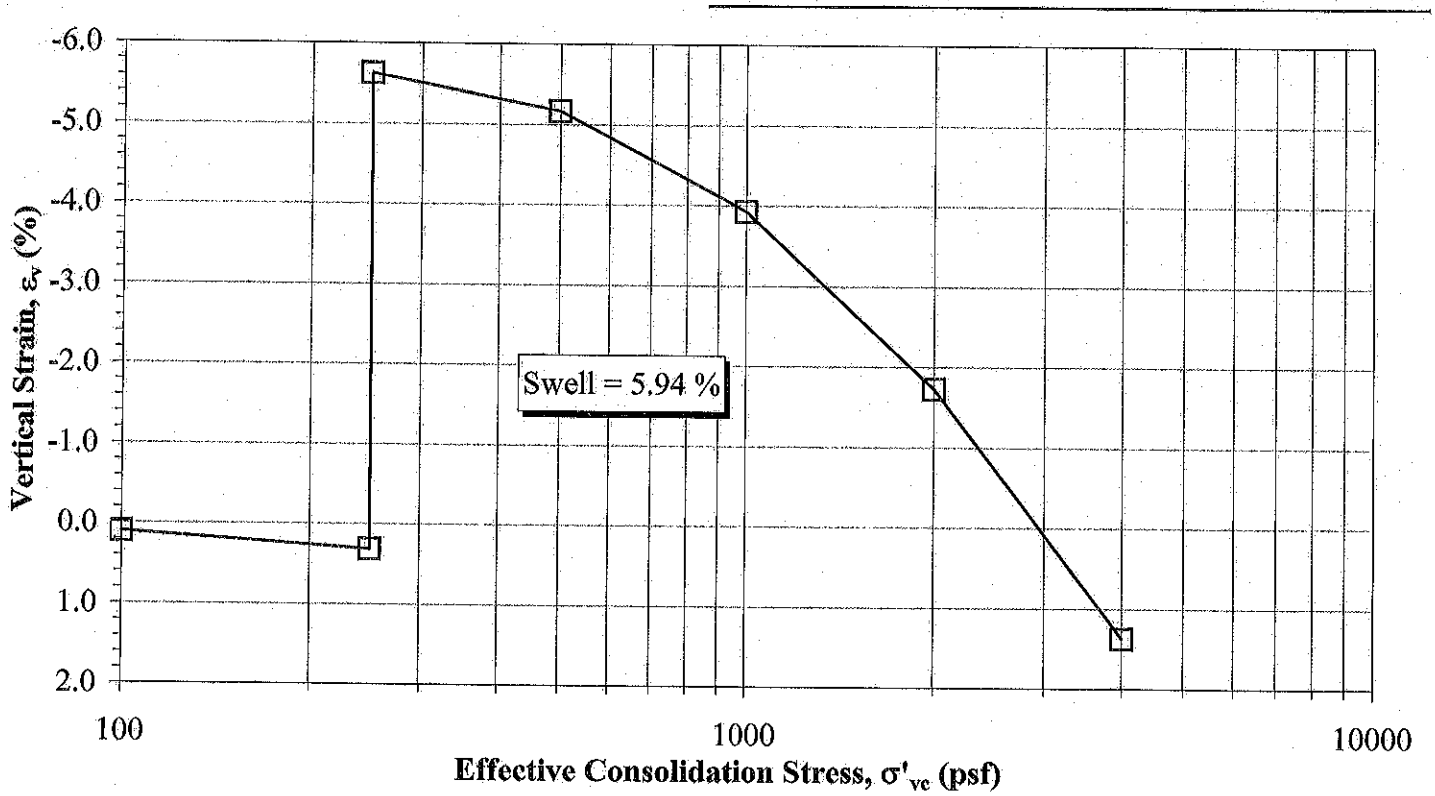
Boring No.: TP ET-7
Sample: -2% of optimum 1557 B
(114.4 pcf @ 15.2%)
Sample Description: reddish clay with gypsum
Engineering Classification: Not requested
Sample type: Laboratory compacted
Dry unit weight 103 pcf
at 19.2 (%) w

Compaction specifications:

Specific gravity, G_s	2.65	Assumed
Swell (%)	5.94	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9863
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	183.85	194.70
Wt. rings/tare (g)	43.57	43.57
Moist unit wt., γ_m (pcf)	116.6	127.3
Wet soil + tare (g)	252.06	
Dry soil + tare (g)	248.71	
Tare (g)	224.14	
Moisture content, w (%)	13.6	22.4
Dry unit wt., γ_d (pcf)	102.6	104.0
Saturation	0.61	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.2175	0.00	1.0000	0.613
100	0.2185	0.10	0.9990	0.611
250	0.2206	0.31	0.9969	0.608
250	0.1612	-5.63	1.0563	0.703
500	0.1658	-5.17	1.0517	0.696
1000	0.1782	-3.93	1.0393	0.676
2000	0.2002	-1.73	1.0173	0.641
4000	0.2312	1.37	0.9863	0.591



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/19/2007
By: BRR

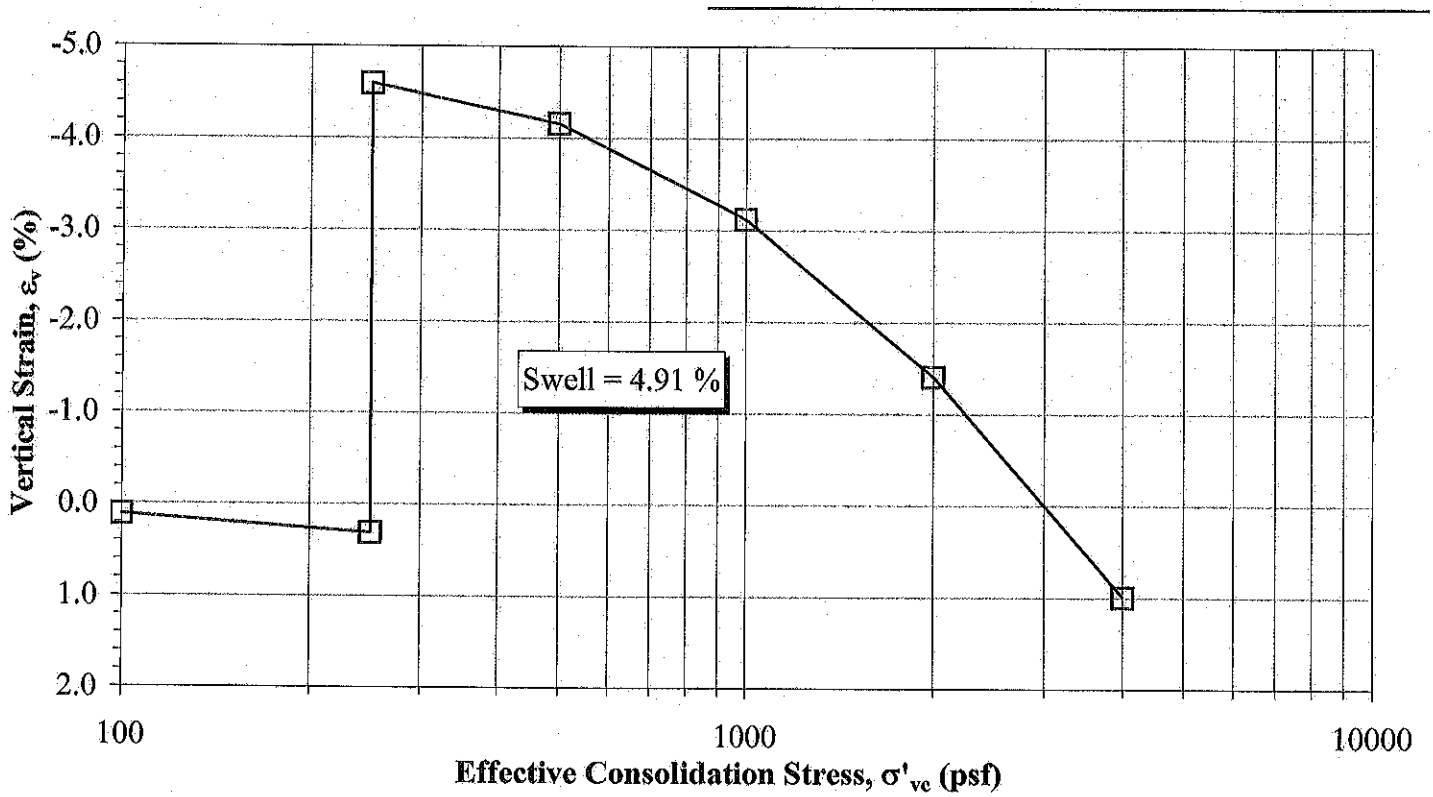
Boring No.: TP ET-7
Sample: Optimum 1557 B
(114.4 pcf @ 15.2%)
Sample Description: reddish clay with gypsum
Engineering Classification: Not requested
Sample type: Laboratory compacted

Compaction specifications:

Specific gravity, G_s	2.65	Assumed
Swell (%)	4.91	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9901
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	186.11	194.92
Wt. rings/tare (g)	43.28	43.28
Moist unit wt., γ_m (pcf)	118.7	127.3
Wet soil + tare (g)	181.20	
Dry soil + tare (g)	177.40	
Tare (g)	152.94	
Moisture content, w (%)	15.5	22.7
Dry unit wt., γ_d (pcf)	102.7	103.8
Saturation	0.69	1.00

Dry unit weight		103	pcf	
	at	19.2	(%) w	
Stress (psf)	Dial (in.)	1-D ε_v (%)	H_o (in.)	e
Seating	0.2177	0.00	1.0000	0.610
100	0.2188	0.11	0.9989	0.609
250	0.2208	0.31	0.9969	0.605
250	0.1717	-4.60	1.0460	0.684
500	0.1761	-4.16	1.0416	0.677
1000	0.1865	-3.12	1.0312	0.661
2000	0.2036	-1.41	1.0141	0.633
4000	0.2276	0.99	0.9901	0.594



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/19/2007
By: BRR

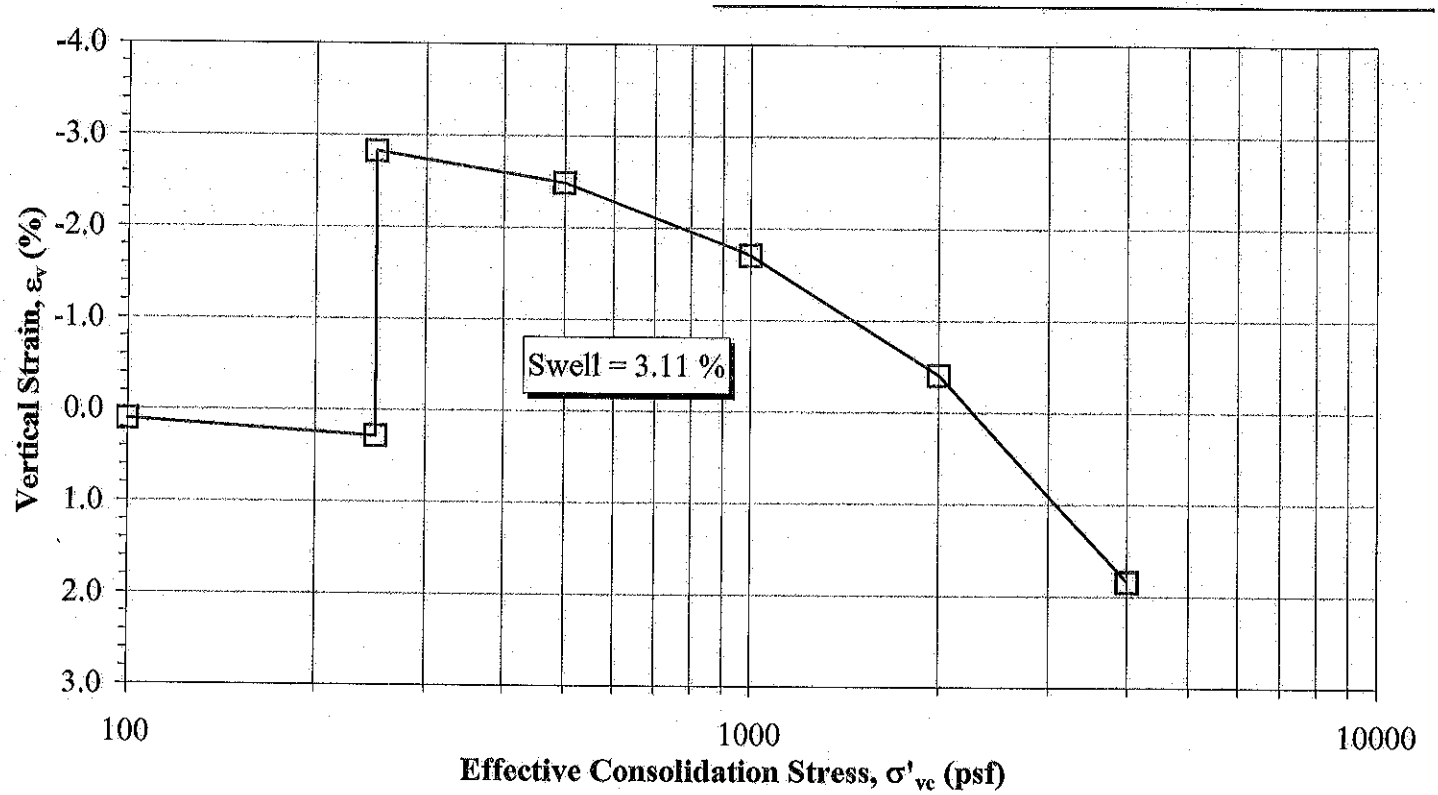
Boring No.: TP ET-7
Sample: +2% of optimum 1557 B
(114.4 pcf @ 15.2%)
Sample Description: reddish clay with gypsum
Engineering Classification: Not requested
Sample type: Laboratory compacted
Dry unit weight 103 pcf
at 19.2 (%) w

Compaction specifications:

Specific gravity, G_s	2.65	Assumed
Swell (%)	3.11	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9816
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	188.50	194.06
Wt. rings/tare (g)	43.38	43.38
Moist unit wt., γ_m (pcf)	120.6	127.6
Wet soil + tare (g)	182.82	
Dry soil + tare (g)	178.60	
Tare (g)	154.03	
Moisture content, w (%)	17.2	21.7
Dry unit wt., γ_d (pcf)	102.9	104.8
Saturation	0.79	0.99

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1864	0.00	1.0000	0.607
100	0.1874	0.10	0.9990	0.606
250	0.1892	0.28	0.9972	0.603
250	0.1581	-2.83	1.0283	0.653
500	0.1615	-2.49	1.0249	0.647
1000	0.1693	-1.71	1.0171	0.635
2000	0.1823	-0.41	1.0041	0.614
4000	0.2048	1.84	0.9816	0.578



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/19/2007
By: BRR

Boring No.: TP ET-7
Sample: +4% of optimum 1557 B
(114.4 pcf @ 15.2%)
Sample Description: reddish clay with gypsum
Engineering Classification: Not requested
Sample type: Laboratory compacted

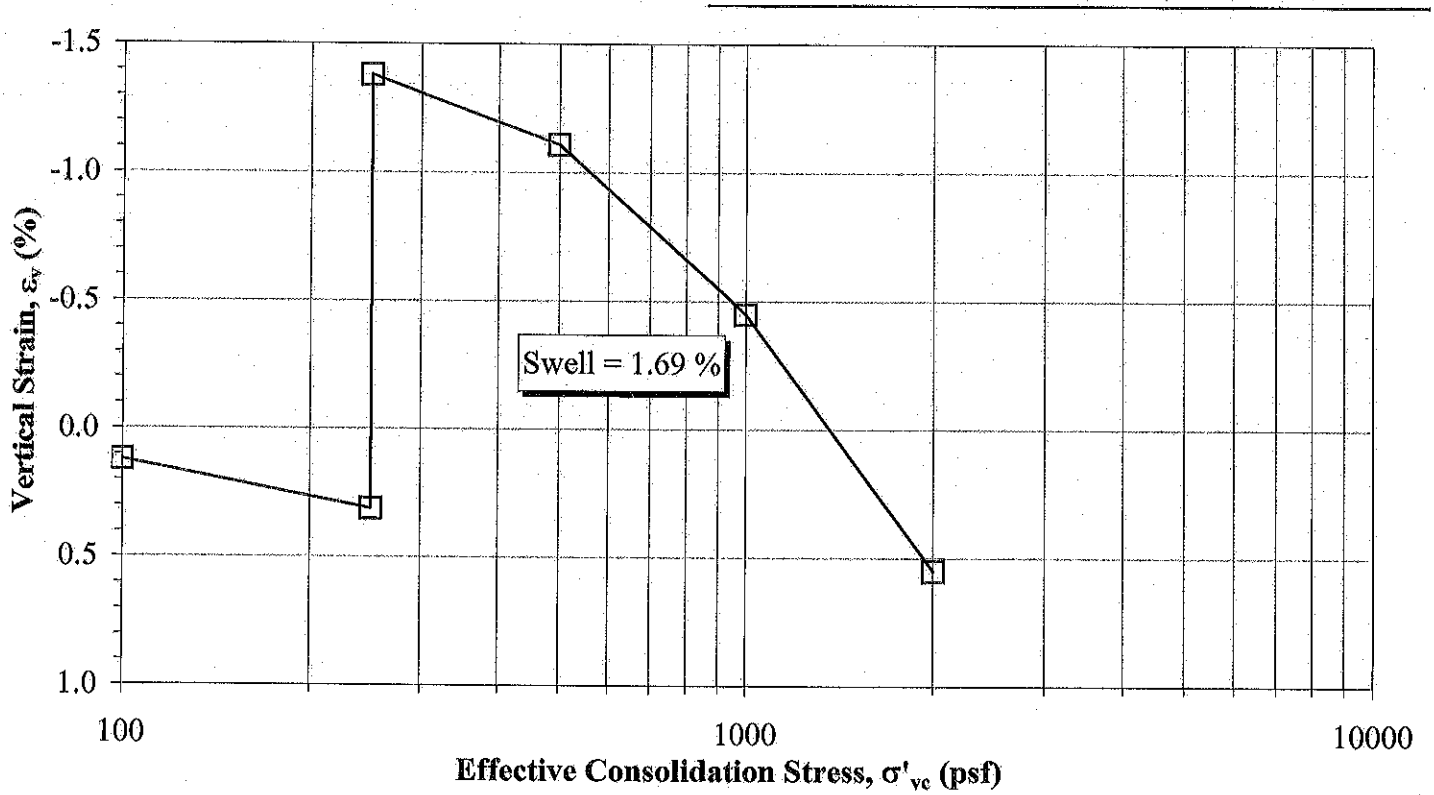
Compaction specifications:

Specific gravity, G_s	2.65	Assumed
Swell (%)	1.69	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9945
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	190.97	194.92
Wt. rings/tare (g)	43.41	43.41
Moist unit wt., γ_m (pcf)	122.6	126.6
Wet soil + tare (g)	182.05	
Dry soil + tare (g)	177.32	
Tare (g)	152.71	
Moisture content, w (%)	19.2	22.4
Dry unit wt., γ_d (pcf)	102.9	103.4
Saturation	0.85	0.99

Dry unit weight 103 pcf
at 19.2 (%) w

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.2220	0.00	1.0000	0.608
100	0.2232	0.12	0.9988	0.607
250	0.2251	0.31	0.9969	0.603
250	0.2082	-1.38	1.0138	0.631
500	0.2109	-1.11	1.0111	0.626
1000	0.2175	-0.45	1.0045	0.616
2000	0.2275	0.55	0.9945	0.600



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Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Landmark Testing & Engineering
No: M00431-009
Location: St. Gerge Replacement Airport (#07330)
Date: 7/10/2007
By: DKS

Boring No.: TP ET-7
Sample: _
Depth: _
Sample Description: Reddish Fat Clay
Engineering Classification: Not requested
As-received moisture content (%): 12.6
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: No

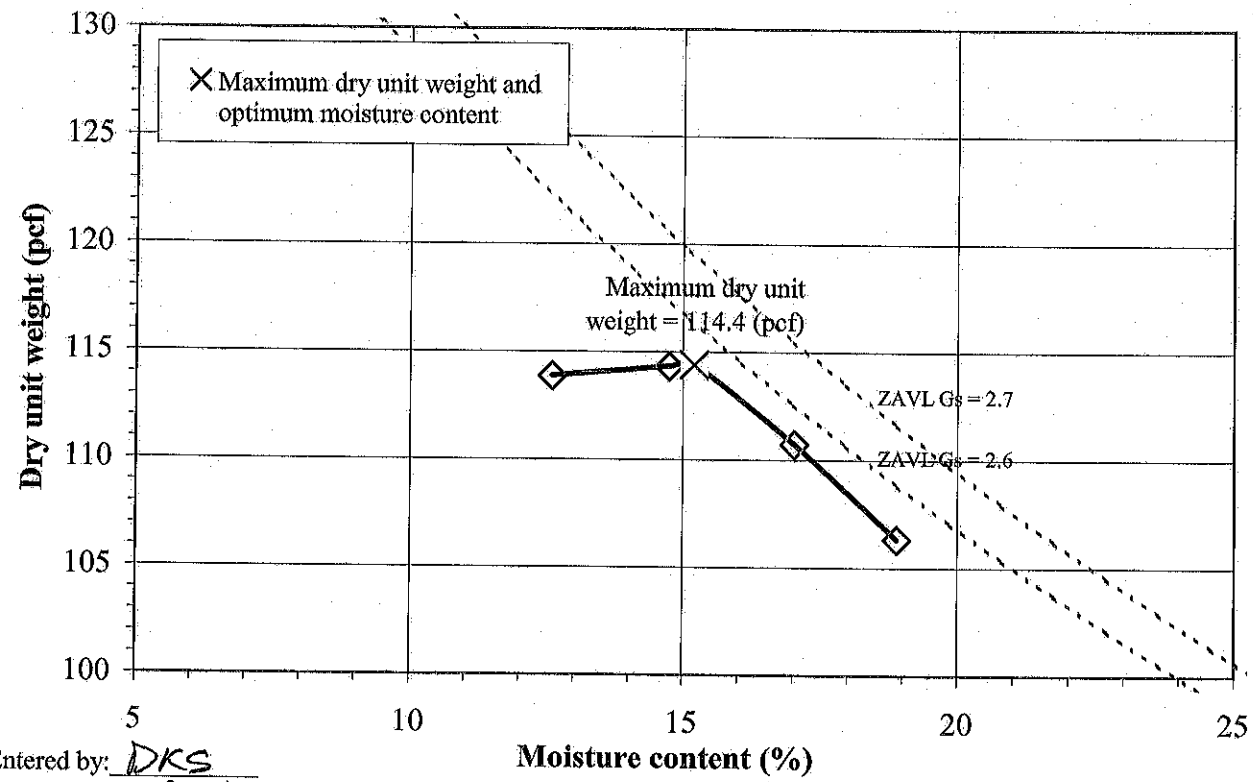
Method: ASTM D1557 B
Mold volume (ft^3): 0.0333

Optimum moisture content (%): 15.2
Maximum dry unit weight (pcf): 114.4

Point Number	As Is	+2%	+4%	+6%				
Wt. Sample + Mold (g)	6194.3	6239.1	6214.5	6166.9				
Wt. of Mold (g)	4255.3	4255.3	4255.3	4255.3				
Wet Unit Wt., γ_m (pcf)	128.2	131.2	129.6	126.4				
Wet Soil + Tare (g)	623.5	761.8	649.3	773				
Dry Soil + Tare (g)	574.43	691.04	575.4	685.1				
Tare (g)	185	211.3	141.2	219.8				
Moisture Content, w (%)	**12.6**	**14.7**	**17.0**	**18.9**				
Dry Unit Wt., γ_d (pcf)	**113.9**	**114.3**	**110.7**	**106.3**				

Comments:

Sample was dryed in a 140°F oven due to gypsum present in the soil.



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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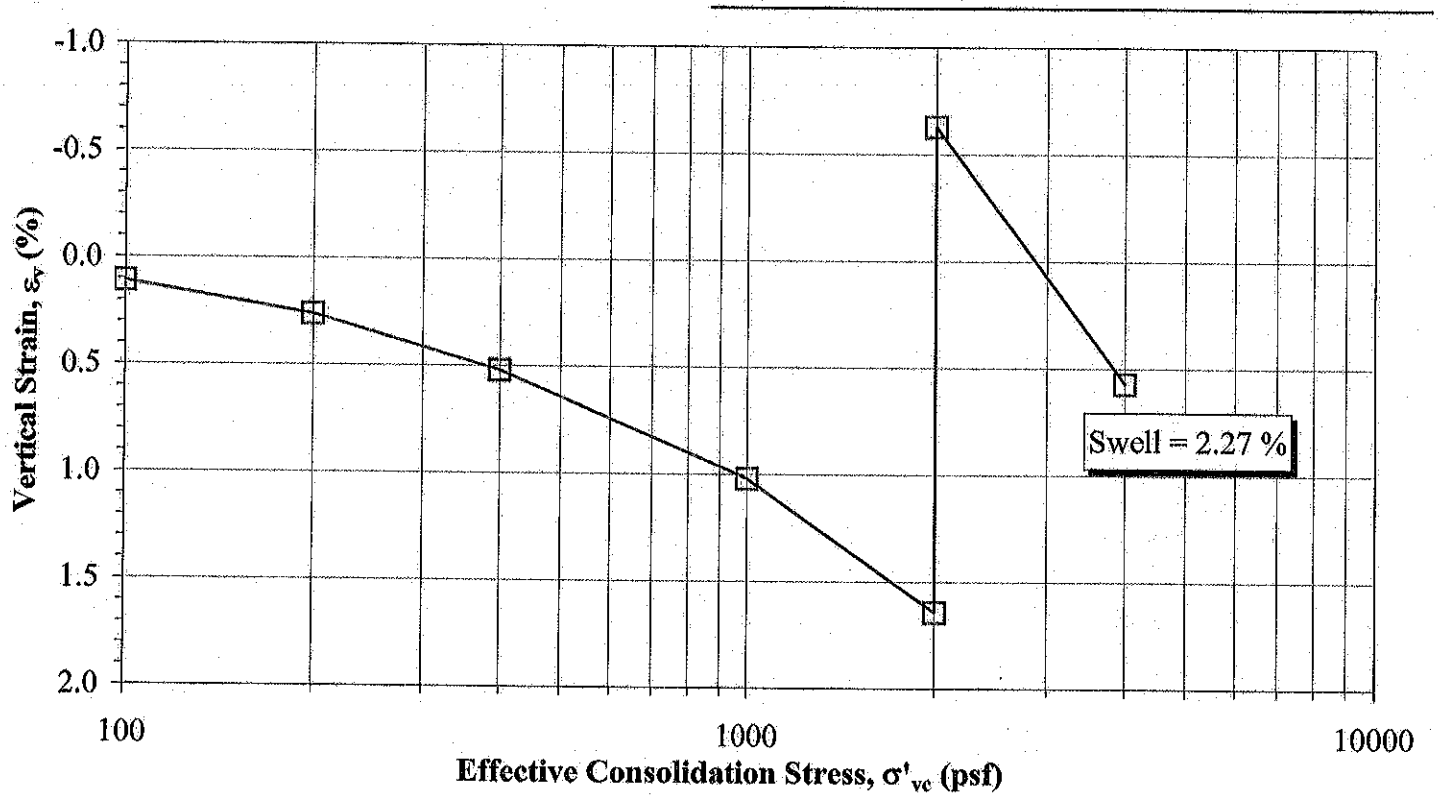
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/11/2007
By: BRR

Boring No.: A-5
Sample:
Depth: 5
Sample Description: reddish clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	2.27	
Swell stress (psf)	2000	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9943
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	183.48	191.30
Wt. rings/tare (g)	41.63	41.63
Moist unit wt., γ_m (pcf)	117.9	125.1
Wet soil + tare (g)	614.53	
Dry soil + tare (g)	547.55	
Tare (g)	177.96	
Moisture content, w (%)	18.1	24.6
Dry unit wt., γ_d (pcf)	99.8	100.4
Saturation	0.74	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1832	0.00	1.0000	0.658
100	0.1843	0.11	0.9989	0.656
200	0.1858	0.26	0.9974	0.654
400	0.1884	0.52	0.9948	0.649
1000	0.1934	1.02	0.9898	0.641
2000	0.1996	1.64	0.9836	0.631
2000	0.1769	-0.63	1.0063	0.668
4000	0.1889	0.57	0.9943	0.648



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Reviewed: KOS

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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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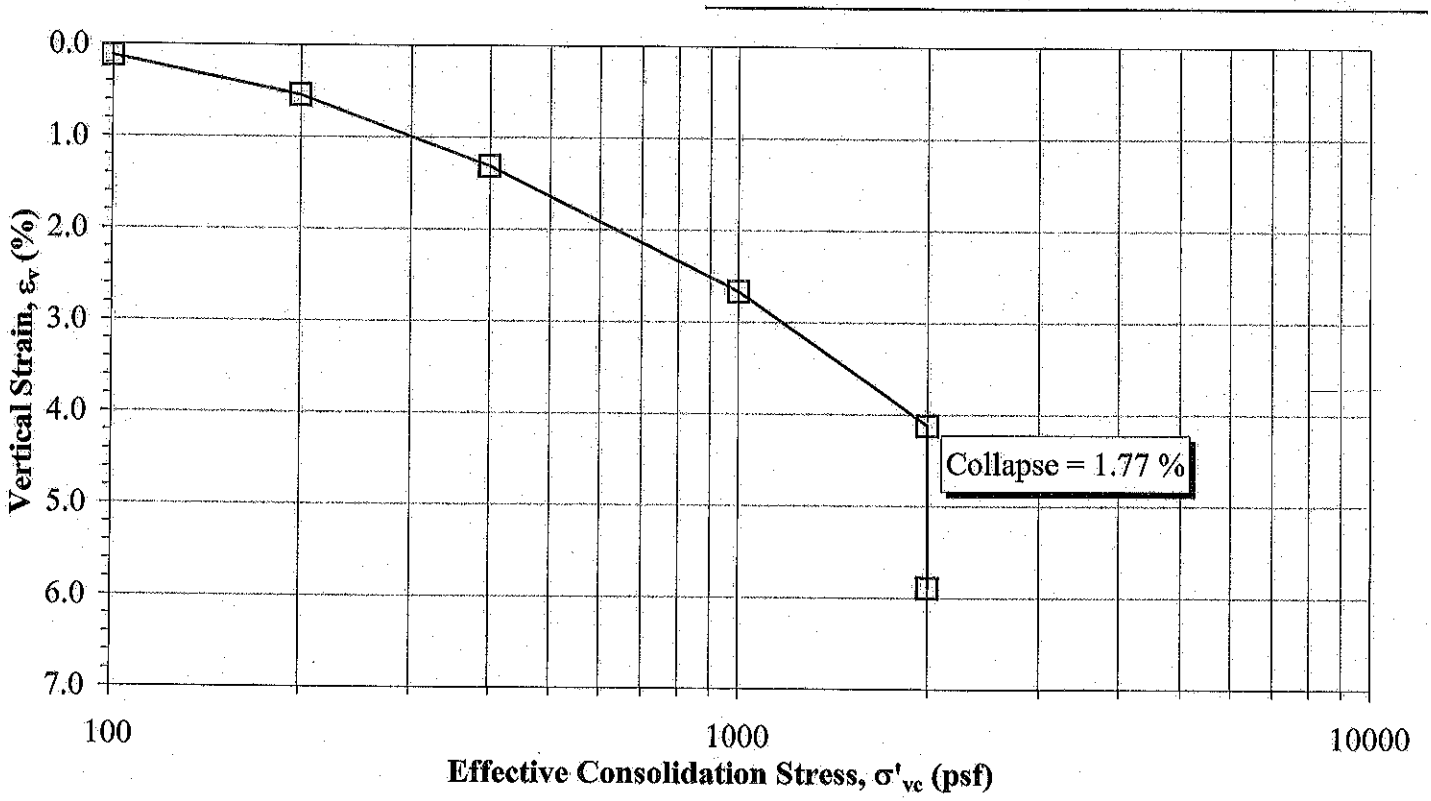
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/10/2007
By: BRR

Boring No.: LS-9
Sample:
Depth: 32
Sample Description: Not requested
Engineering Classification: Not requested
Sample type: Disturbed

Specific gravity, G_s	2.65	Assumed
Collapse (%)	1.77	
Collapse stress (psf)	2000	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9411
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	175.72	187.68
Wt. rings/tare (g)	46.36	46.36
Moist unit wt., γ_m (pcf)	107.5	124.8
Wet soil + tare (g)	649.92	
Dry soil + tare (g)	598.57	
Tare (g)	195.59	
Moisture content, w (%)	12.7	23.2
Dry unit wt., γ_d (pcf)	95.3	101.3
Saturation	0.53	0.97

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_o (in.)	e
Seating	0.2585	0.00	1.0000	0.735
100	0.2597	0.12	0.9988	0.733
200	0.2639	0.54	0.9946	0.726
400	0.2716	1.31	0.9869	0.712
1000	0.2851	2.66	0.9734	0.689
2000	0.2997	4.12	0.9588	0.664
2000	0.3174	5.89	0.9411	0.633



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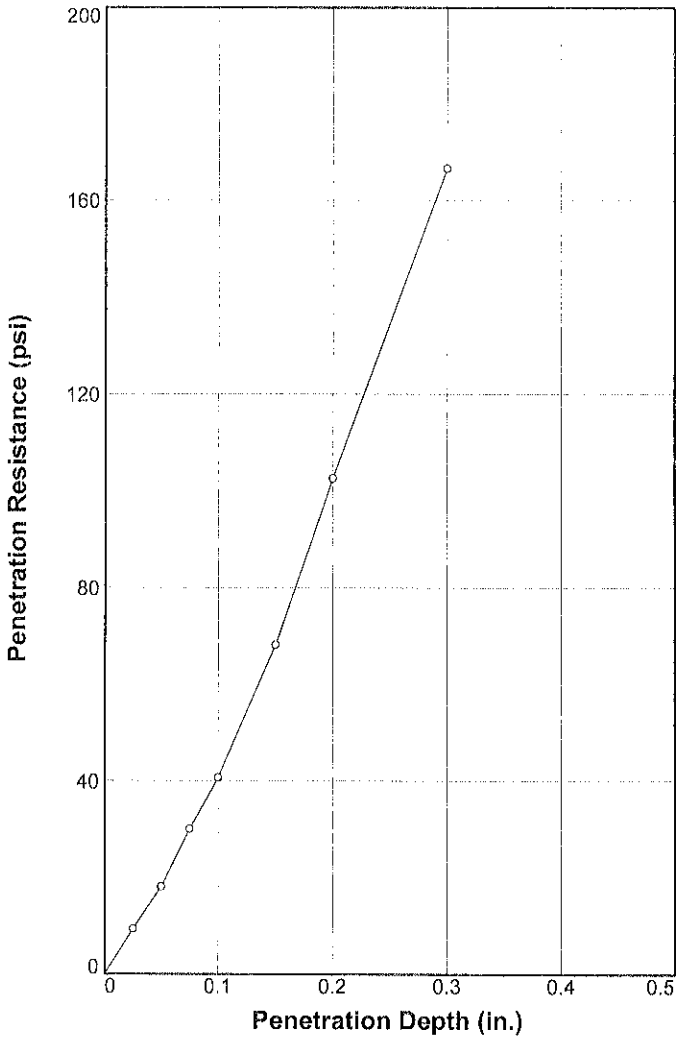
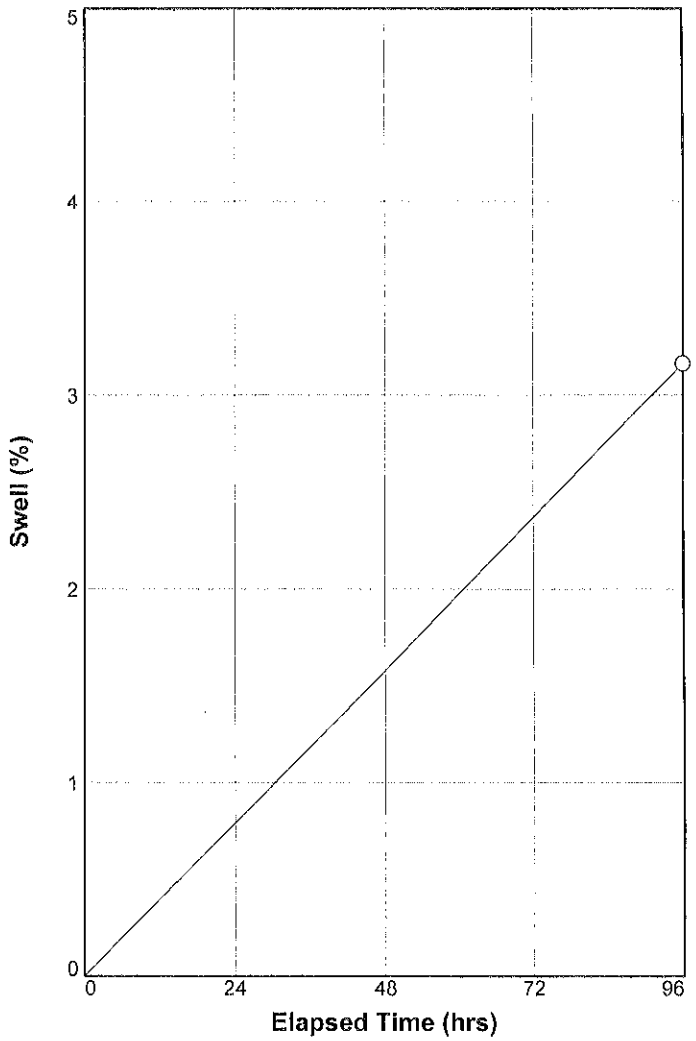
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	112.2	95.1	11.0	108.8	92.2	19.3	4.8	7.4	0.014	10	3.2
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silty / clayey sand with gravel		118	11.0		

Project No: 07330

Project: St. George Replacement Airport

Location: WT-1 @ 2'

Sample Number: 7SG2301

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2301

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-1 @ 2' **Authorized By:** Client **Date:** 6/29/2007

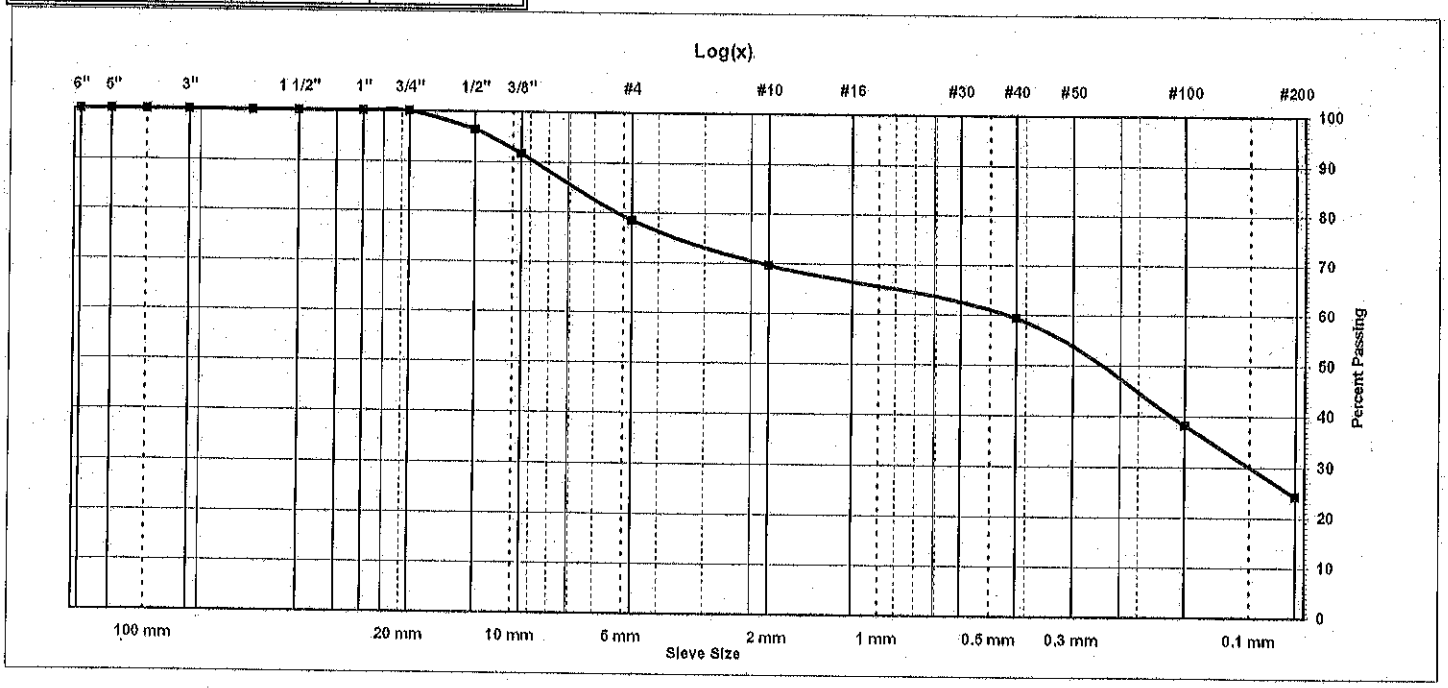
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	96	
9.5 mm	3/8"	92	
4.75 mm	#4	79	
2.00 mm	#10	70	
425 µm	#40	59	
150 µm	#100	38	
75 µm	#200	24.2	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	21.5	54.3	24.2



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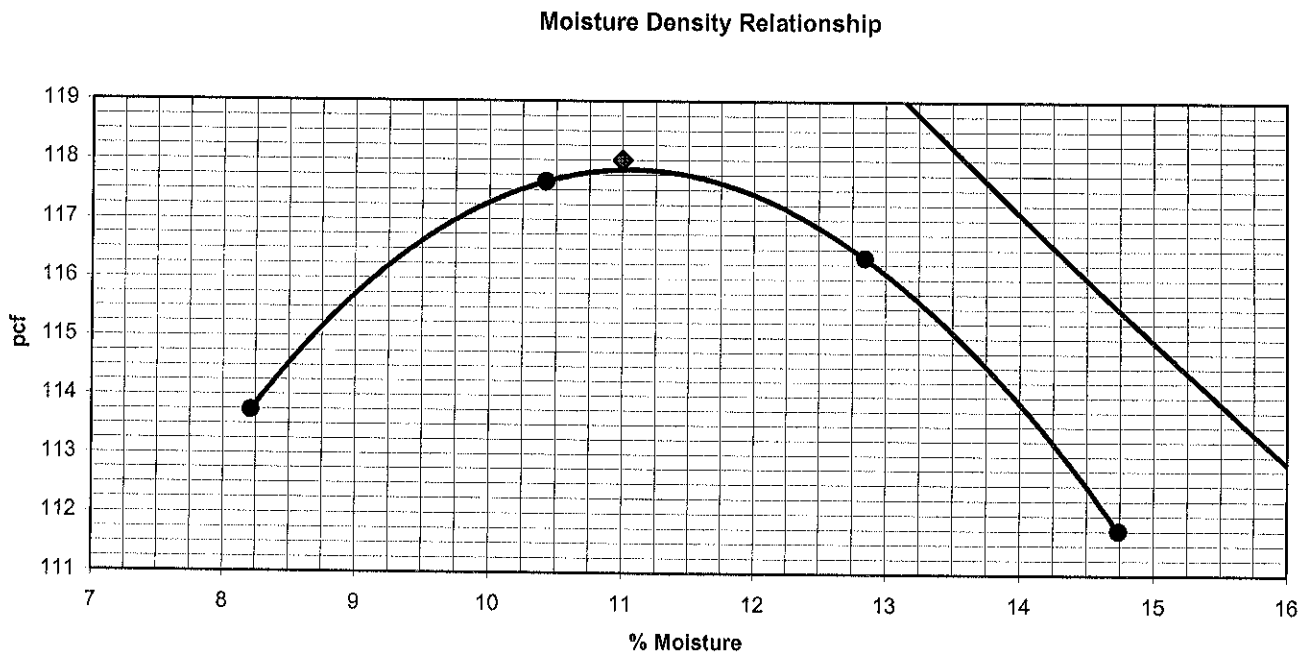
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2301

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: Silty / clayey sand with gravel
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: WT-1 @ 2'
Approved By: Client **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	8.2	10.4	12.8	14.7		
Dry Density	113.7	117.6	116.4	111.8		

Test Results	
Maximum Dry Density	118.0
Optimum Moisture	11.0
Test Standard	ASTM D 1557
Method	C

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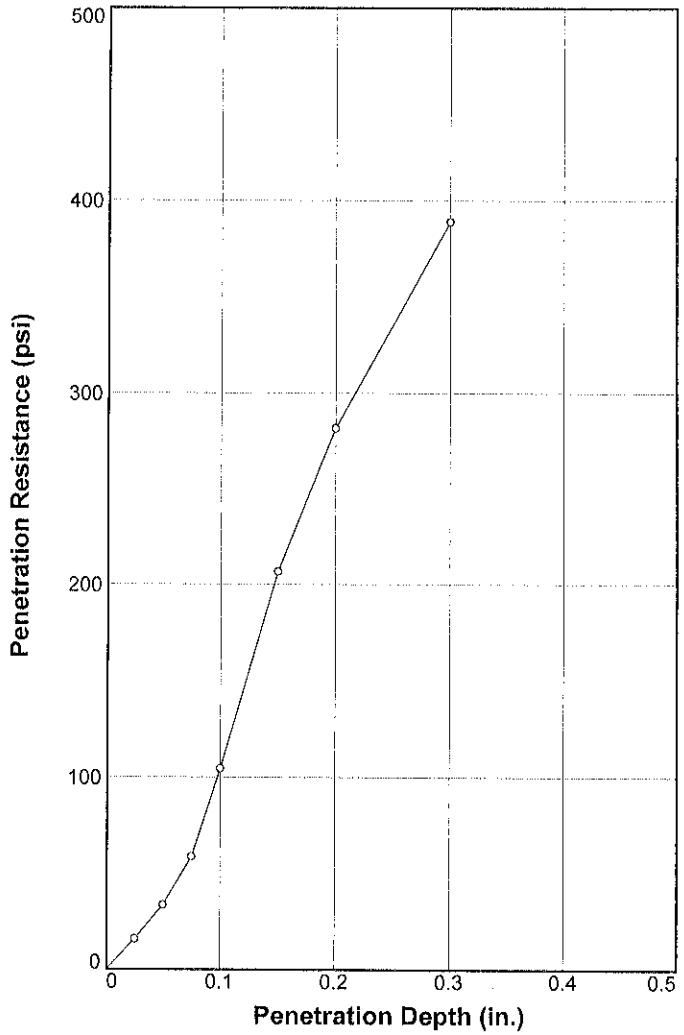
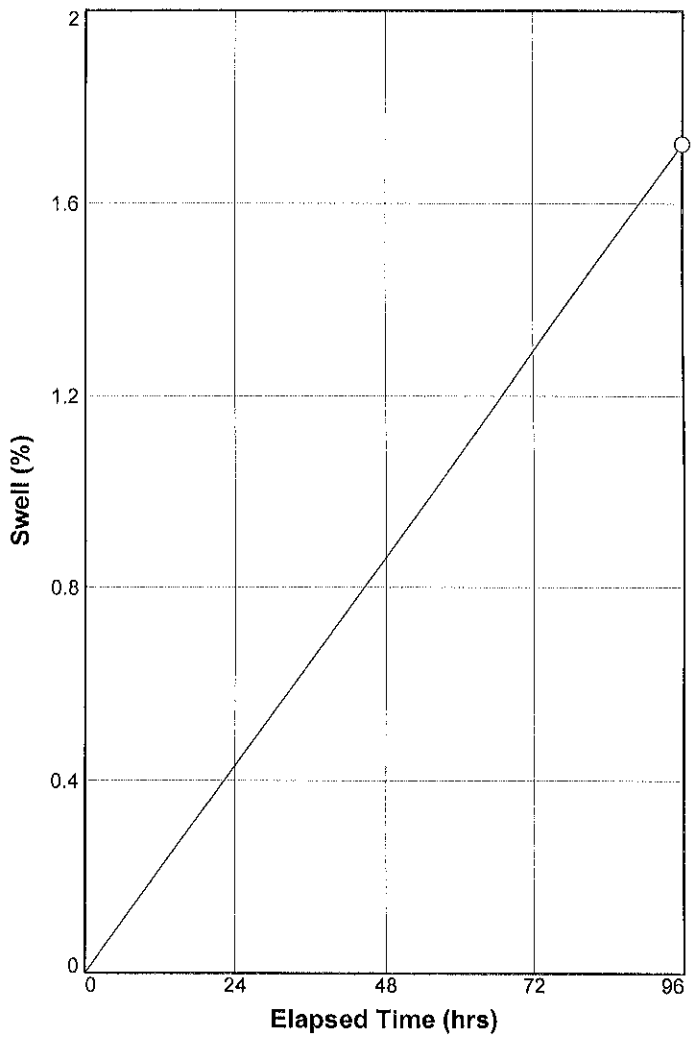
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	118.8	95	8.0	116.8	93.4	15.0	19.0	21.8	0.042	10	1.7
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Poorly-graded sand with gravel		125.0	8.5		

Project No: 07330

Project: St. George Replacement Airport

Location: WT-3 @ 15'

Sample Number: 7SG2302

Date: 6/29/07

Test Description/Remarks:

BEARING RATIO TEST REPORT

LANDMARK

Figure _____

LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2302

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Poorly-graded sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-3 @ 15' **Authorized By:** Client **Date:** 6/29/2007

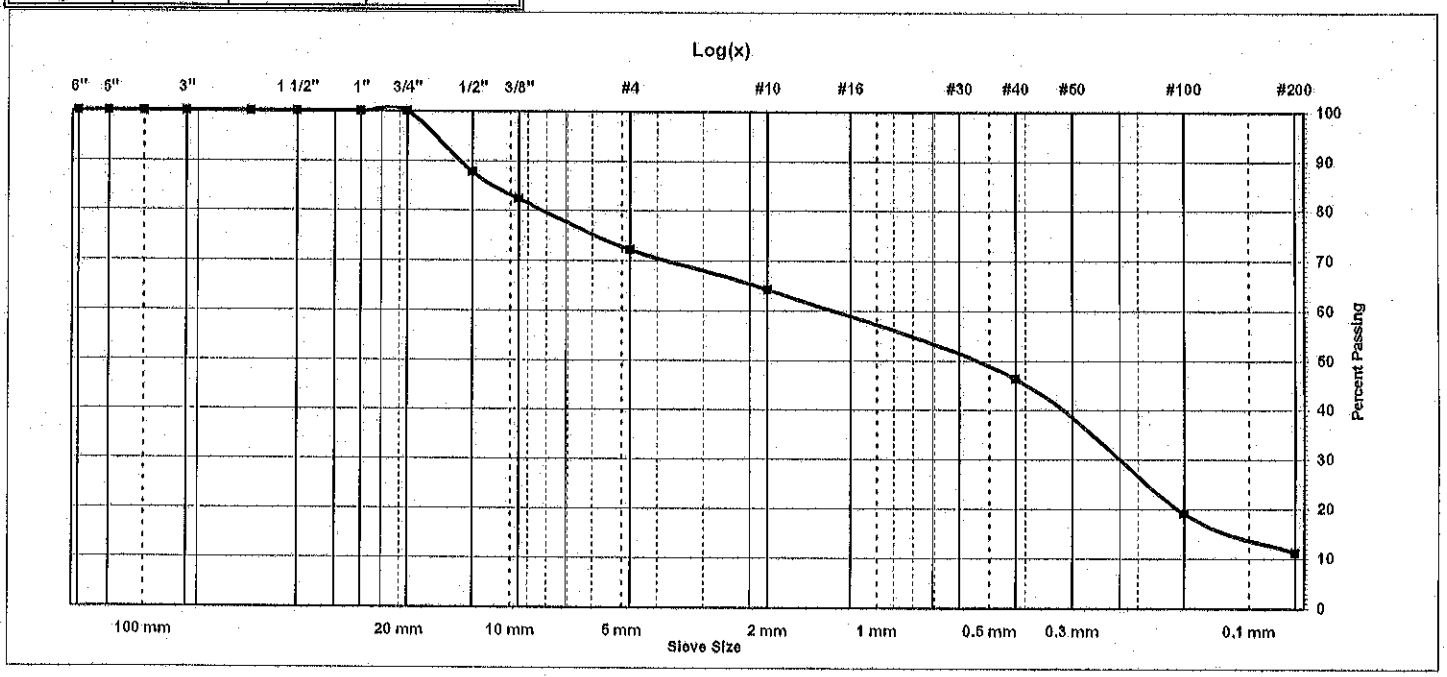
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	88	
9.5 mm	3/8"	82	
4.75 mm	#4	72	
2.00 mm	#10	64	
425 µm	#40	46	
150 µm	#100	19	
75 µm	#200	11.2	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.0		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	27.8	61.0	11.2



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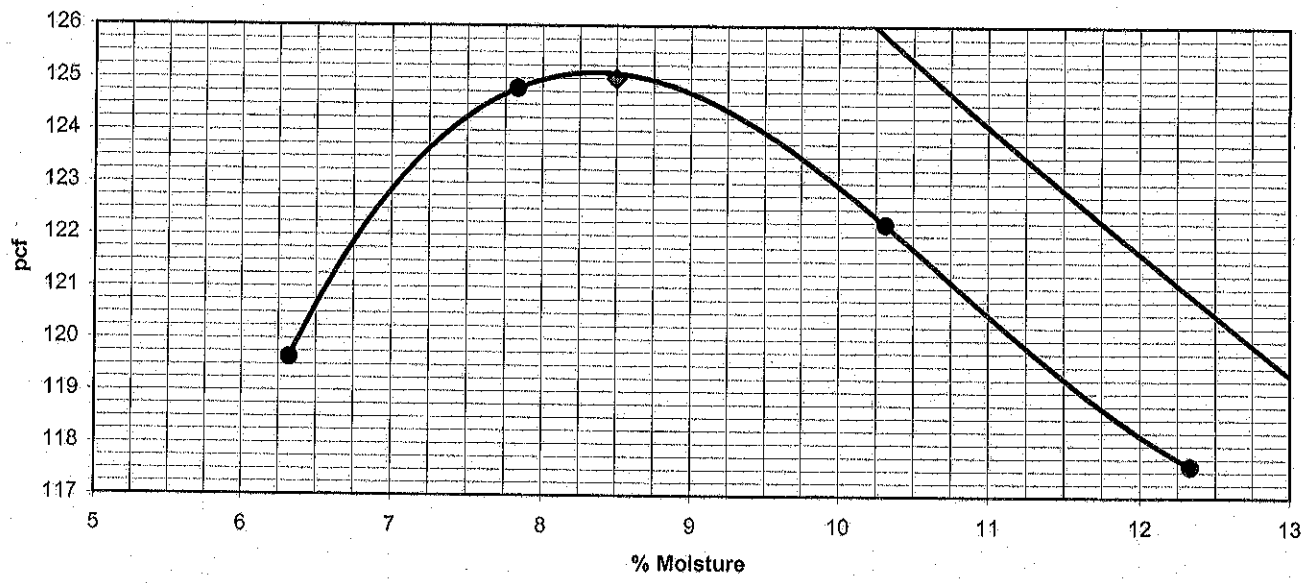
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2302

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: Poorly-graded sand with gravel
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: WT-3 @ 15'
Approved By: Client **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	6.3	7.8	10.3	12.3		
Dry Density	119.6	124.8	122.2	117.6		

Test Results	
Maximum Dry Density	125.0
Optimum Moisture	8.5
Test Standard	ASTM D 1557
Method	C

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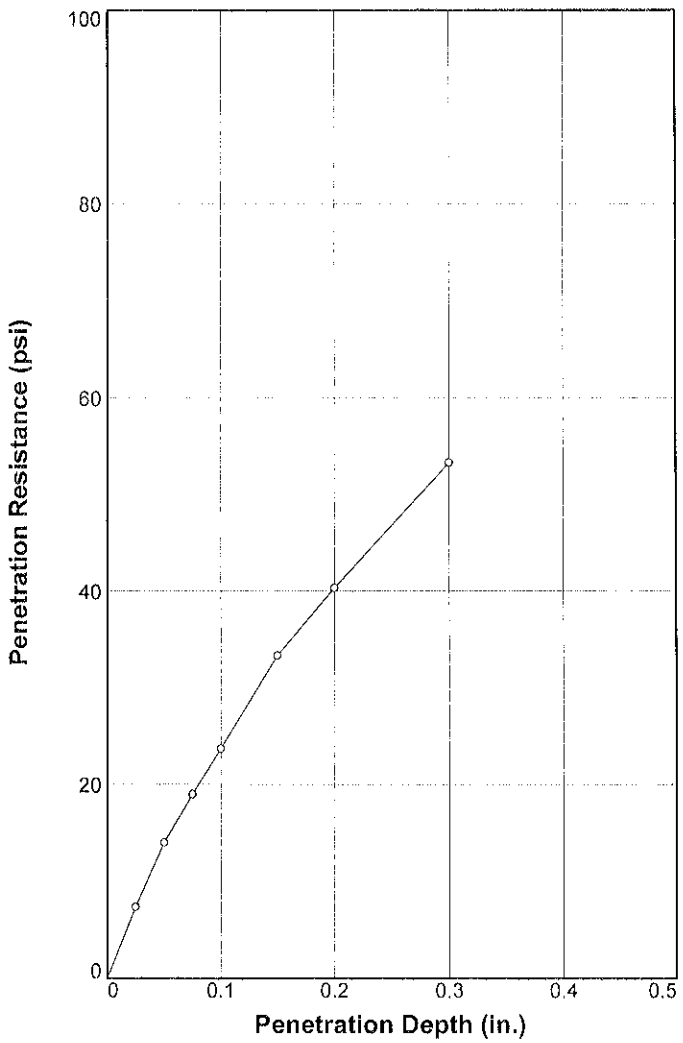
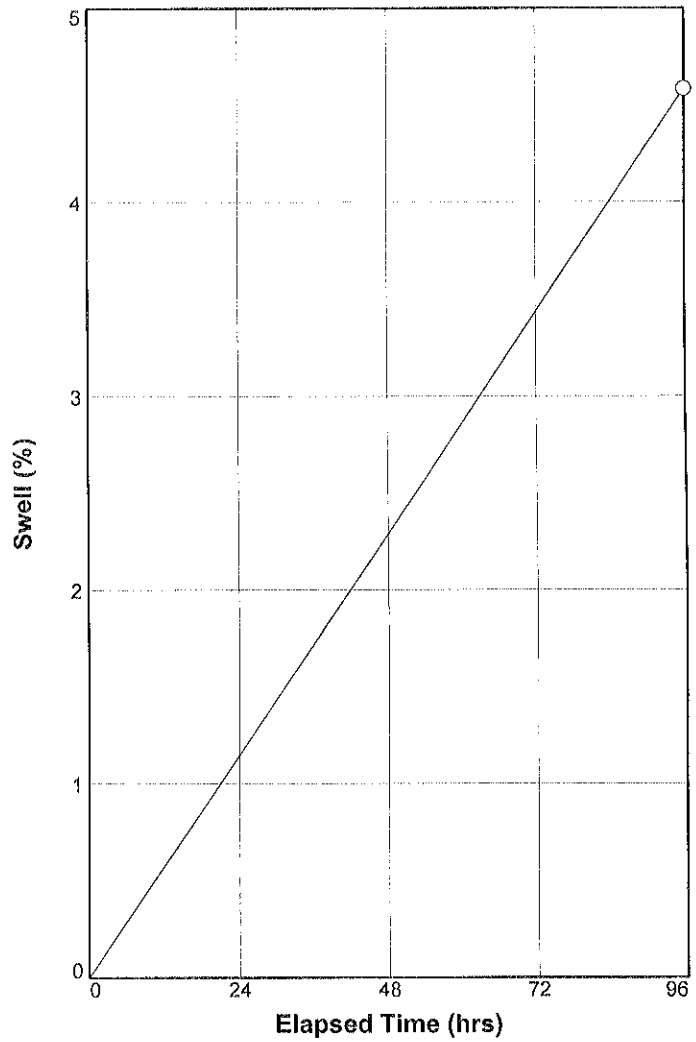
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	127.2	94.9	7.0	121.6	90.8	13.9	2.4	2.7	0.000	10	4.6
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Clay with sand		134	7		

Project No: 07330

Project: St. George Replacement Airport

Location: WT-8 @ 3'

Sample Number: 7SG2303

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2303

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Clay with sand **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: WT-8 @ 3' **Authorized By:** Client **Date:** 6/29/2007

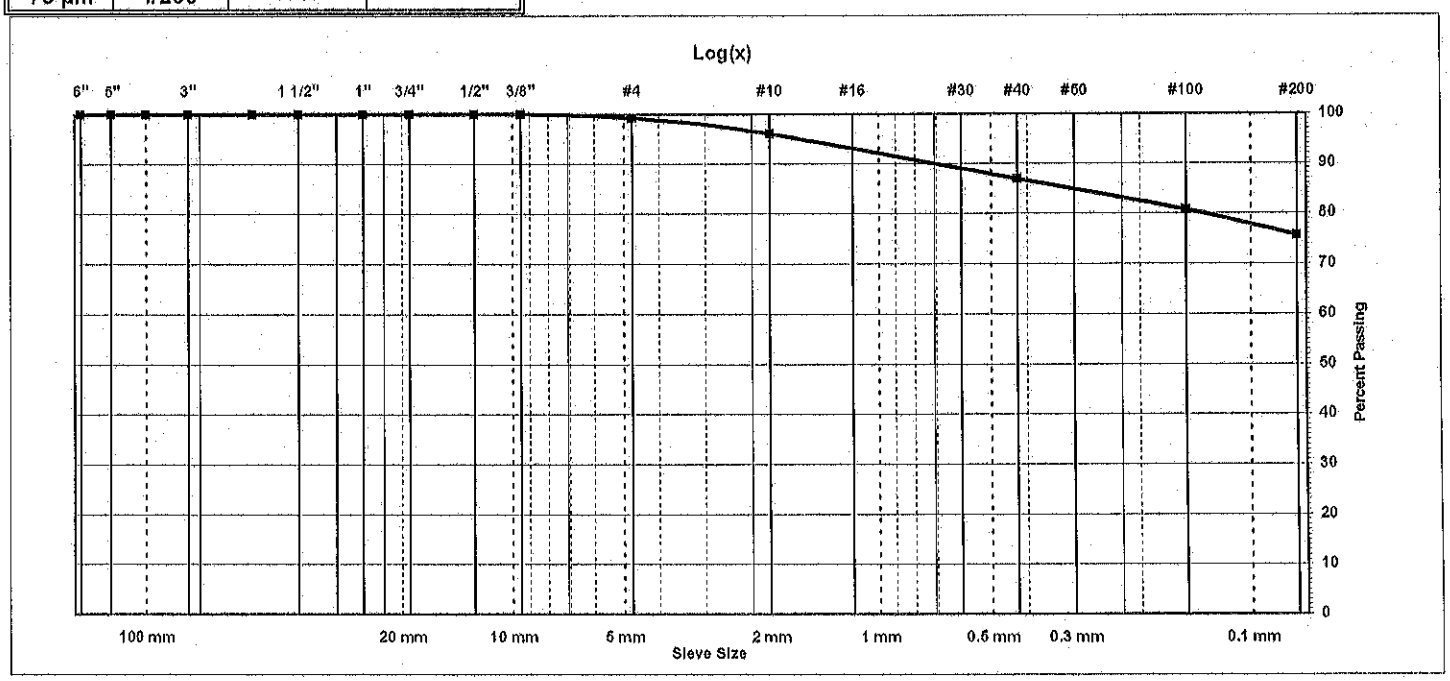
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"	100	
4.75 mm	#4	99	
2.00 mm	#10	96	
425 µm	#40	87	
150 µm	#100	81	
75 µm	#200	75.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.6		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.7	23.6	75.6



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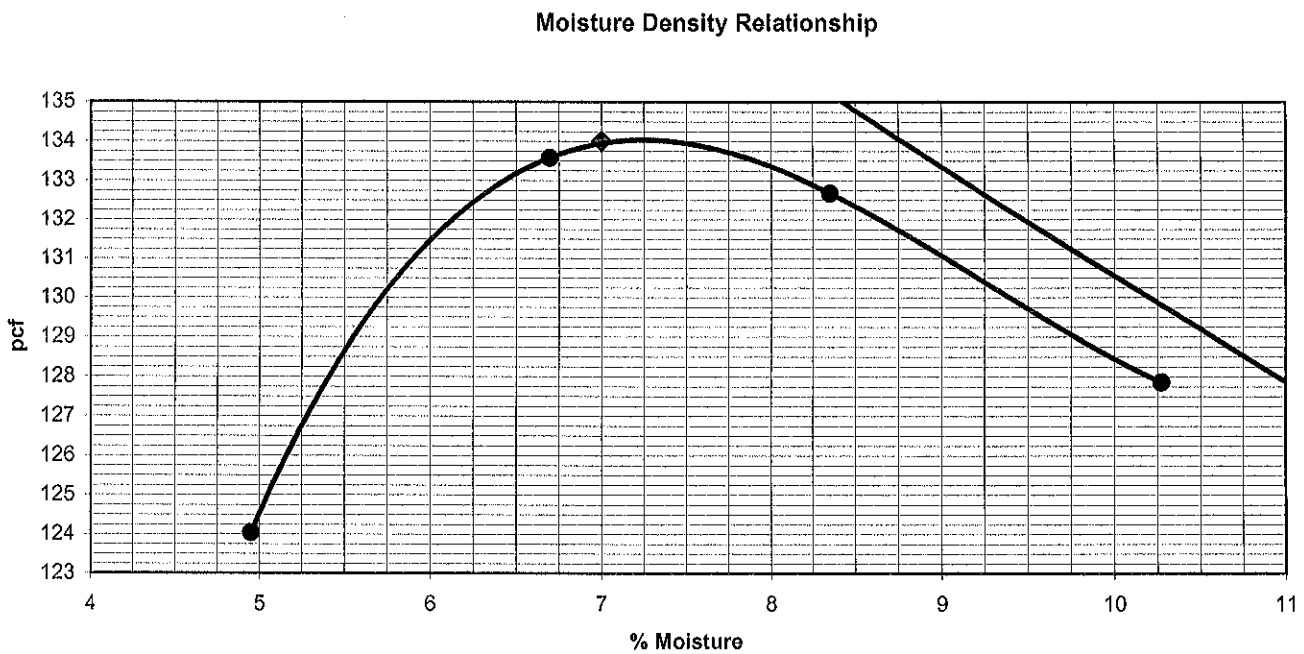
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2303

Project: St. George Replacement Airport — **Project #:** 07330
Location: St. George — **Sampled By:** R. Owens — **Date:** 7/1/2007
Type of Sample: Clay with sand — **Tested By:** B. Jansen — **Date:** 7/6/2007
Sample Location: WT-8 @ 3' — **Approved By:** Client — **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	4.9	6.7	8.4	10.3		
Dry Density	124.0	133.6	132.7	127.9		

Test Results	
Maximum Dry Density	134.0
Optimum Moisture	7.0
Test Standard	ASTM D 1557
Method	C

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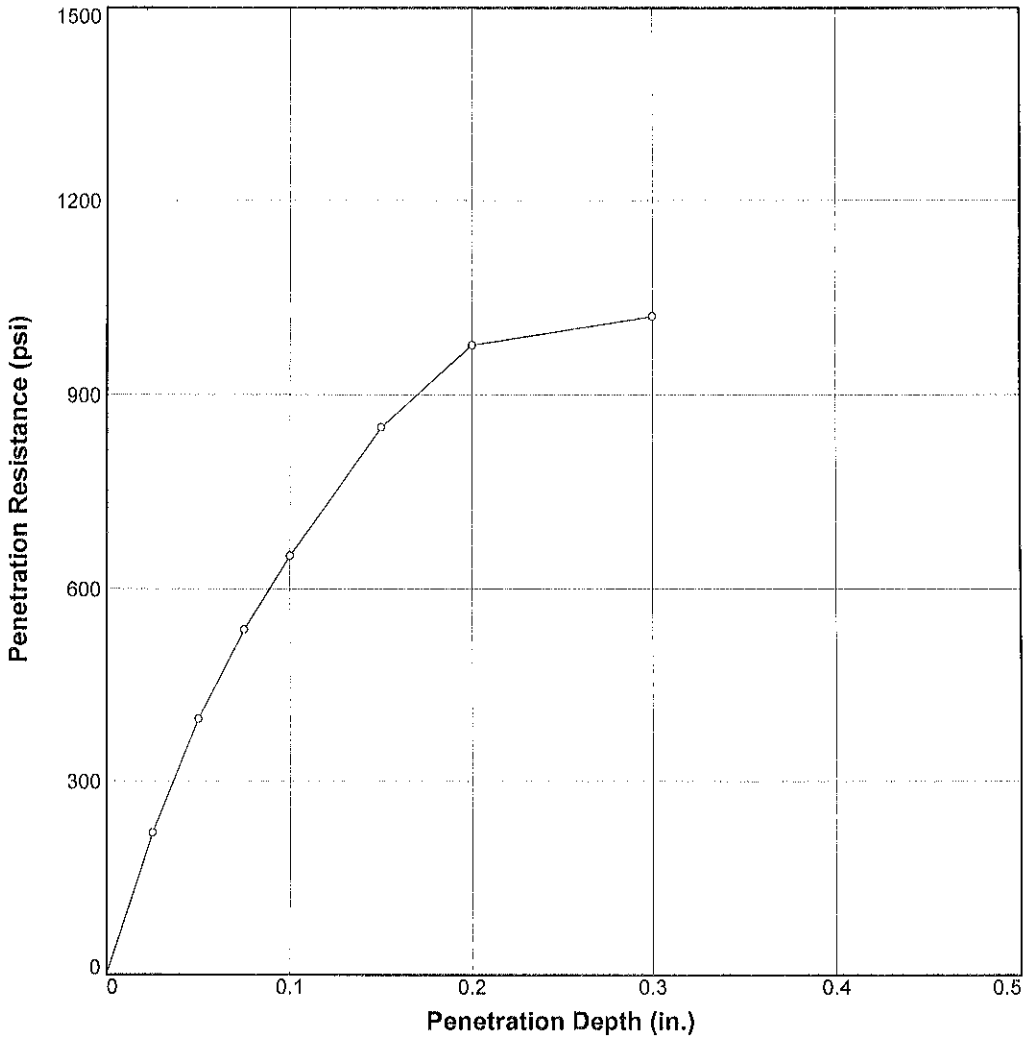
BEARING RATIO TEST REPORT
ASTM D 1883-99



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	125.2	95.9	7.5	125.2	95.9	9.6	65.1	65.1	0.000	10	0
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silty / clayey sand with gravel		130.5	7.5		

Project No: 07330

Project: St. George Replacement Airport

Location: RW-2 @ 2'

Sample Number: 7SG2304

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2304

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: RW-2 @ 2' **Authorized By:** Client **Date:** 6/29/2007

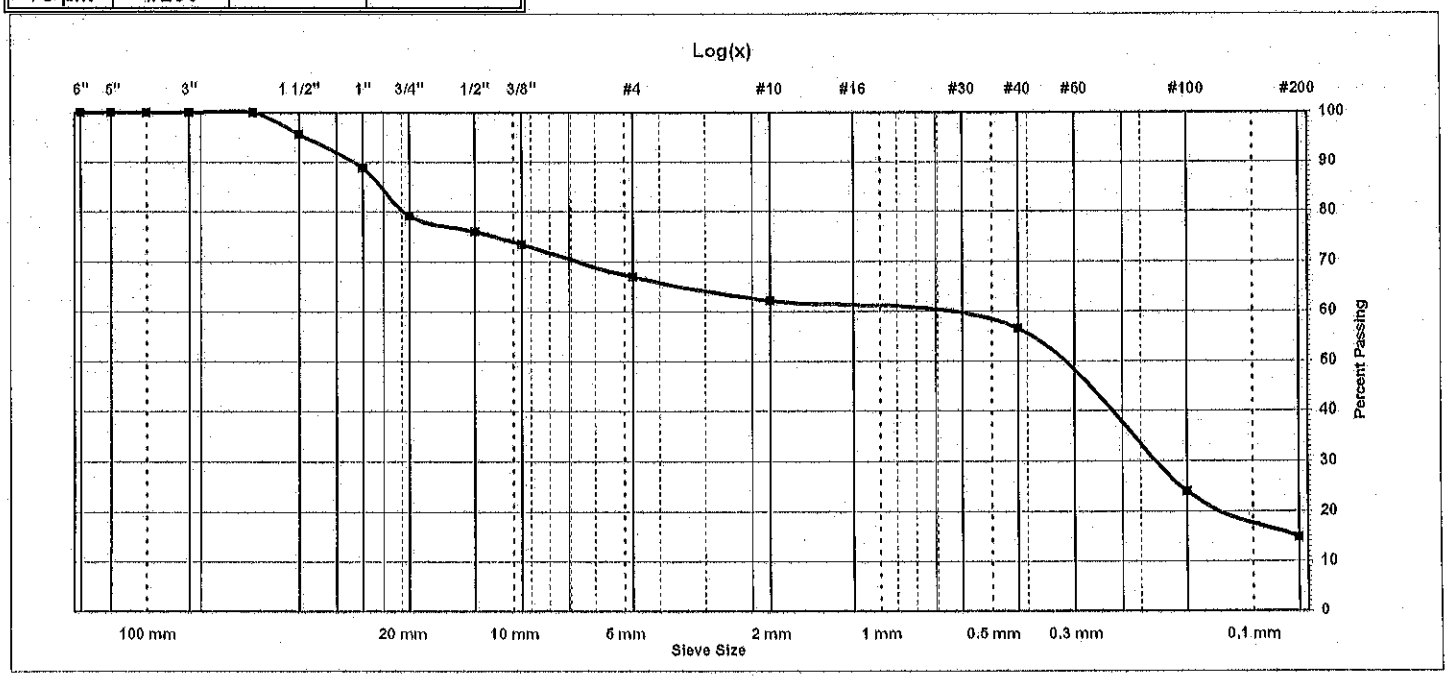
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"	100	
37.5 mm	1-1/2"	96	
25 mm	1"	89	
19 mm	3/4"	79	
12.5 mm	1/2"	76	
9.5 mm	3/8"	74	
4.75 mm	#4	67	
2.00 mm	#10	62	
425 µm	#40	56	
150 µm	#100	24	
75 µm	#200	14.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	7.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	33.1	52.2	14.8



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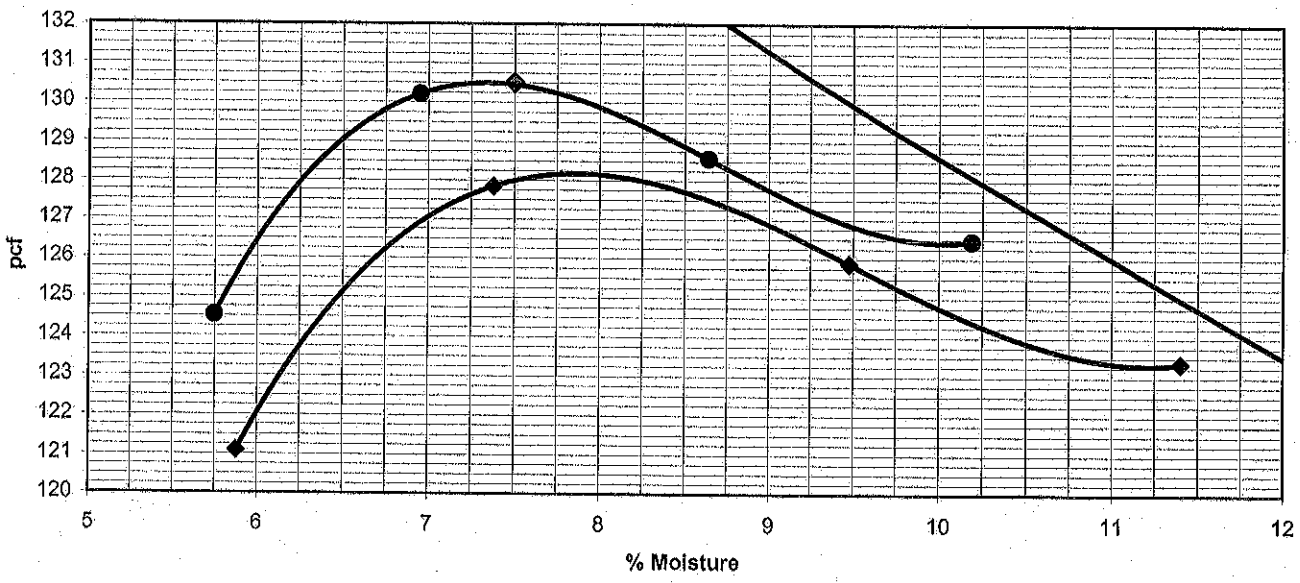
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2304

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: Silty / clayey sand with gravel
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: RW-2 @ 2'
Approved By: Client **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	19.6
Oversize Sp. G.:	2.3
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	5.7	7.0	8.6	10.2		
Dry Density	124.5	130.2	128.6	126.4		

Test Results	
Maximum Dry Density	130.5
Optimum Moisture	7.5
Test Standard	ASTM D 1557
Method	C

Correction applied to each point in accordance with ASTM D 4718

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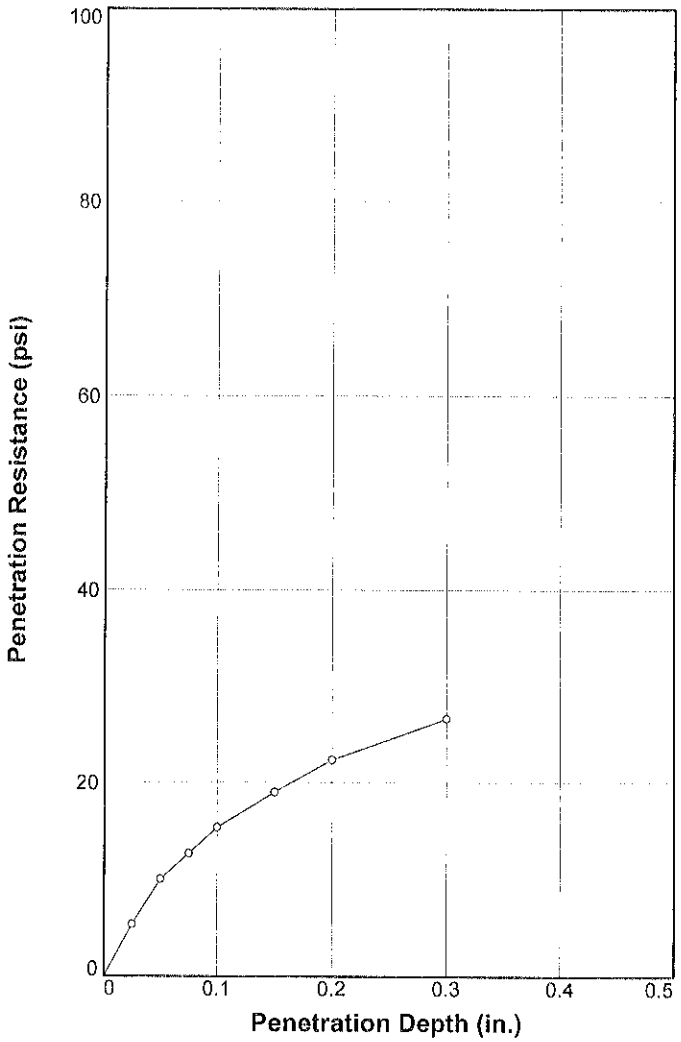
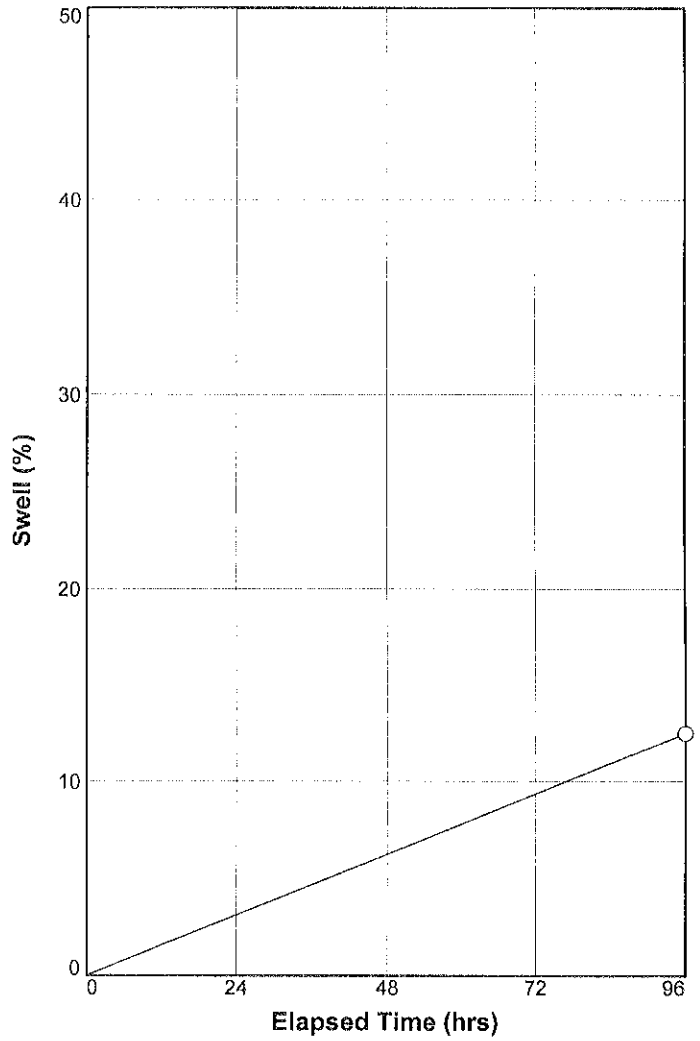
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	102.1	91.2	16.0	90.8	81.1	22.3	1.5	1.5	0.000	10	12.5
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
25% Sand 75% Clay		112.0	16.0		

Project No: 07330

Project: St. George Replacement Airport

Location: RW-6 @ 10.5'

Sample Number: 7SG2305

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

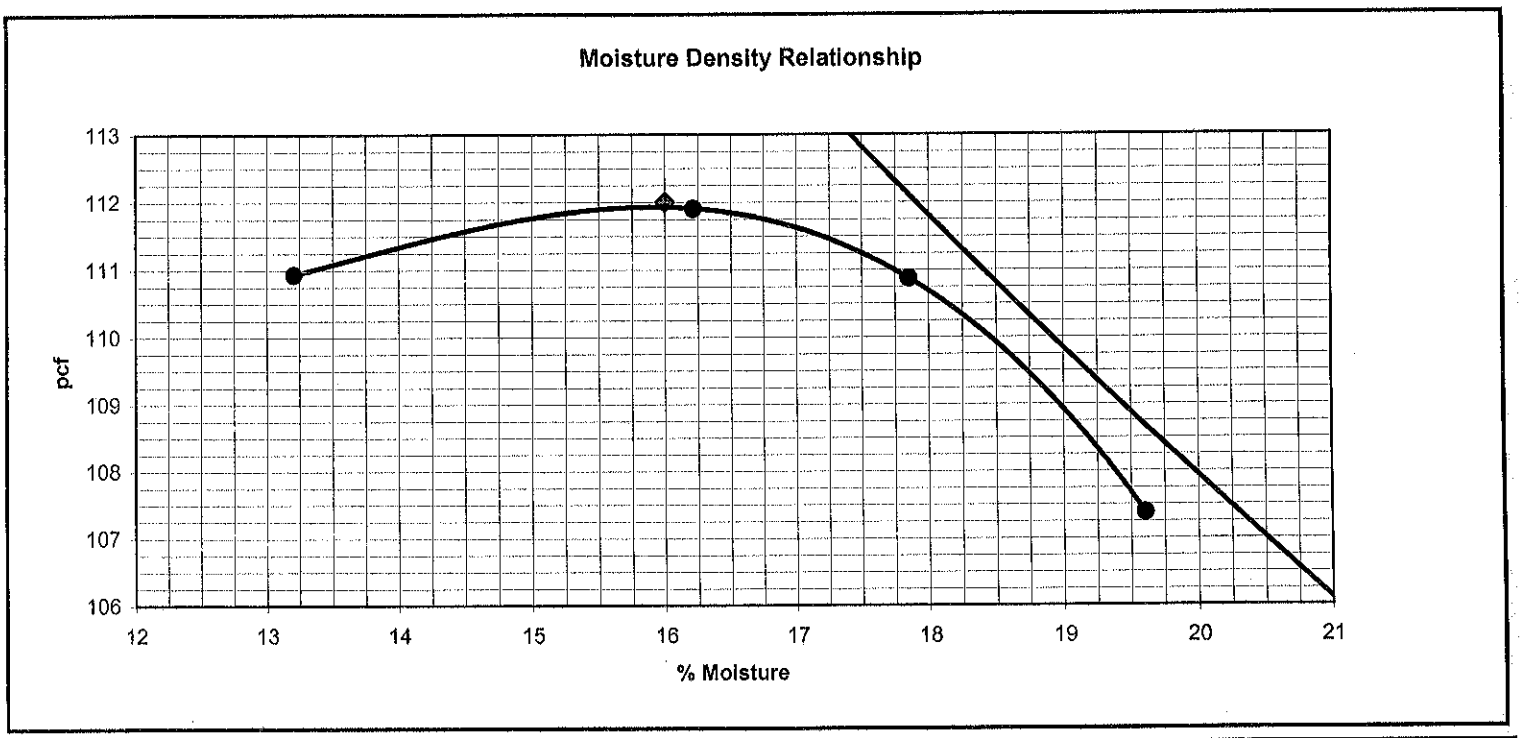
LANDMARK
TESTING & ENGINEERING

MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2305

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: 25% Sand 75% clay
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: RW - 6 @ 10.5'
Approved By: Client **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	13.2	16.2	17.9	19.6		
Dry Density	110.9	111.9	110.9	107.4		

Test Results	
Maximum Dry Density	112.0
Optimum Moisture	16.0
Test Standard	ASTM D 1557
Method	C

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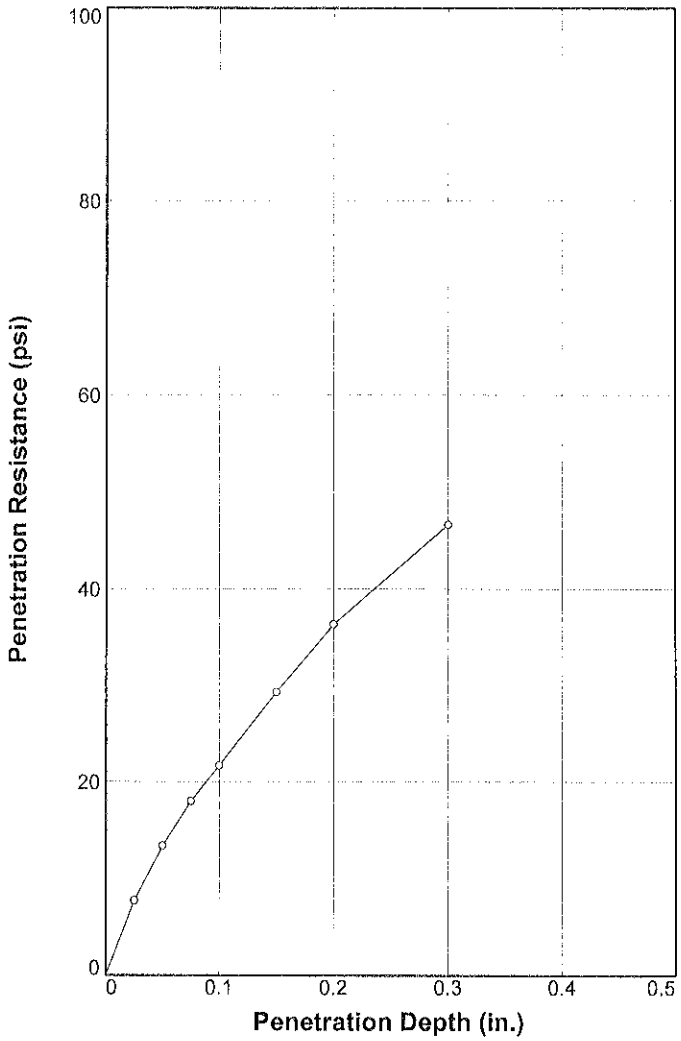
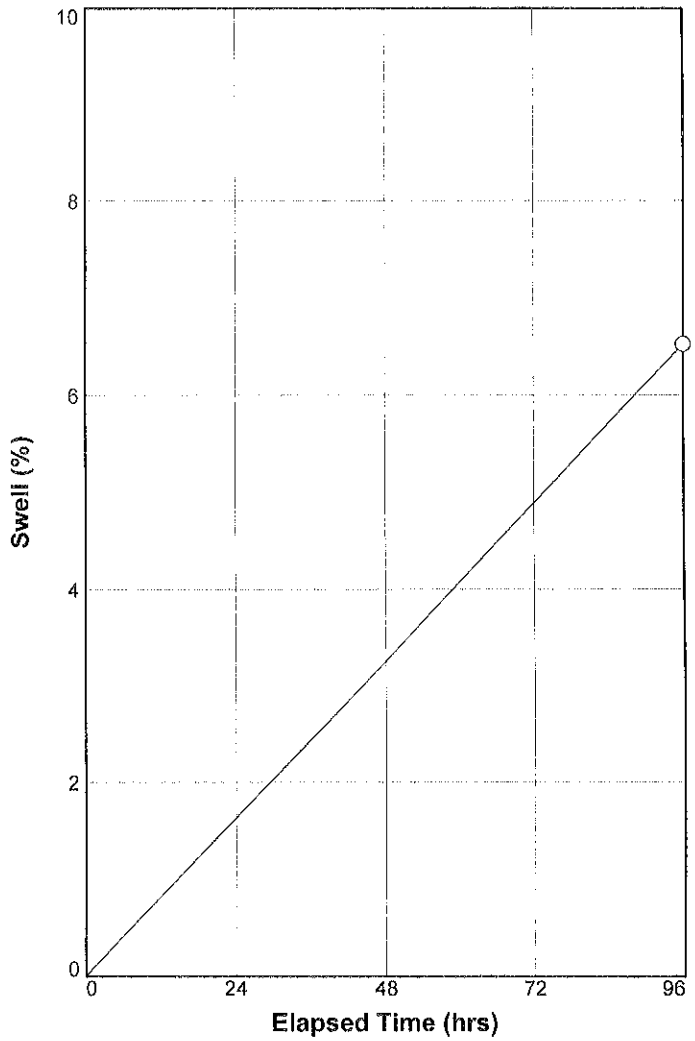
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	112.2	95.1	14.0	105.3	89.2	17.1	2.2	2.4	0.000	10	6.5
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
50 % Sand 50 % Clay		118.0	14.0		

Project No: 07330

Project: St. George Replacement Airport

Location: RW-6 @ 10.5'

Sample Number: 7SG2305

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

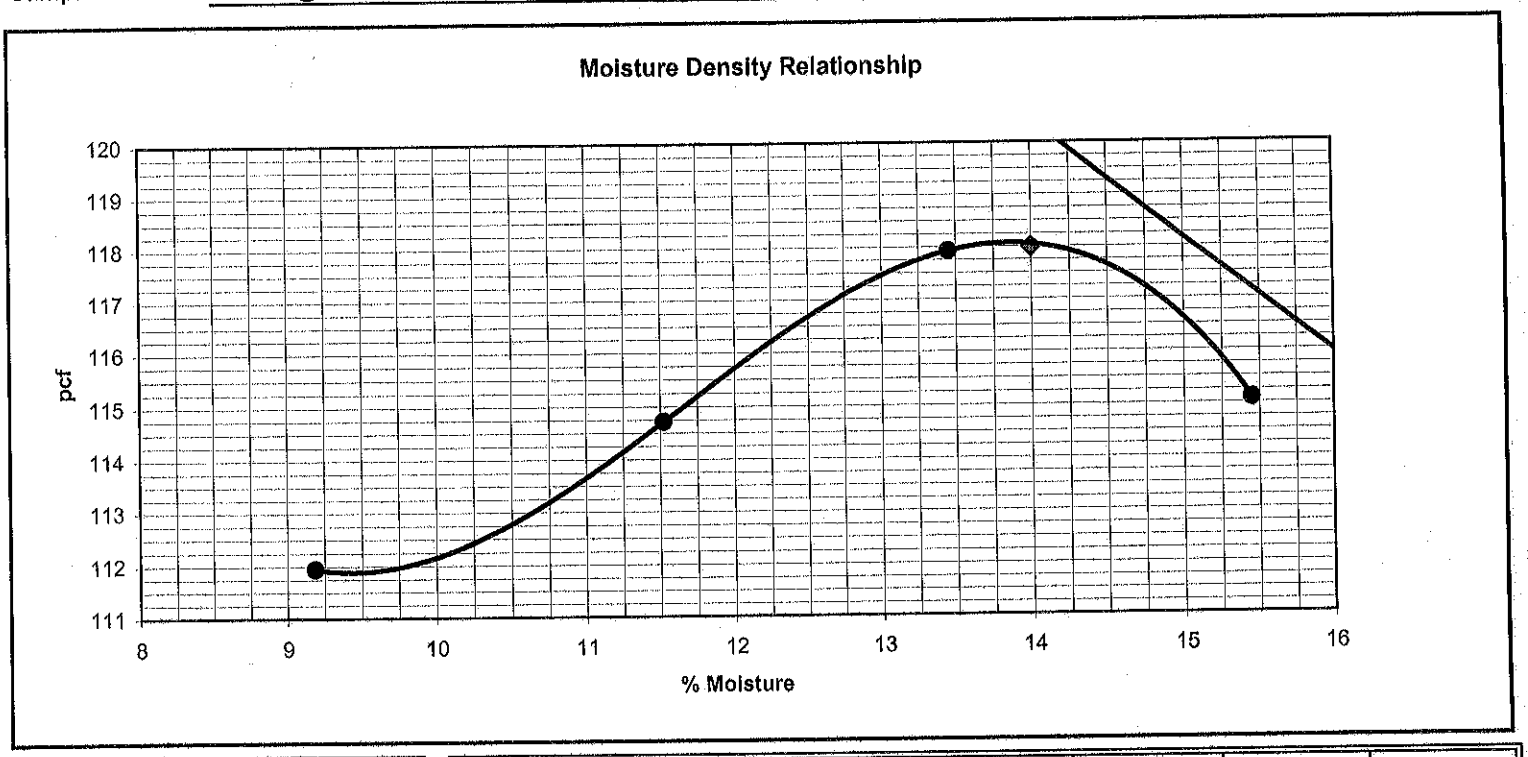
LANDMARK
TESTING & ENGINEERING

MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2305

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: 50% Sand 50% clay
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: RW - 6 @ 10.5'
Approved By: Client **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 In. Sieve

Point	1	2	3	4	5	6
% Moisture	9.2	11.5	13.5	15.4		
Dry Density	111.9	114.7	117.9	115.1		

Test Results	
Maximum Dry Density	118.0
Optimum Moisture	14.0
Test Standard	ASTM D 1557
Method	C

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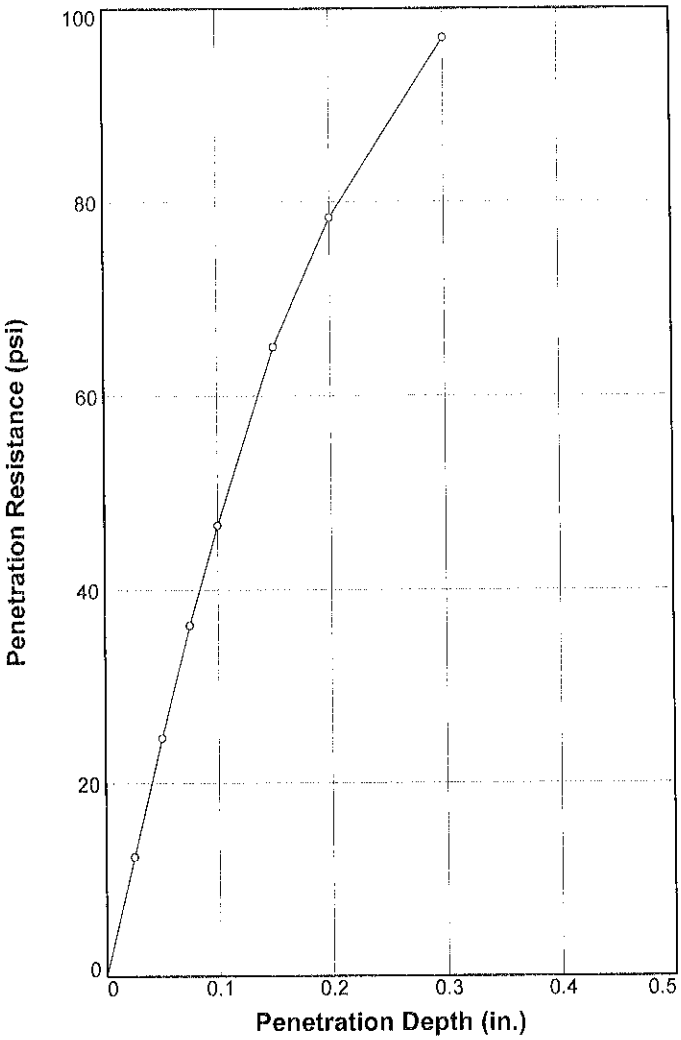
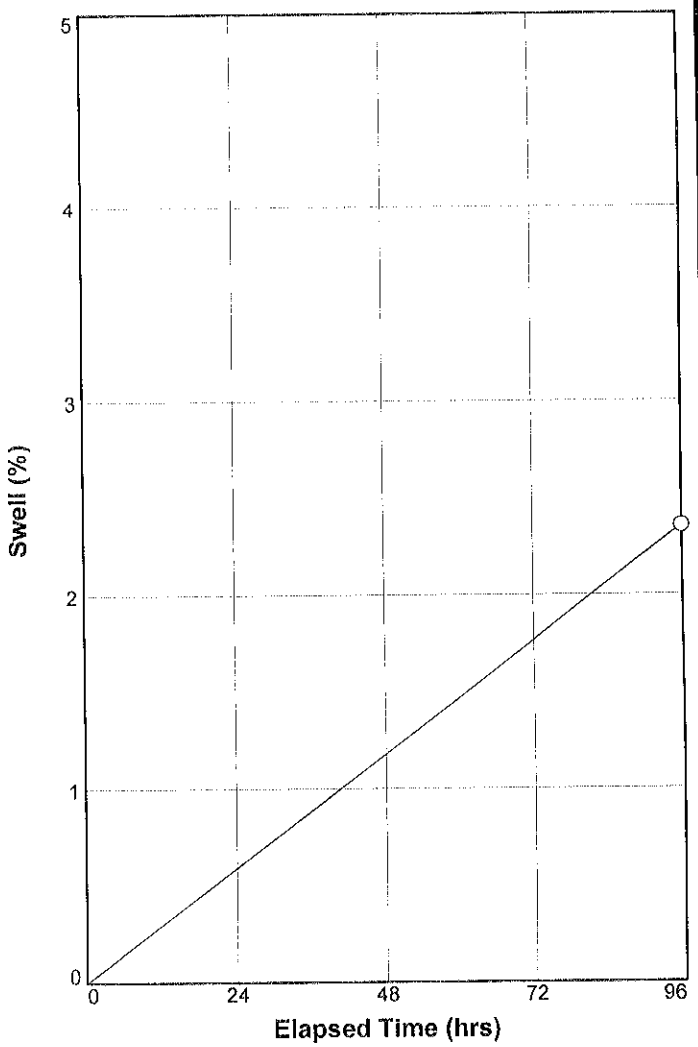
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	117.4	95.4	10.5	114.7	93.3	11.8	4.7	5.2	0.000	10	2.4
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
75% Sand 25% Clay		123.0	10.5		

Project No: 07330

Project: St. George Replacement Airport

Location: RW-6 @ 10.5'

Sample Number: 7SG2305

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

LANDMARK
TESTING & ENGINEERING

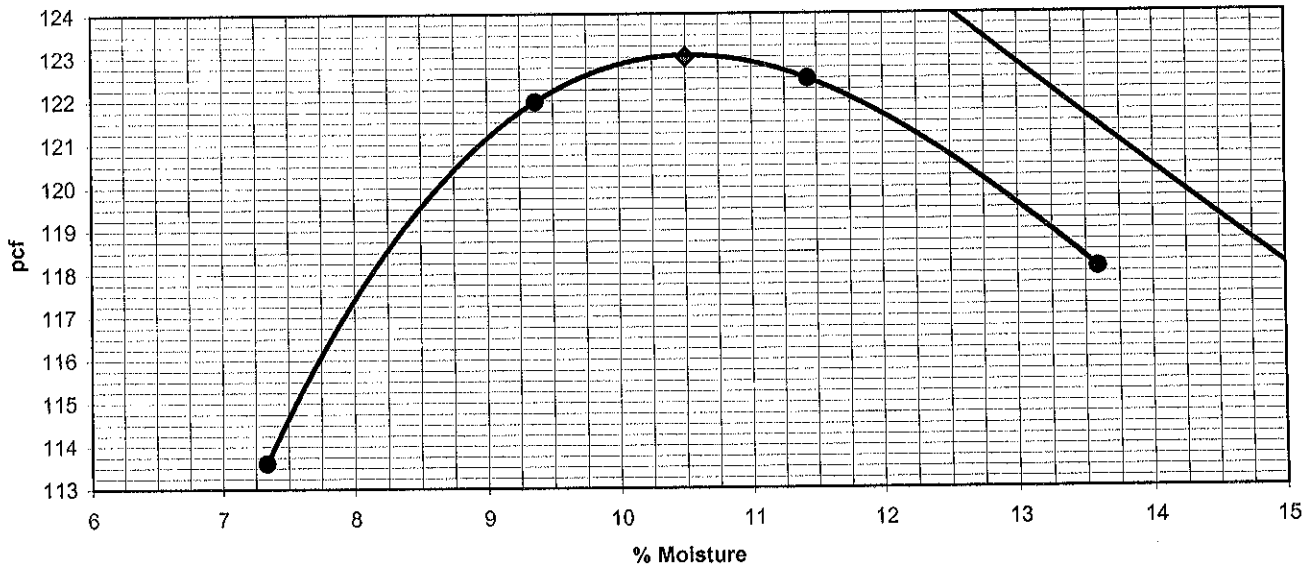
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2305

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: 75% Sand 25% clay
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: RW - 6 @ 10.5'
Approved By: Client **Date:** 7/1/2007

Moisture Density Relationship



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	7.3	9.4	11.4	13.6		
Dry Density	113.6	122.0	122.5	118.1		

Test Results	
Maximum Dry Density	123.0
Optimum Moisture	10.5
Test Standard	ASTM D 1557
Method	C

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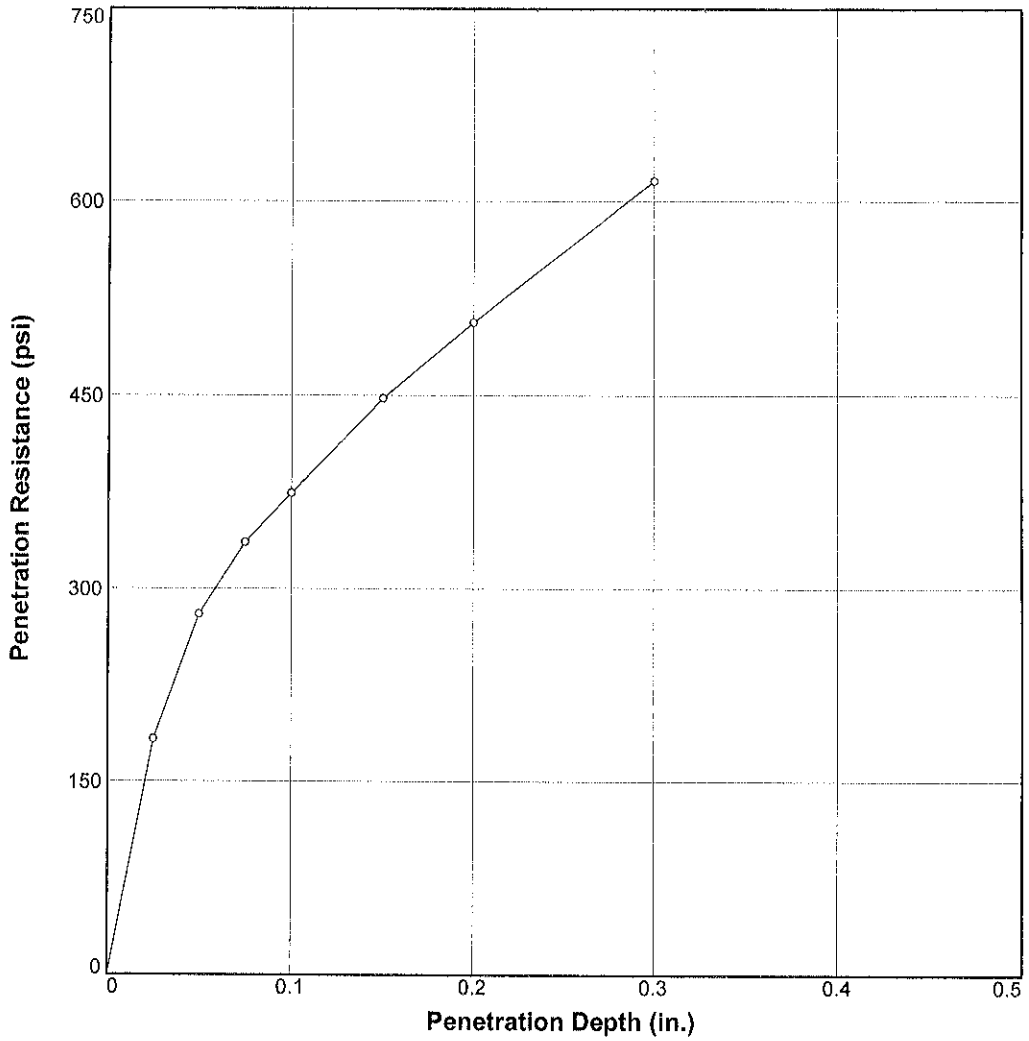
BEARING RATIO TEST REPORT
ASTM D 1883-99



	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	123.3	96	7.5	123.3	96	10.8	37.5	33.8	0.000	10	0
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silty / clayey sand with gravel		128.5	7.5		

Project No: 07330

Project: St. George Replacement Airport

Location: ET-2 @ 5'

Sample Number: 7SG2306

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2306

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-2 @ 5' **Authorized By:** Client **Date:** 6/29/2007

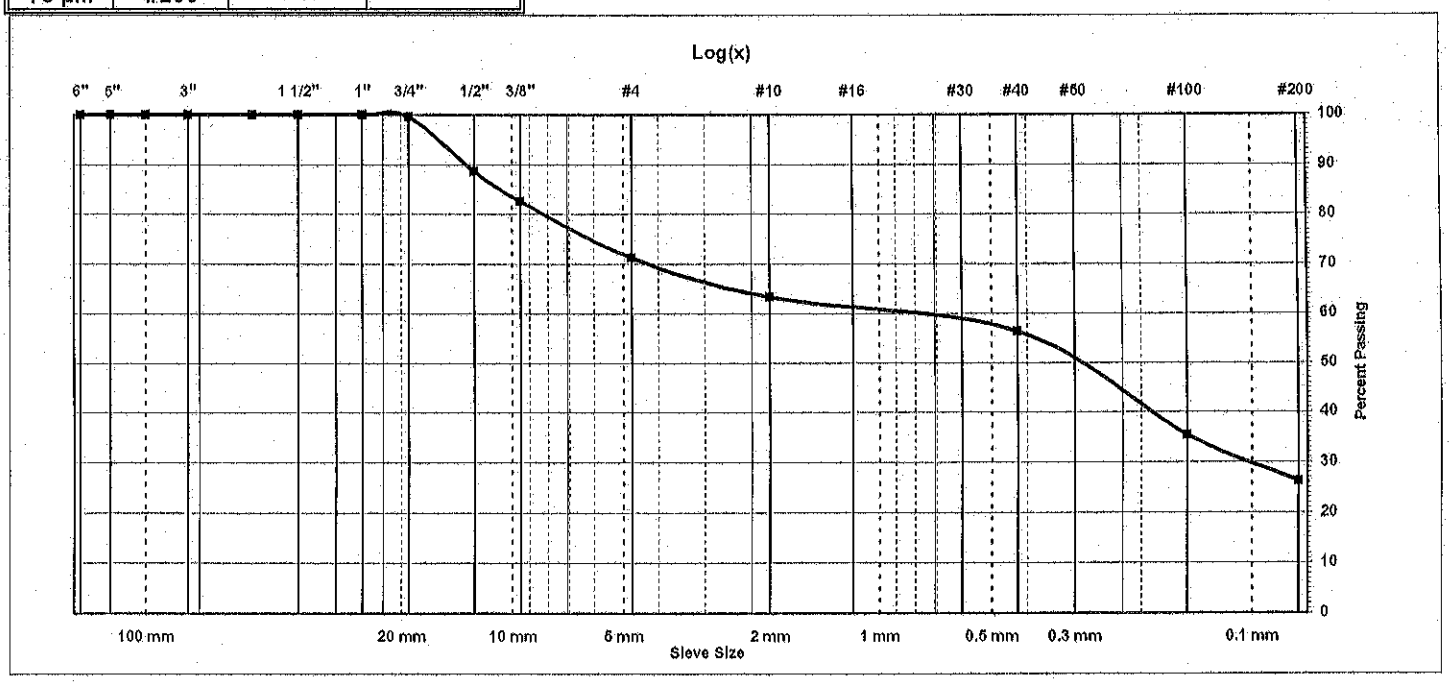
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	89	
9.5 mm	3/8"	83	
4.75 mm	#4	71	
2.00 mm	#10	63	
425 µm	#40	56	
150 µm	#100	35	
75 µm	#200	26.3	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	28.7	45.0	26.3



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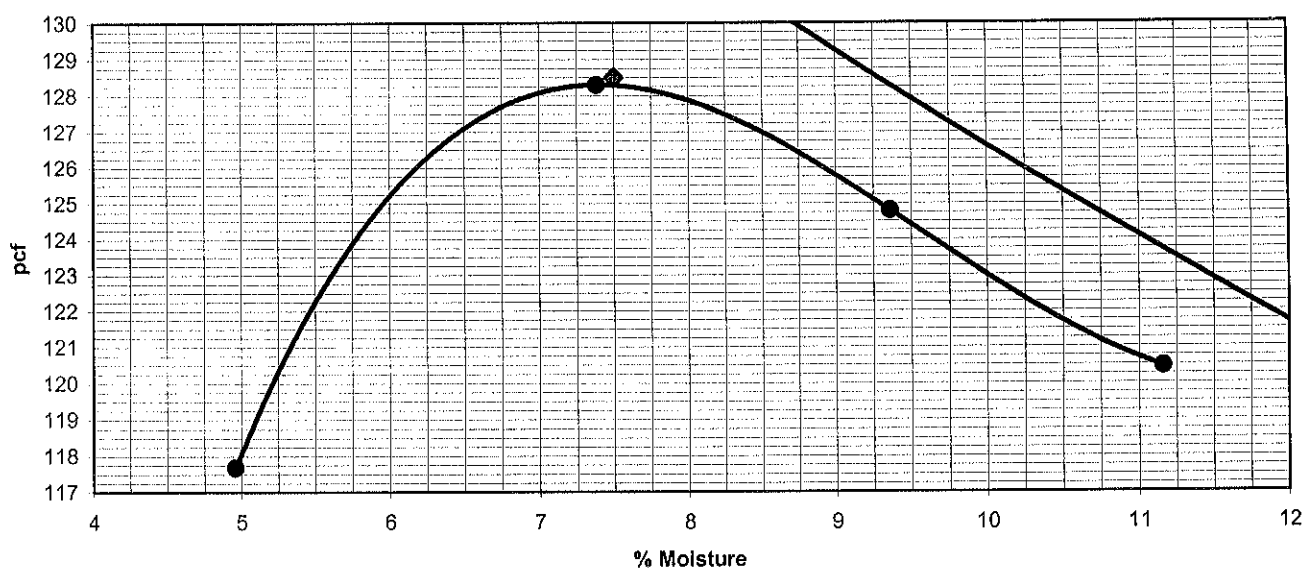
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2306

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 7/1/2007
Type of Sample: Silty / clayey sand with gravel
Tested By: B. Jansen **Date:** 7/6/2007
Sample Location: ET-2 @ 5
Approved By: Client **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	5.0	7.4	9.4	11.2		
Dry Density	117.7	128.3	124.8	120.5		

Test Results	
Maximum Dry Density	128.5
Optimum Moisture	7.5
Test Standard	ASTM D 1557
Method	C

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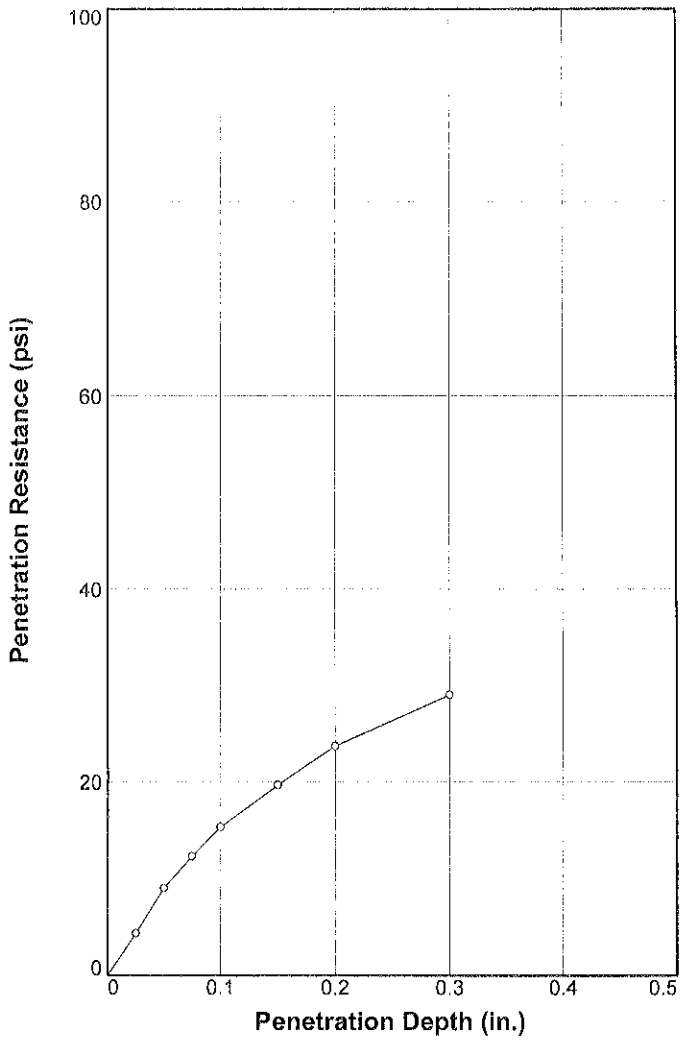
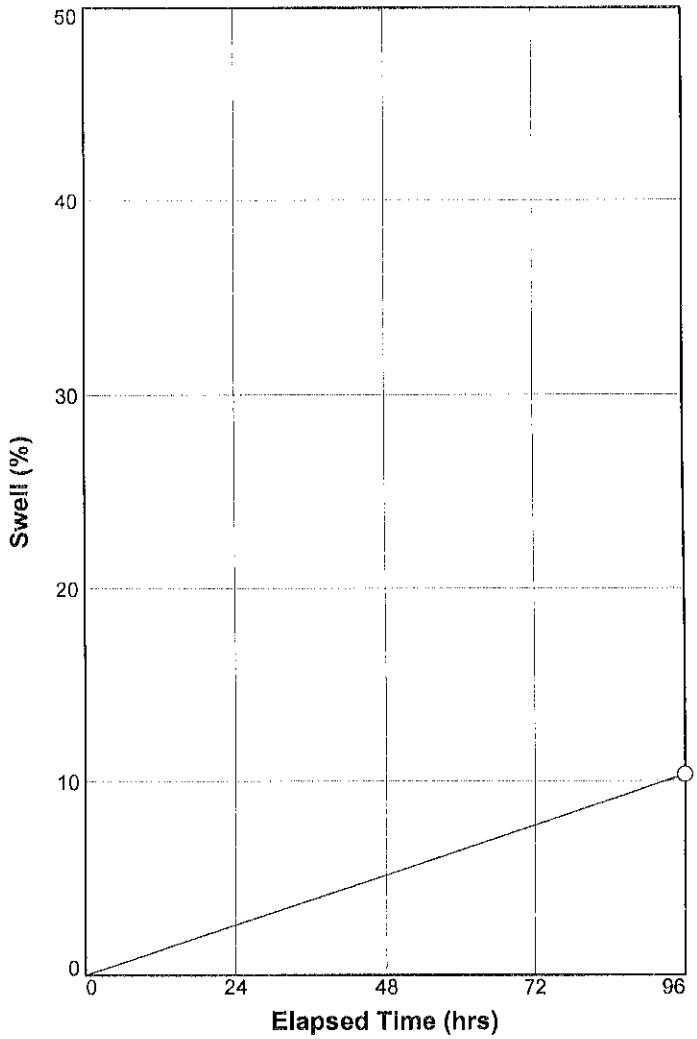
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	98.6	90.5	19.0	89.4	82	24.2	1.5	1.6	0.000	10	10.3
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Sandy clay		109.0	19.0		

Project No: 07330

Project: St. George Replacement Airport

Location: ET-5 @ 7'

Sample Number: 7SG2307

Date: 6/29/07

BEARING RATIO TEST REPORT

LANDMARK

Test Description/Remarks:

Figure _____

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2307

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Sandy clay **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: ET-5 @ 7' **Authorized By:** Client **Date:** 6/29/2007

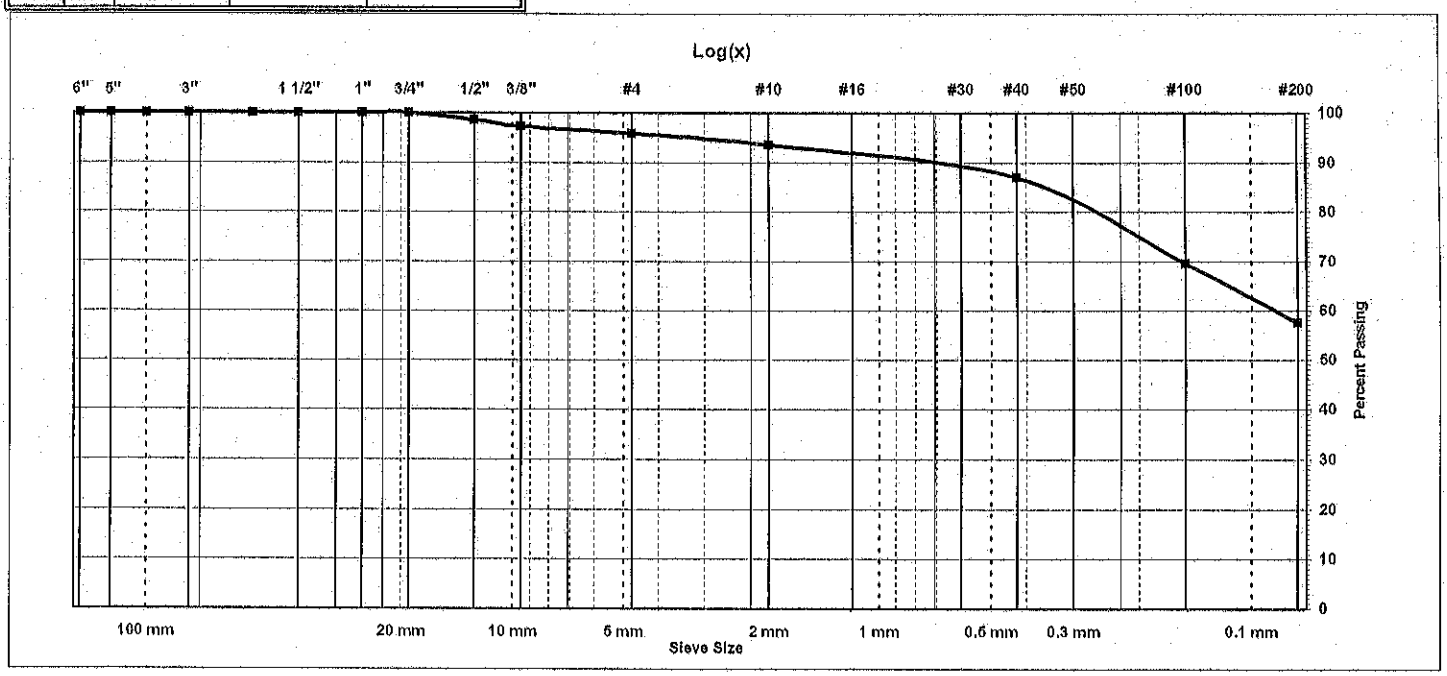
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	99	
9.5 mm	3/8"	97	
4.75 mm	#4	96	
2.00 mm	#10	94	
425 µm	#40	87	
150 µm	#100	70	
75 µm	#200	57.5	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.2		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	4.1	38.4	57.5



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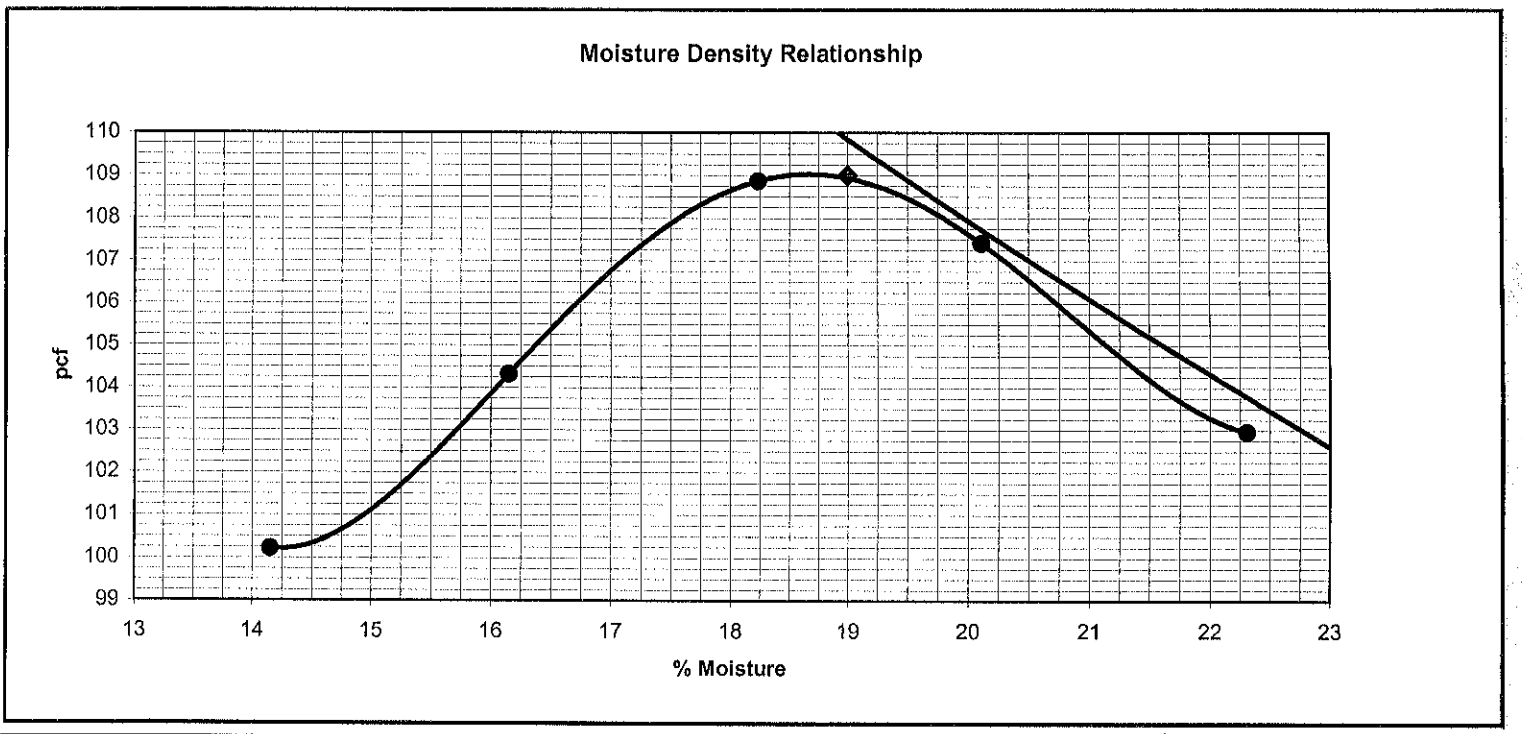
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2307

Project: St. George Replacement Airport — **Project #:** 07330
Location: St. George — **Sampled By:** R. Owens — **Date:** 7/1/2007
Type of Sample: Sandy clay — **Tested By:** B. Jansen — **Date:** 7/6/2007
Sample Location: TP ET-5 @ 7' — **Approved By:** Client — **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	14.2	16.1	18.2	20.1	22.3	
Dry Density	100.2	104.3	108.9	107.4	103.0	

Test Results	
Maximum Dry Density	109.0
Optimum Moisture	19.0
Test Standard	ASTM D 1557
Method	C

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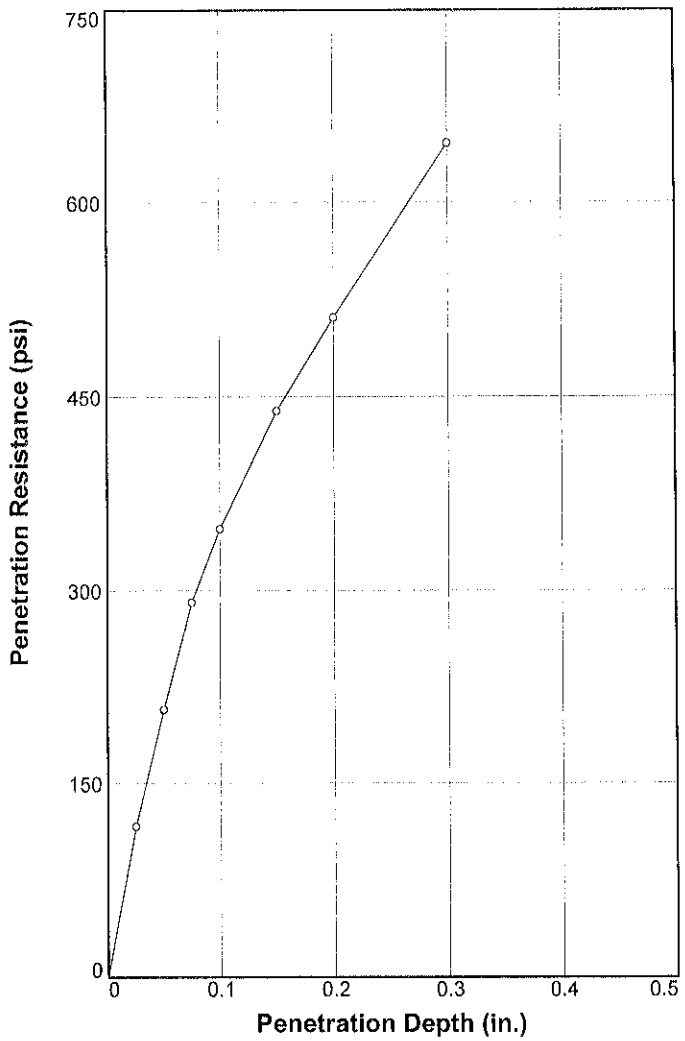
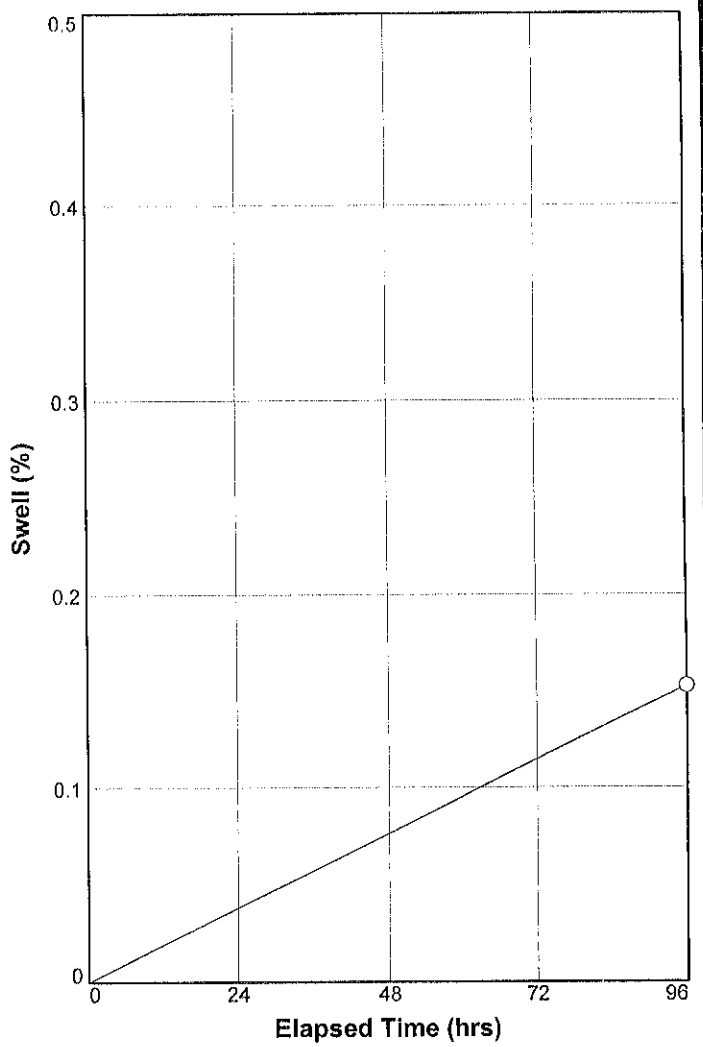
BEARING RATIO TEST REPORT
ASTM D 1883-99





	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	117.6	94.8	10.5	117.5	94.7	12.6	34.8	34.1	0.000	10	0.2
2 △											
3 □											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silty / clayey sand with gravel		124.0	10.5		

Project No: 07330

Project: St. George Replacement Airport

Location: A-3 @ 5'

Sample Number: 7SG2309

Date: 6/29/07

Test Description/Remarks:

BEARING RATIO TEST REPORT

LANDMARK

Figure _____

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2309

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 6/29/2007
Type of Sample: Silty / clayey sand with gravel **Tested By:** A. Whipple **Date:** 7/2/2007
Location of Sample: A-3 @ 5' **Authorized By:** Client **Date:** 6/29/2007

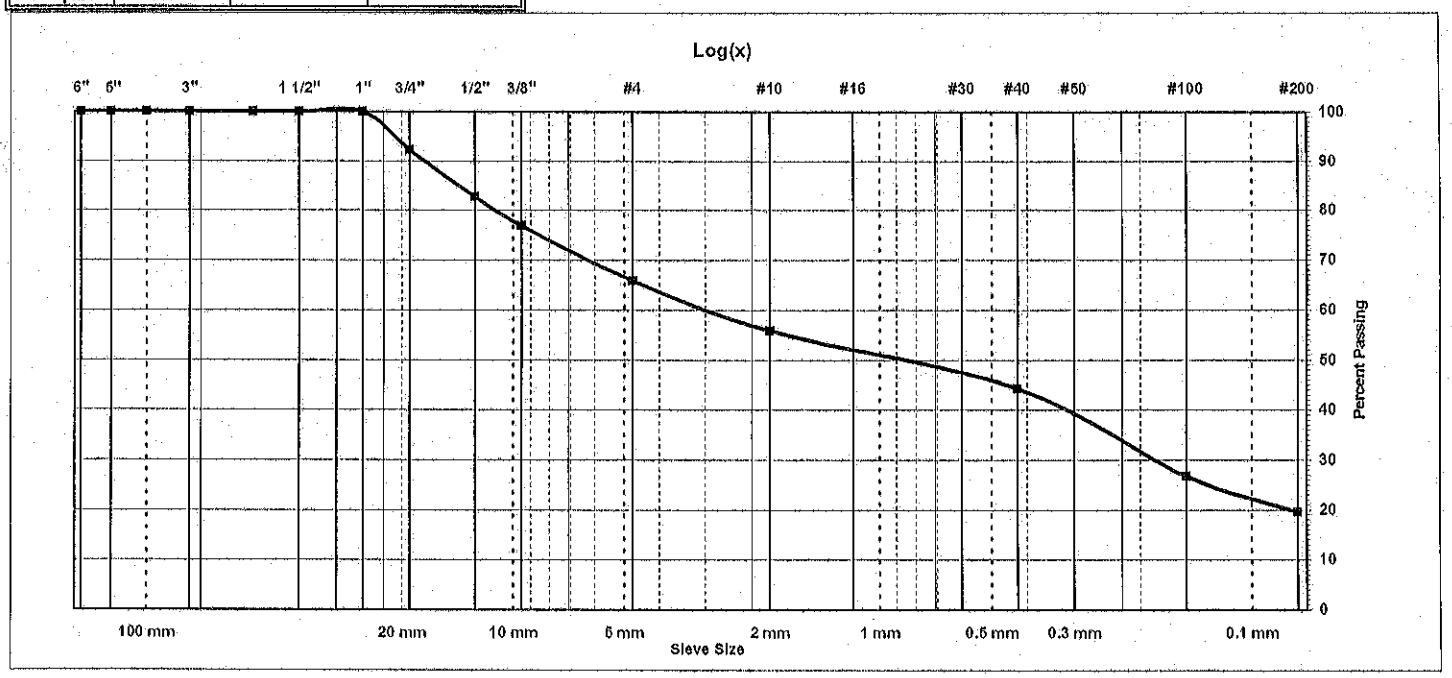
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	92	
12.5 mm	1/2"	83	
9.5 mm	3/8"	77	
4.75 mm	#4	66	
2.00 mm	#10	56	
425 µm	#40	44	
150 µm	#100	27	
75 µm	#200	19.5	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	1.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	34.1	46.4	19.5



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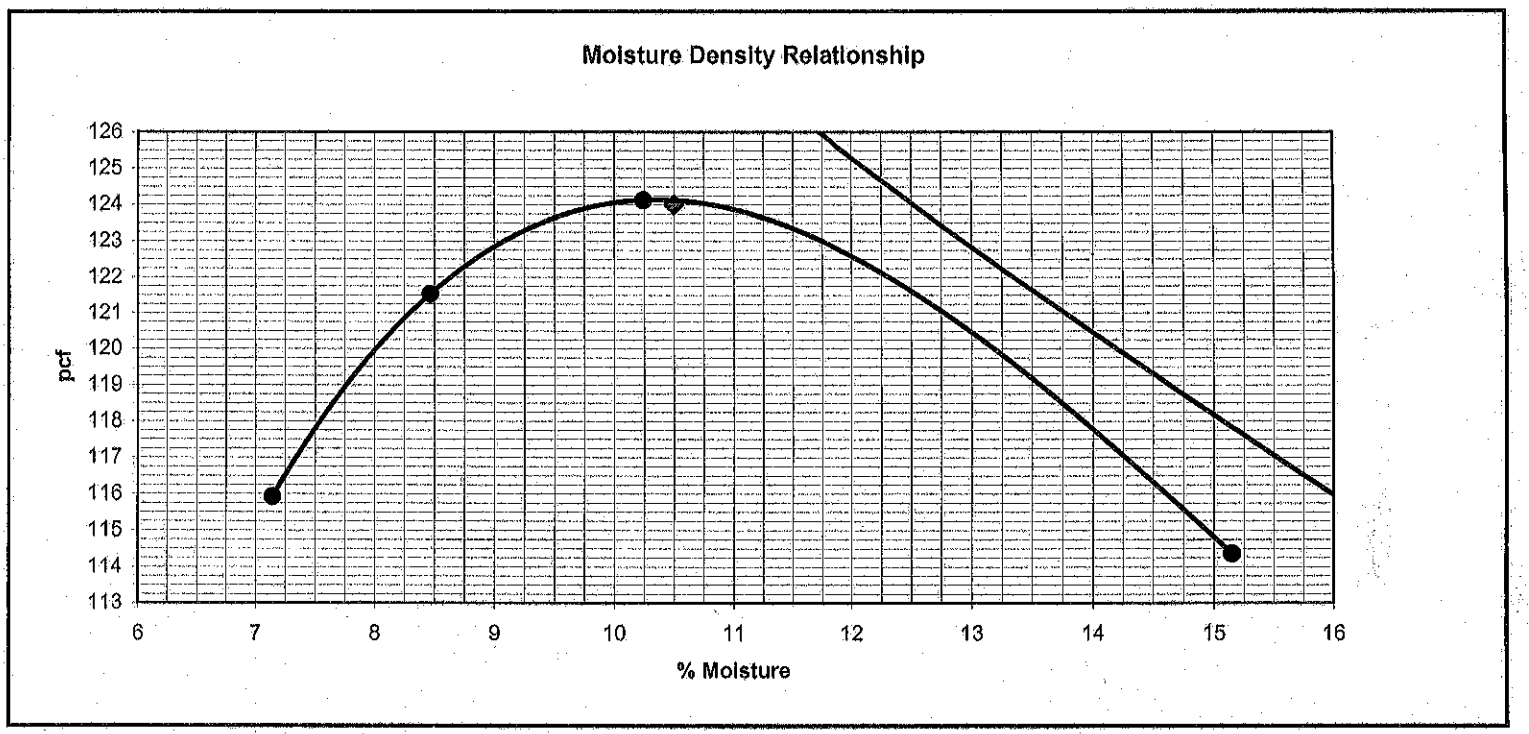
MOISTURE-DENSITY RELATIONSHIP REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/9/2007
Reviewed By:
Lab #: 7SG2309

Project: St. George Replacement Airport — **Project #:** 07330
Location: St. George — **Sampled By:** R. Owens — **Date:** 7/1/2007
Type of Sample: Silty / clayey sand with gravel — **Tested By:** B. Jansen — **Date:** 7/6/2007
Sample Location: A-3 @ 5' — **Approved By:** Client — **Date:** 7/1/2007



Proctor Data	
Hammer Weight:	10 pounds
Hammer Drop:	18 inches
Number of Layers:	5 layers
Blows per Layer:	56 blows
Mold Size (cu. Ft.):	0.0750
% Oversized:	N/A
Oversize Sp. G.:	N/A
ZAV Sp. G.:	
Performed on Material Passing:	3/4 in. Sieve

Point	1	2	3	4	5	6
% Moisture	7.1	8.5	10.2	15.2		
Dry Density	115.9	121.5	124.1	114.4		

Test Results	
Maximum Dry Density	124.0
Optimum Moisture	10.5
Test Standard	ASTM D 1557
Method	C

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Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

IGES

© IGES 2005

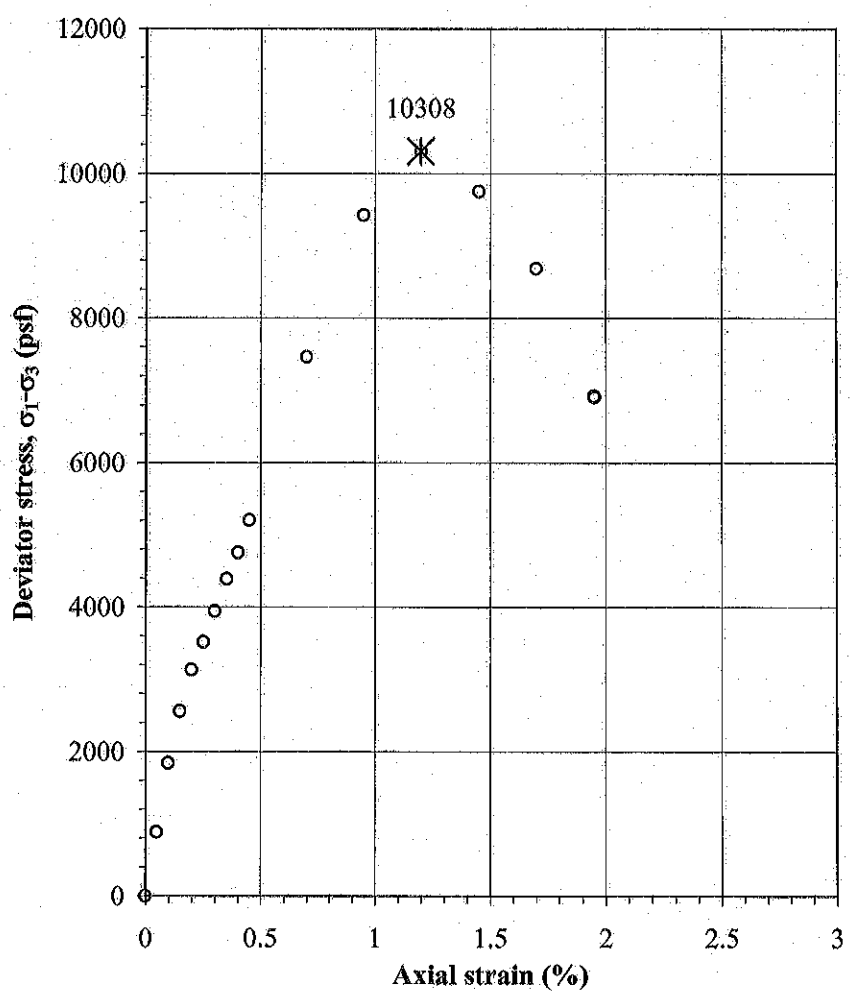
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/10/2007
By: BRR

Boring No.: A-5
Sample:
Depth: 2
Sample Description: top- red clay/ bottom- gray silt w/ gravel
Sample type: Undisturbed

Sample height, H (in.)	6.000
Sample diameter, D (in.)	2.416
Sample volume, V (ft^3)	0.0159
Wt. rings + wet soil (g)	1027.73
Wt. rings/tare (g)	210.83
Moist soil, Ws (g)	816.90
Moist unit wt., γ_m (pcf)	113.1
Dry unit wt., γ_d (pcf)	**103.9**

Wet soil + tare (g)	1015.50
Dry soil + tare (g)	951.15
Tare (g)	226.36
Moisture content, w (%)	**8.9**
Confining stress, $\sigma3$ (psf)	245
Strain rate (in/min)	0.0180
Strain at failure, ε_f (%)	1.20
Deviator stress at failure, $(\sigma1-\sigma3)_f$ (psf)	10308
Shear stress at failure, $q_f = (\sigma1_f-\sigma3_f)/2$ (psf)	5154

Axial Strain (%)	σd $\sigma1-\sigma3$ (psf)	Q 1/2 σd (psf)
0.00	0.0	0.0
0.05	887.0	443.5
0.10	1843.2	921.6
0.15	2559.3	1279.6
0.20	3130.4	1565.2
0.25	3515.5	1757.7
0.30	3945.7	1972.8
0.35	4395.9	2197.9
0.40	4759.3	2379.6
0.45	5204.6	2602.3
0.70	7465.2	3732.6
0.95	9428.3	4714.1
1.20	10308.3	5154.1
1.45	9754.3	4877.1
1.70	8692.9	4346.4
1.95	6923.7	3461.8
1.95	6911.3	3455.6



Entered by: BRR
Reviewed: DS

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Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

IGES

© IGES 2005

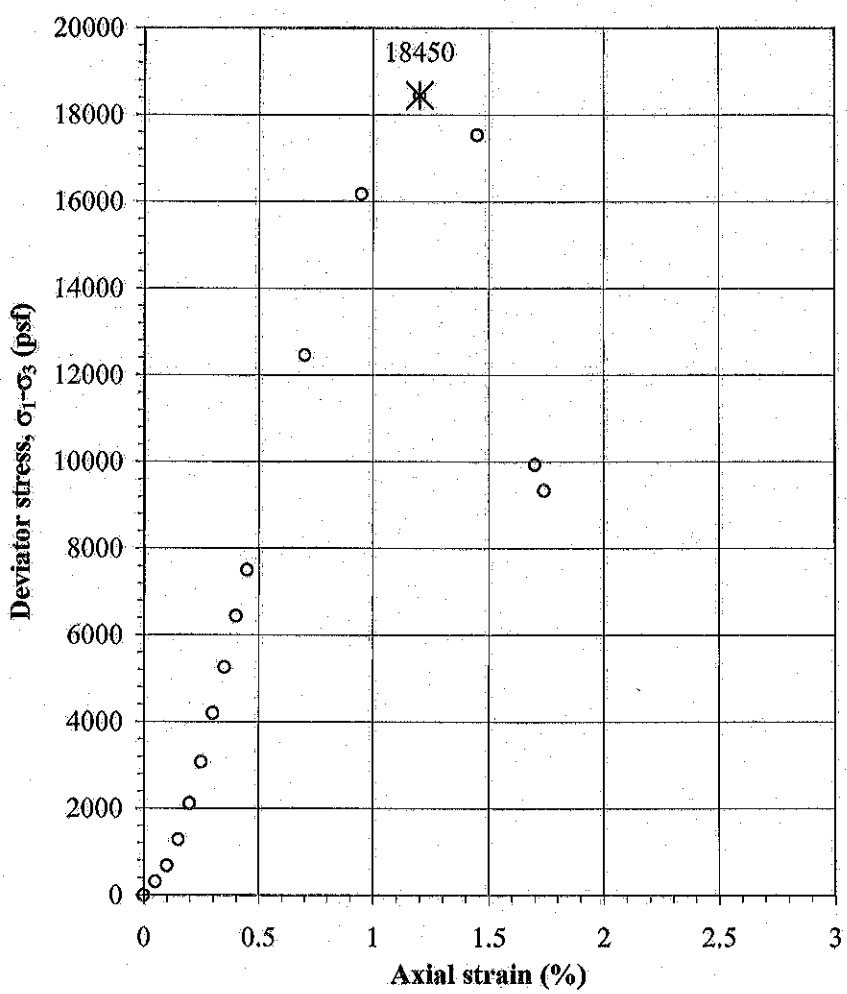
Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/11/2007
By: BRR

Boring No.: A-6
Sample:
Depth: 5
Sample Description: red/ brown clay w/ silt and gravel
Sample type: Undisturbed

Sample height, H (in.)	5.860
Sample diameter, D (in.)	2.416
Sample volume, V (ft^3)	0.0155
Wt. rings + wet soil (g)	926.36
Wt. rings/tare (g)	0.00
Moist soil, Ws (g)	926.36
Moist unit wt., γ_m (pcf)	131.4
Dry unit wt., γ_d (pcf)	**117.6**

Wet soil + tare (g)	985.55
Dry soil + tare (g)	901.24
Tare (g)	181.32
Moisture content, w (%)	**11.7**
Confining stress, σ3 (psf)	605
Strain rate (in/min)	0.0176
Strain at failure, ε_f (%)	1.20
Deviator stress at failure, $(\sigma1-\sigma3)_f$ (psf)	18450
Shear stress at failure, $q_f = (\sigma1_f-\sigma3_f)/2$ (psf)	9225

Axial Strain (%)	σd σ1-σ3 (psf)	Q 1/2 σd (psf)
0.00	0.0	0.0
0.05	317.7	158.8
0.10	676.3	338.1
0.15	1286.0	643.0
0.20	2121.9	1061.0
0.25	3076.3	1538.2
0.30	4202.6	2101.3
0.35	5262.0	2631.0
0.40	6443.8	3221.9
0.45	7509.2	3754.6
0.70	12459.5	6229.8
0.95	16173.5	8086.8
1.20	18449.5	9224.8
1.45	17539.5	8769.8
1.70	9940.5	4970.3
1.74	9336.0	4668.0



Entered by: BRR
Reviewed: DS

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Unconfined Compressive Strength

Project: St. George Replacement Airport

Project #: 07330

Lab #	Location	Length	Diameter	Area	Load	PSI
7SG2070	WT-9 @ 6'	4.02	2.04	3.27	24020	7350
7SG2071	WT-9 @ 14'	4.00	2.04	3.27	23260	7120
7SG2072	WT-9 @ 22'	3.96	2.02	3.20	22830	7120
7SG2073	WT-9 @ 35'	4.01	1.98	3.08	17980	5840
7SG2253	RW-10 @ 12'	4.01	2.05	3.30	28460	8620
7SG2254	RW-10 @ 20'	4.07	2.04	3.27	23080	7060
7SG2255	RW-11 @ 11'	4.05	2.05	3.30	22280	6750
7SG2256	RW-11 @ 19'	3.99	2.05	3.30	19080	5780
7SG2257	RW-11 @ 29'	4.07	2.05	3.30	27440	8310
7SG2258	RW-12 @ 9'	4.05	2.02	3.20	28110	8770
7SG2259	RW-12 @ 23'	4.02	2.03	3.24	28610	8840

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ACT LAB NO: 14510(a) **DATE:** July 12, 2007

PROJECT NO: 07330 **P.O.:**

ANALYZED BY: Kurt D. Ergun **LAB ID:**

ST. GEORGE REPLACEMENT AIRPORT, ST. GEORGE, UTAH

WATER SOLUBLE SALT ANALYSIS IN SOIL
1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E
AWWA 2540 C

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
Solubility = 0.24%	A-1	5.0	0.02	0.01	0.01
Solubility = 0.04%	ET-2	2.0	<0.01	0.01	<0.01
Solubility = 0.10%	ET-3	2.0	<0.01	0.01	0.01
Solubility = 0.25%	ET-8	2.0	<0.01	0.02	0.01
Solubility = 0.06%	RW-2	2.0	<0.01	0.01	<0.01
Solubility = 0.44%	RW-4	7.0	0.01	0.03	0.04

LABORATORY MANAGER

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

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ACT LAB NO: 14510(a)

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PROJECT NO: 07330

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ANALYZED BY: Kurt D. Ergun

LAB ID:

ST. GEORGE REPLACEMENT AIRPORT,
ST. GEORGE, UTAH

WATER SOLUBLE SALT ANALYSIS IN SOIL

1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E
AWWA 2540 C

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
Solubility = 0.12%	WT-1	2.0	0.01	0.01	0.01
Solubility = 0.14%	WT-3	17.0	0.01	0.01	0.02
Solubility = 0.36%	WT-5	7.0	0.03	0.02	0.03
Solubility = 0.20%	LS-6	10.0	0.02	0.01	0.02
Solubility = 0.30%	LS-8	5.0	0.03	0.01	0.02

LABORATORY MANAGER

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

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ACT LAB NO: 14621(a)

DATE: September 20, 2007

PROJECT NO: 07330

P.O.:

ANALYZED BY: Kurt D. Ergun

LAB ID:

St. George Repl Airport

WATER SOLUBLE SALT ANALYSIS IN SOIL
1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E
AWWA 2540 C

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
75G3017	WD-1	7	0.02	0.01	0.02

Solubility 0.20%

LABORATORY MANAGER

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

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ACT LAB NO: 14621(c) **DATE:** September 20, 2007

PROJECT NO: 07330 **P.O.:**

ANALYZED BY: Kurt D. Ergun **LAB ID:**

St. George Repl Airport

WATER SOLUBLE SALT ANALYSIS IN SOIL
1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E
AWWA 2540 C

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
75G3027	WD-2	4	0.02	0.02	0.02

Solubility 0.32%

LABORATORY MANAGER

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

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ACT LAB NO: 14621(b)

DATE: September 20, 2007

PROJECT NO: 07330

P.O.:

ANALYZED BY: Kurt D. Ergun

LAB ID:

St. George Repl Airport

WATER SOLUBLE SALT ANALYSIS IN SOIL
1:5 (soil:water) Aqueous Extraction
AWWA 3500-Na D, AWWA 4500 E
AWWA 2540 C

SOIL SIEVE SIZE = -10 MESH

Sample No.	Location	Depth (feet)	Sodium (Percent)	Water Soluble Sulfate (SO_4) (Percent)	Total Available Water Soluble Sodium Sulfate (Na_2SO_4) (Percent)
75G3030	WD-~~X~~4	~~X~~2	<0.01	0.01	0.01

Solubility 0.03%

LABORATORY MANAGER

Notes: The results for each constituent denote the percentage of that analyte, at a 1:5 (soil:water) extraction ratio, which is present in the soil. Sodium was determined by flame photometry, sulfate turbidimetrically, and sodium sulfate by calculation.

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3017

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-1 @ 7' **Authorized By:** Client **Date:** 8/25/2007

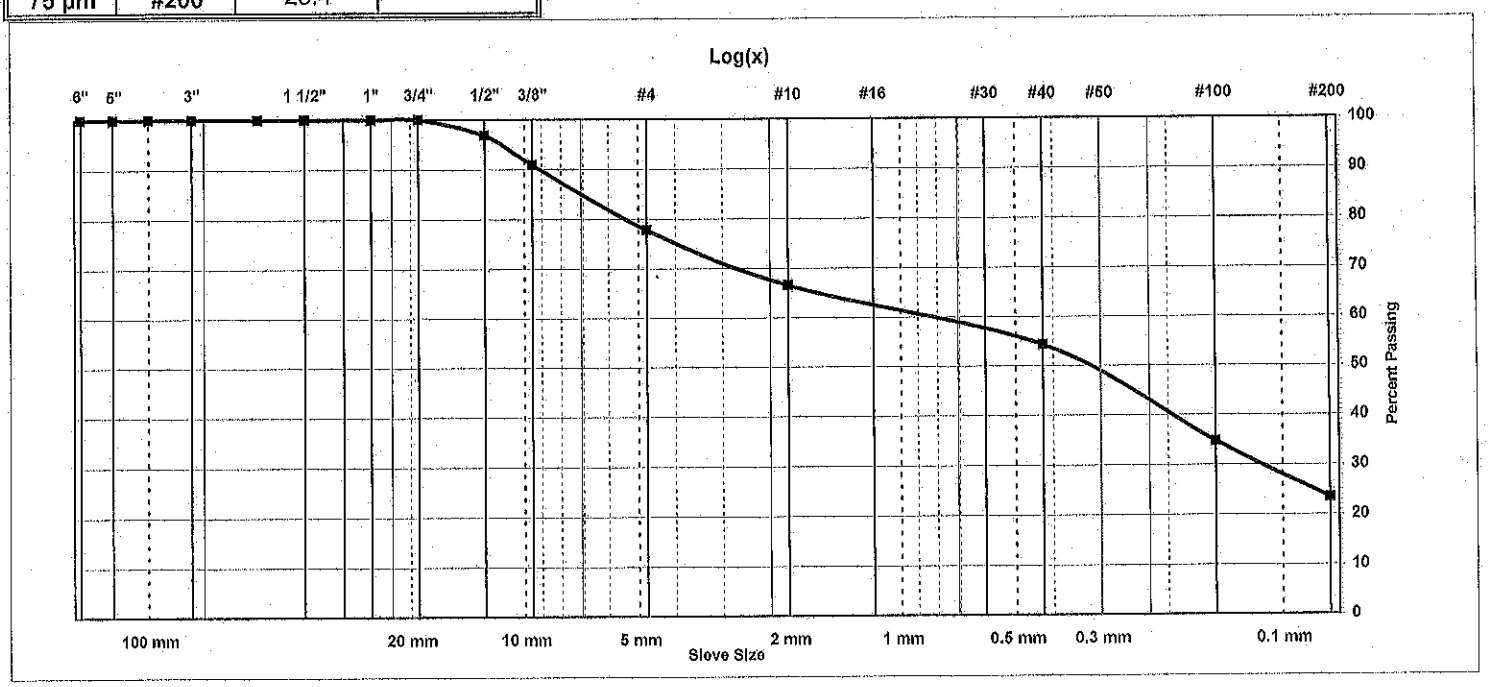
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	97	
9.5 mm	3/8"	91	
4.75 mm	#4	78	
2.00 mm	#10	67	
425 µm	#40	54	
150 µm	#100	35	
75 µm	#200	23.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	22.3	54.3	23.4



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3018

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD 1 @ 12' **Authorized By:** Client **Date:** 8/25/2007

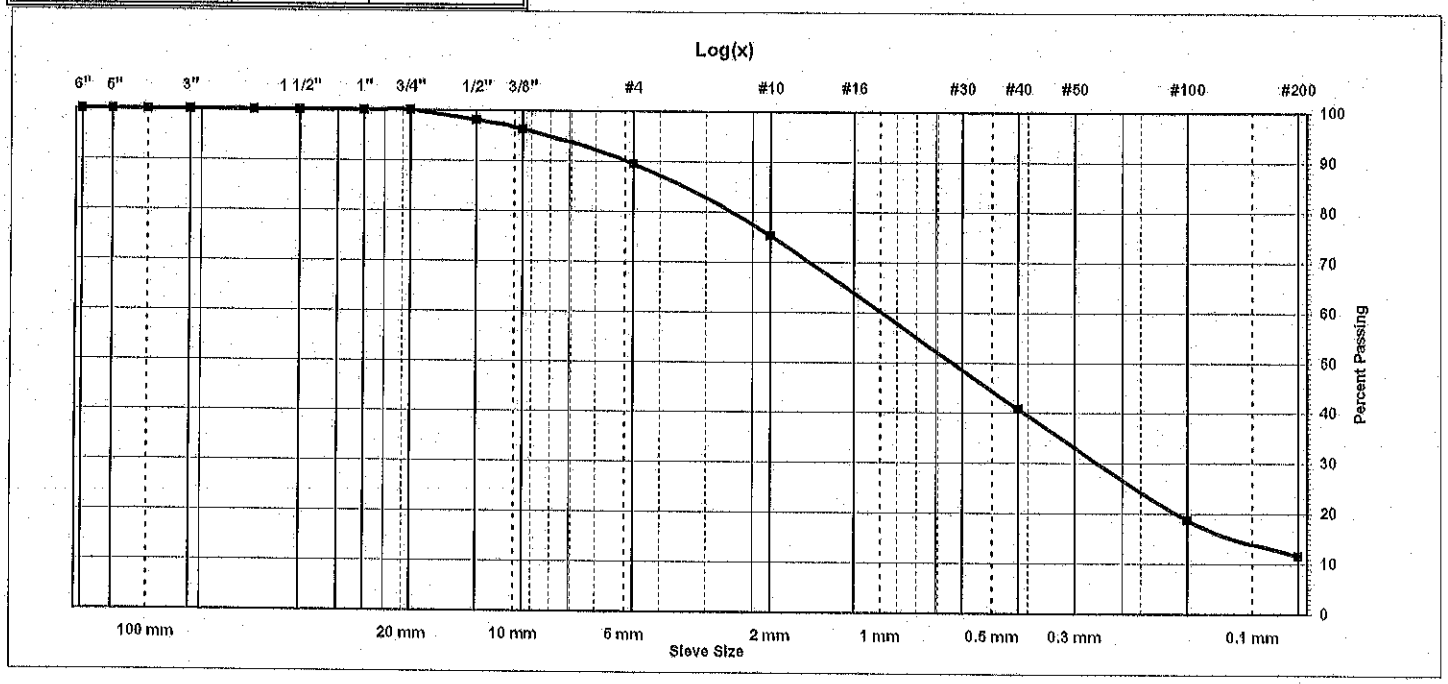
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	98	
9.5 mm	3/8"	96	
4.75 mm	#4	89	
2.00 mm	#10	75	
425 µm	#40	41	
150 µm	#100	19	
75 µm	#200	11.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	2.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	104.5		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	10.6	77.8	11.6



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3019

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-1 @ 22' **Authorized By:** Client **Date:** 8/25/2007

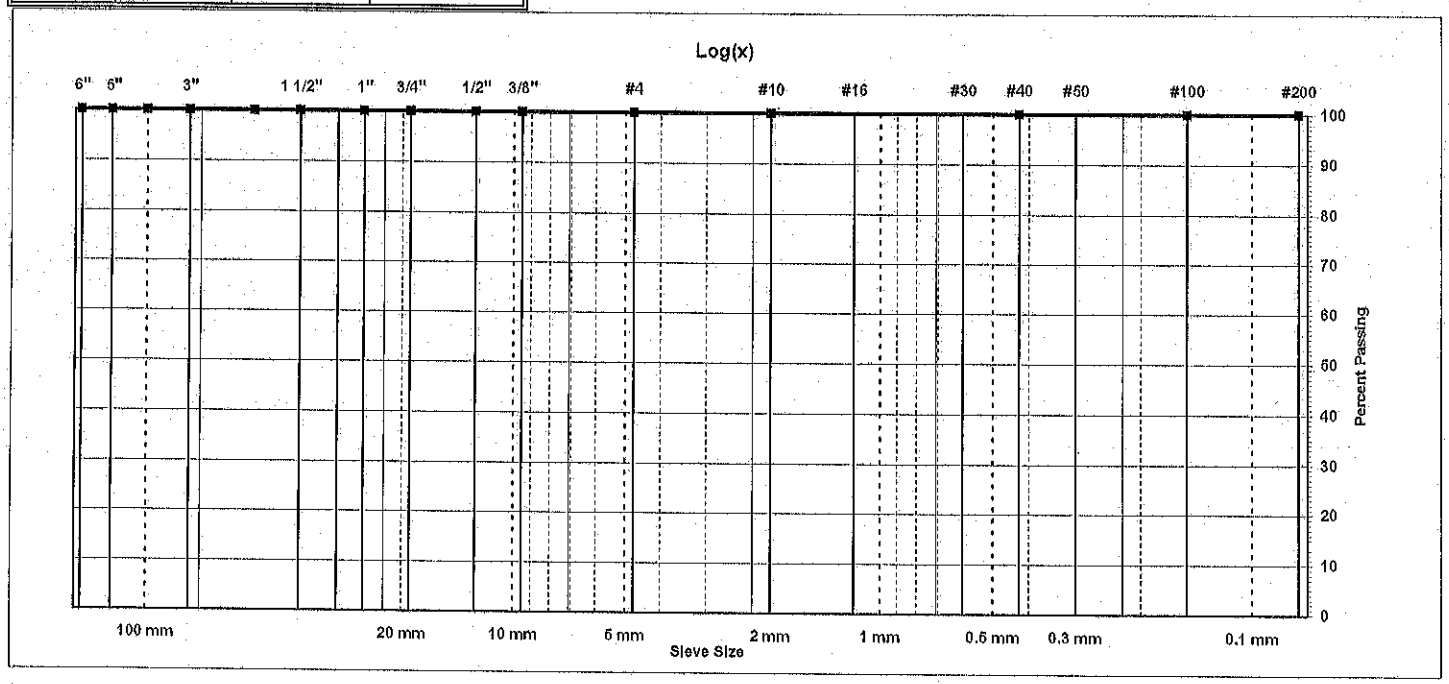
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	51		D 4318
Plasticity Index	28		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3020

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-2 @ 4' **Authorized By:** Client **Date:** 8/25/2007

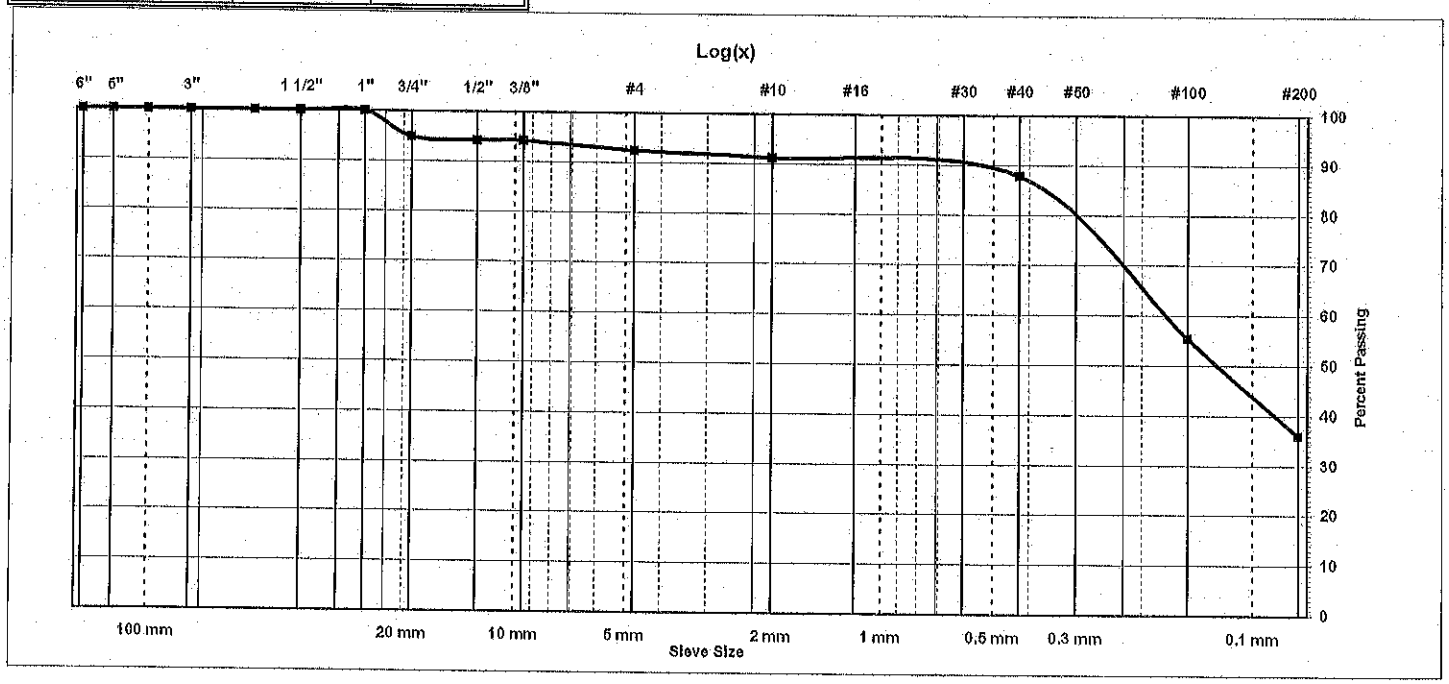
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	95	
12.5 mm	1/2"	94	
9.5 mm	3/8"	94	
4.75 mm	#4	92	
2.00 mm	#10	91	
425 µm	#40	88	
150 µm	#100	55	
75 µm	#200	35.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	1.2		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	7.5	56.5	35.9



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3021

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-2 @ 12' **Authorized By:** Client **Date:** 8/25/2007

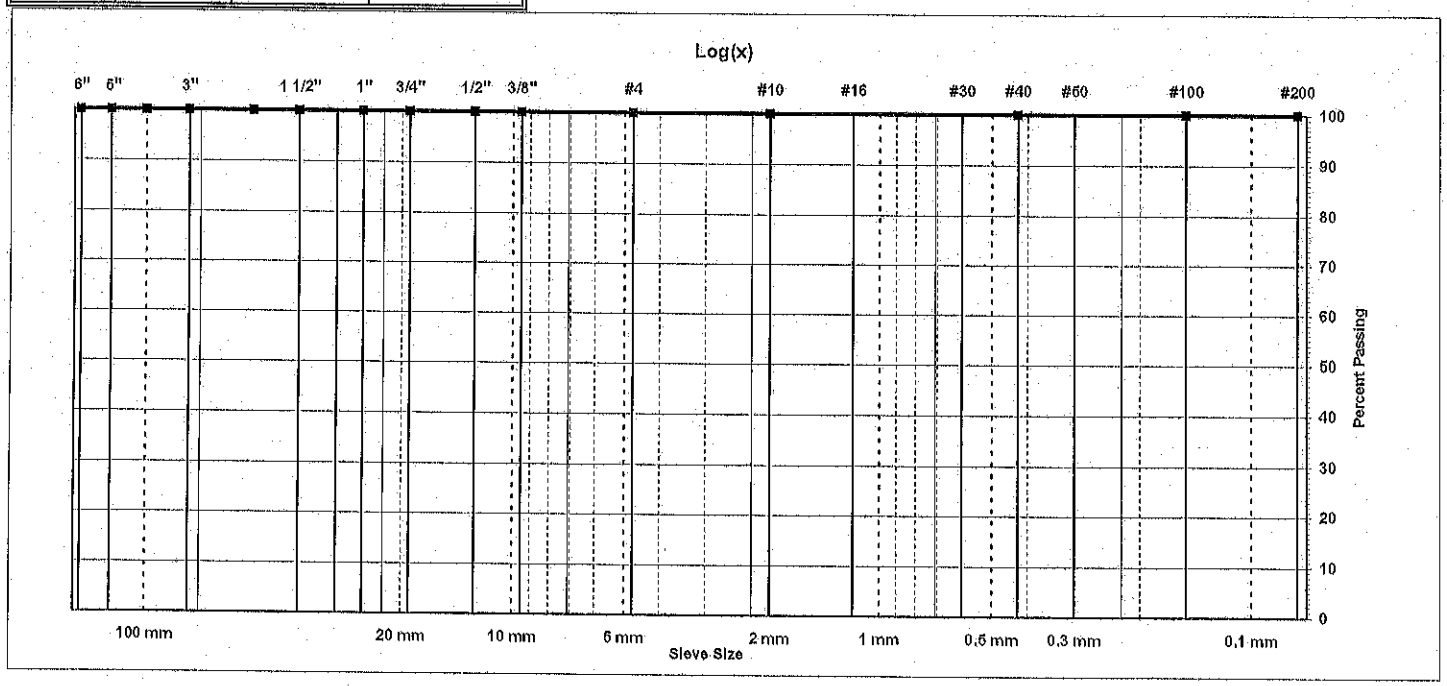
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	33		D 4318
Plasticity Index	17		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3022

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-2 @ 17' **Authorized By:** Client **Date:** 8/25/2007

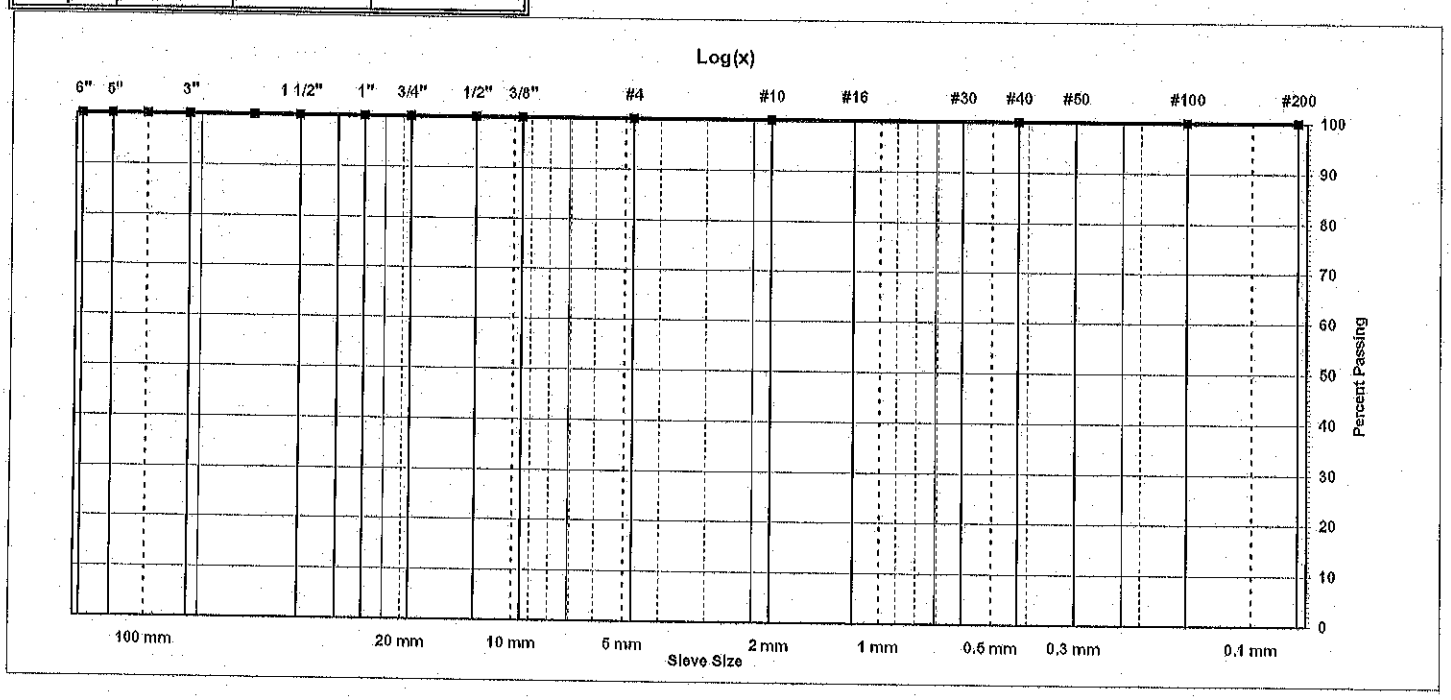
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	24		D 4318
Plasticity Index	9		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3023

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-3 @ 7' **Authorized By:** Client **Date:** 8/25/2007

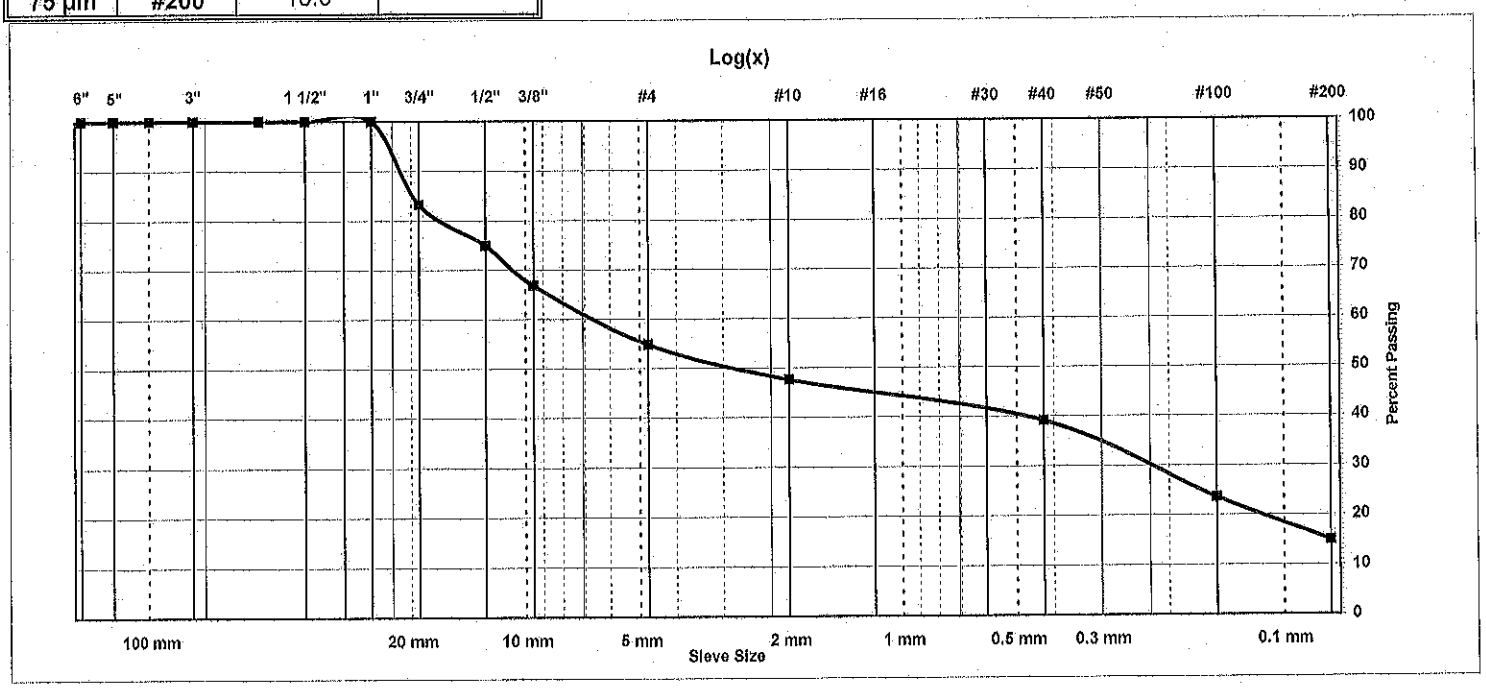
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"	100	
19 mm	3/4"	83	
12.5 mm	1/2"	75	
9.5 mm	3/8"	67	
4.75 mm	#4	55	
2.00 mm	#10	48	
425 µm	#40	39	
150 µm	#100	24	
75 µm	#200	15.0	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	45.2	39.8	15.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3024

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-3 @ 12' **Authorized By:** Client **Date:** 8/25/2007

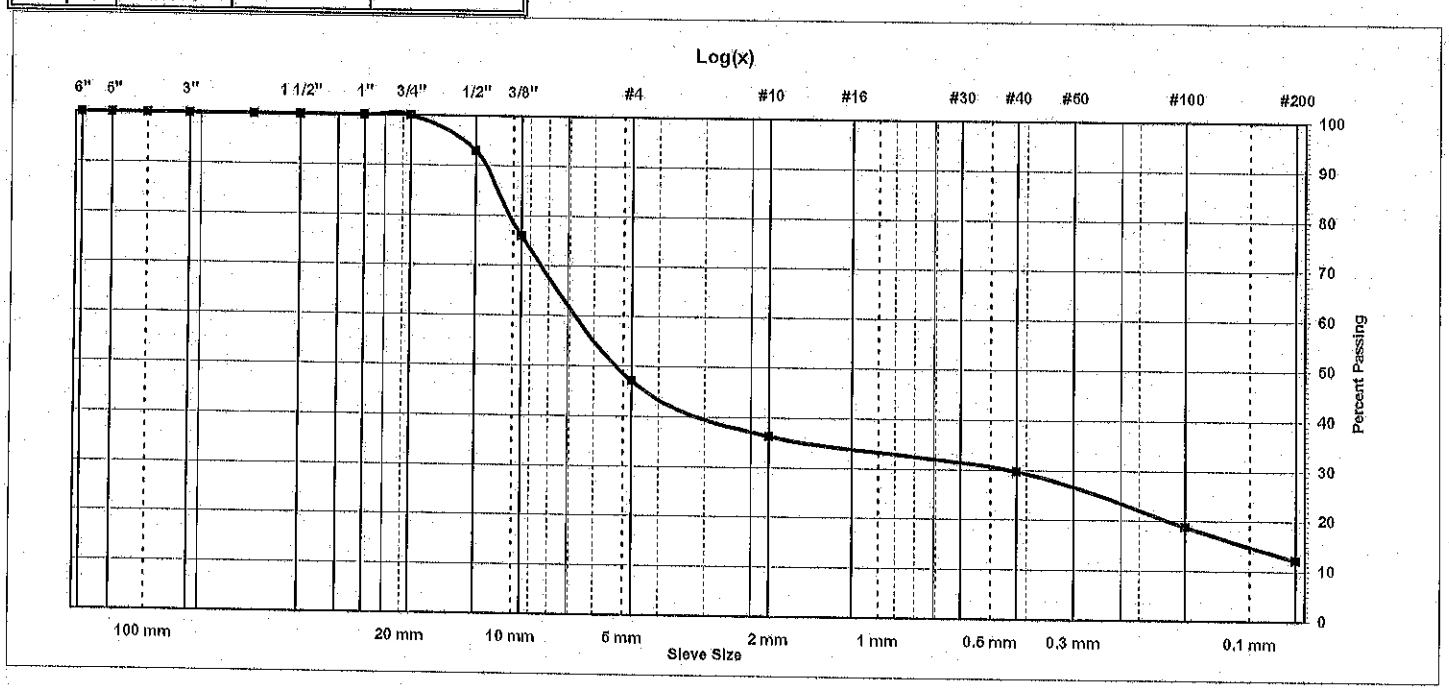
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	93	
9.5 mm	3/8"	76	
4.75 mm	#4	47	
2.00 mm	#10	36	
425 µm	#40	30	
150 µm	#100	19	
75 µm	#200	12.3	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	8.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	104.5		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	53.0	34.8	12.3



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3025

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: S. Wells **Date:** 8/25/2007
Location of Sample: WD-3 @ 22'
Authorized By: Client **Date:** 8/25/2007

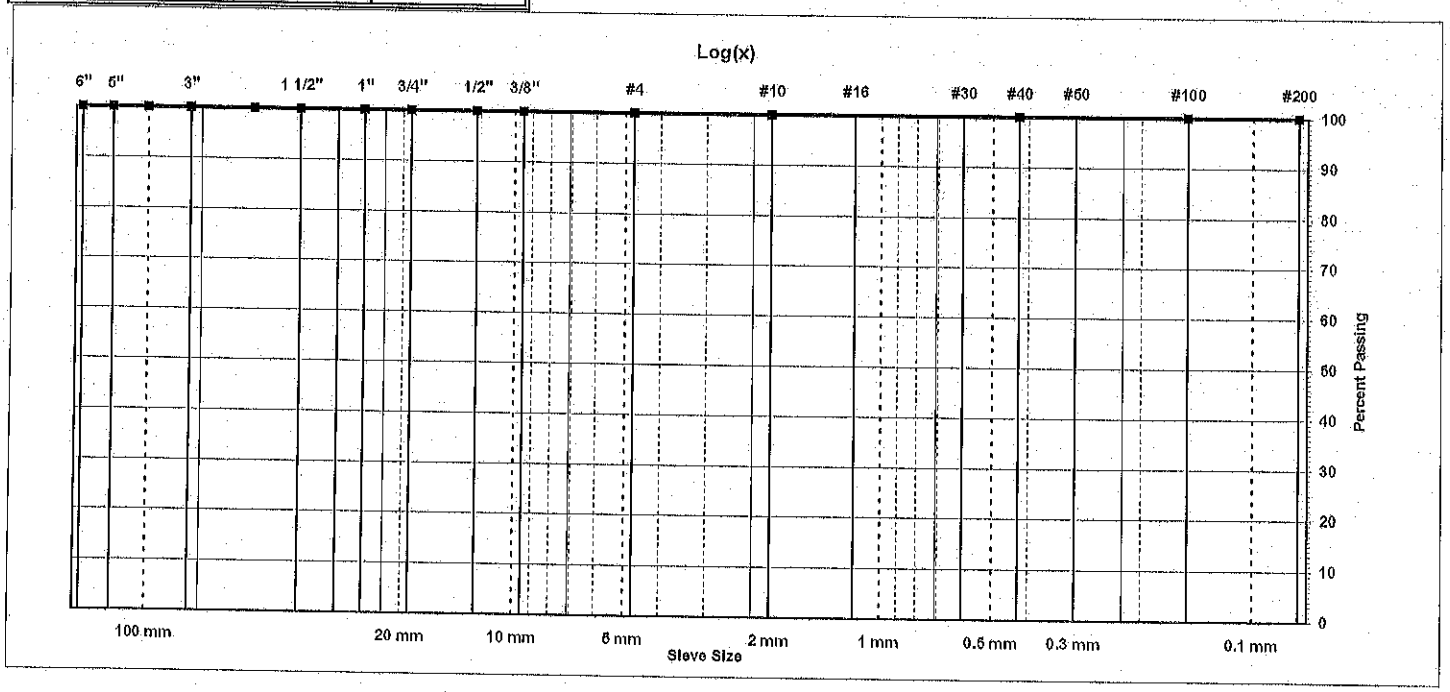
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	52		D 4318
Plasticity Index	27		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3026

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-3 @ 27' **Authorized By:** Client **Date:** 8/25/2007

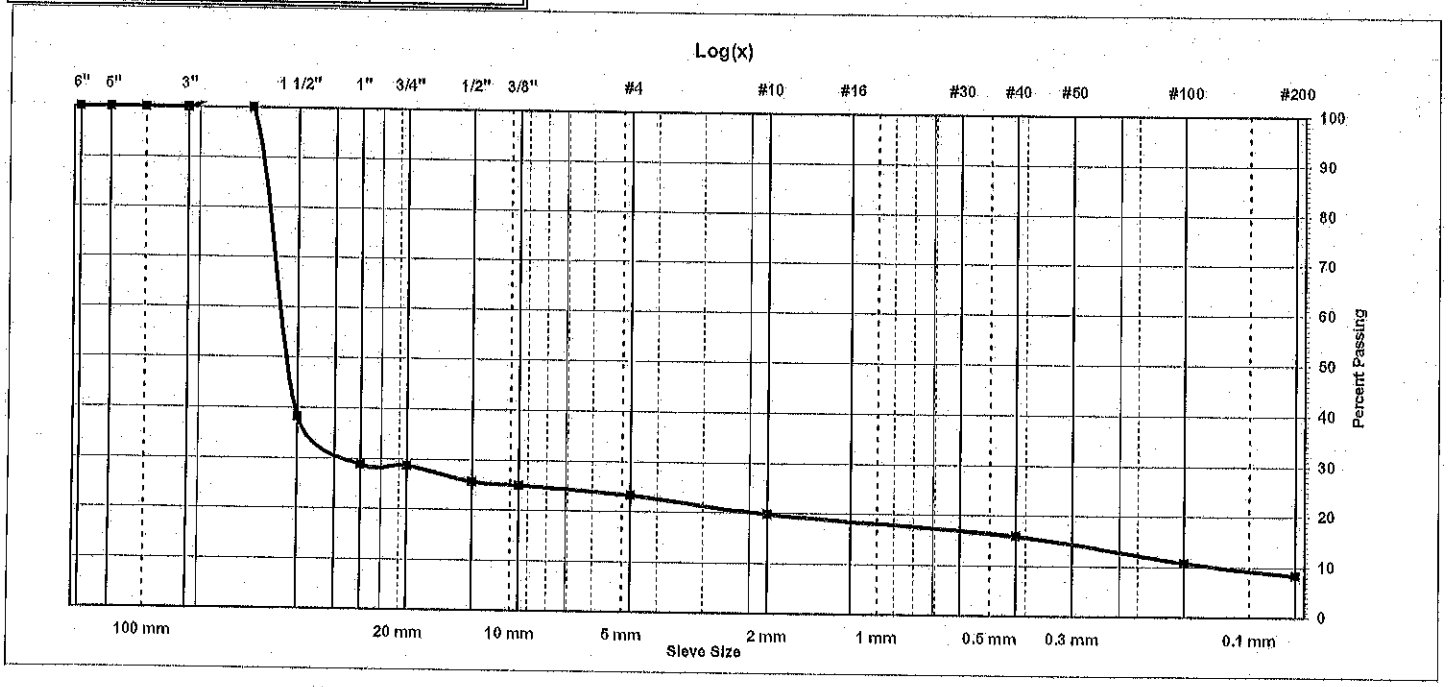
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"	100	
37.5 mm	1-1/2"	38	
25 mm	1"	29	
19 mm	3/4"	29	
12.5 mm	1/2"	26	
9.5 mm	3/8"	25	
4.75 mm	#4	23	
2.00 mm	#10	20	
425 µm	#40	16	
150 µm	#100	11	
75 µm	#200	8.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	3.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	76.8	14.8	8.4



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3027

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD 4 @ 7' **Authorized By:** Client **Date:** 8/25/2007

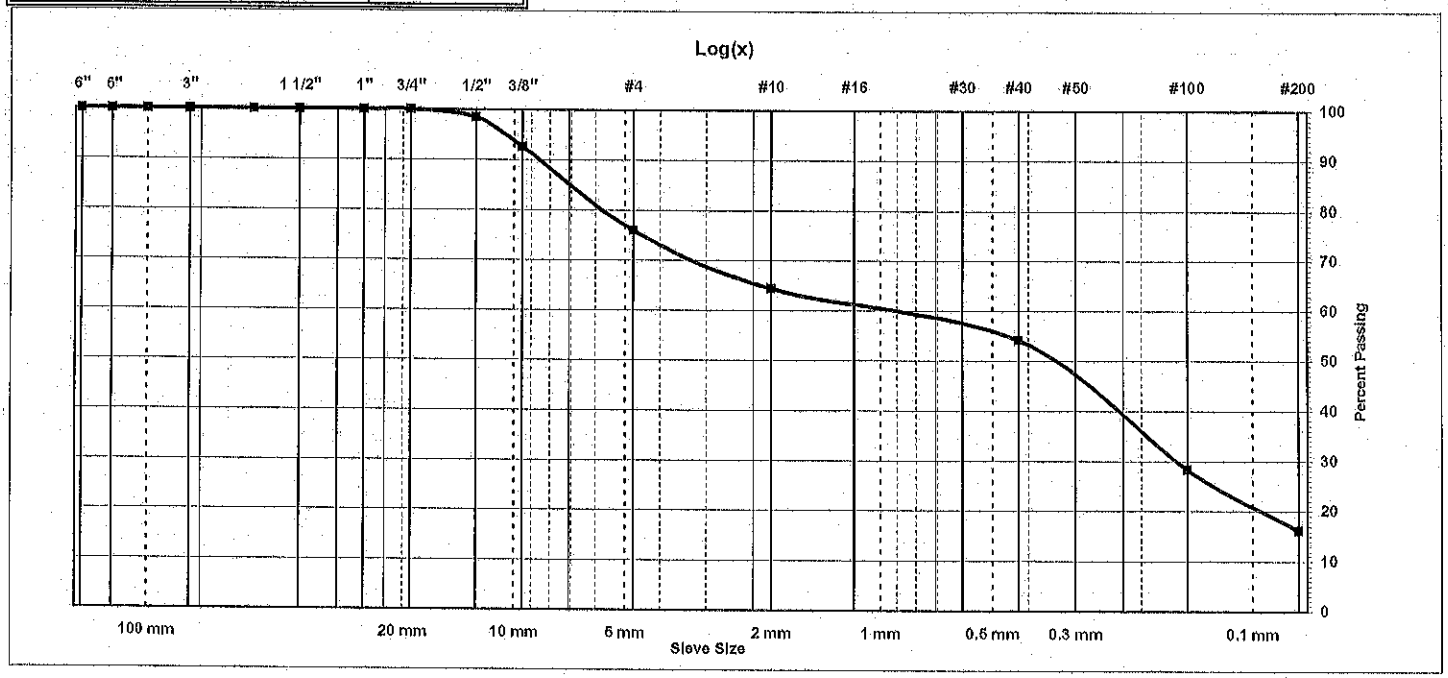
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	98	
9.5 mm	3/8"	92	
4.75 mm	#4	76	
2.00 mm	#10	64	
425 µm	#40	54	
150 µm	#100	28	
75 µm	#200	16.2	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	6.8		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	24.0	59.8	16.2



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SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3028

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: S. Wells **Date:** 8/25/2007
Location of Sample: WD-4 @ 17'
Authorized By: Client **Date:** 8/25/2007

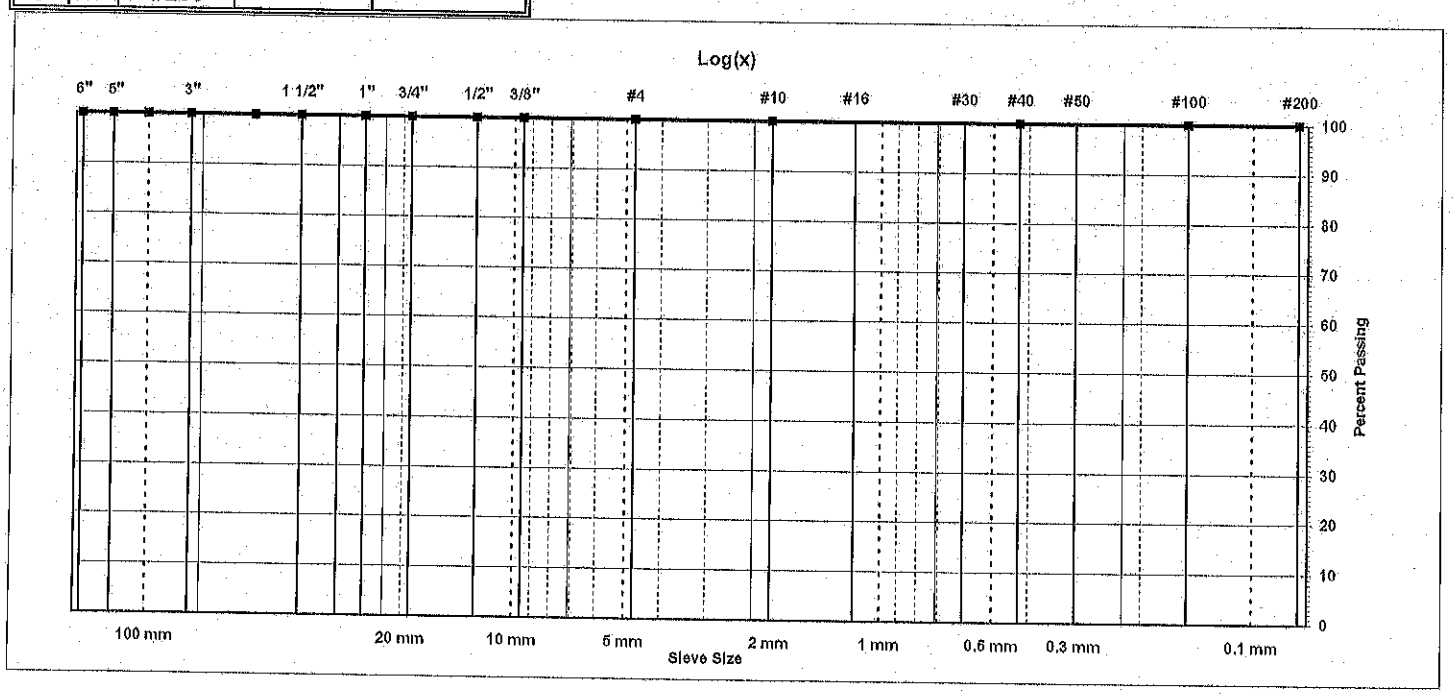
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	27		D 4318
Plasticity Index	5		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3029

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-4 @ 22' **Authorized By:** Client **Date:** 8/25/2007

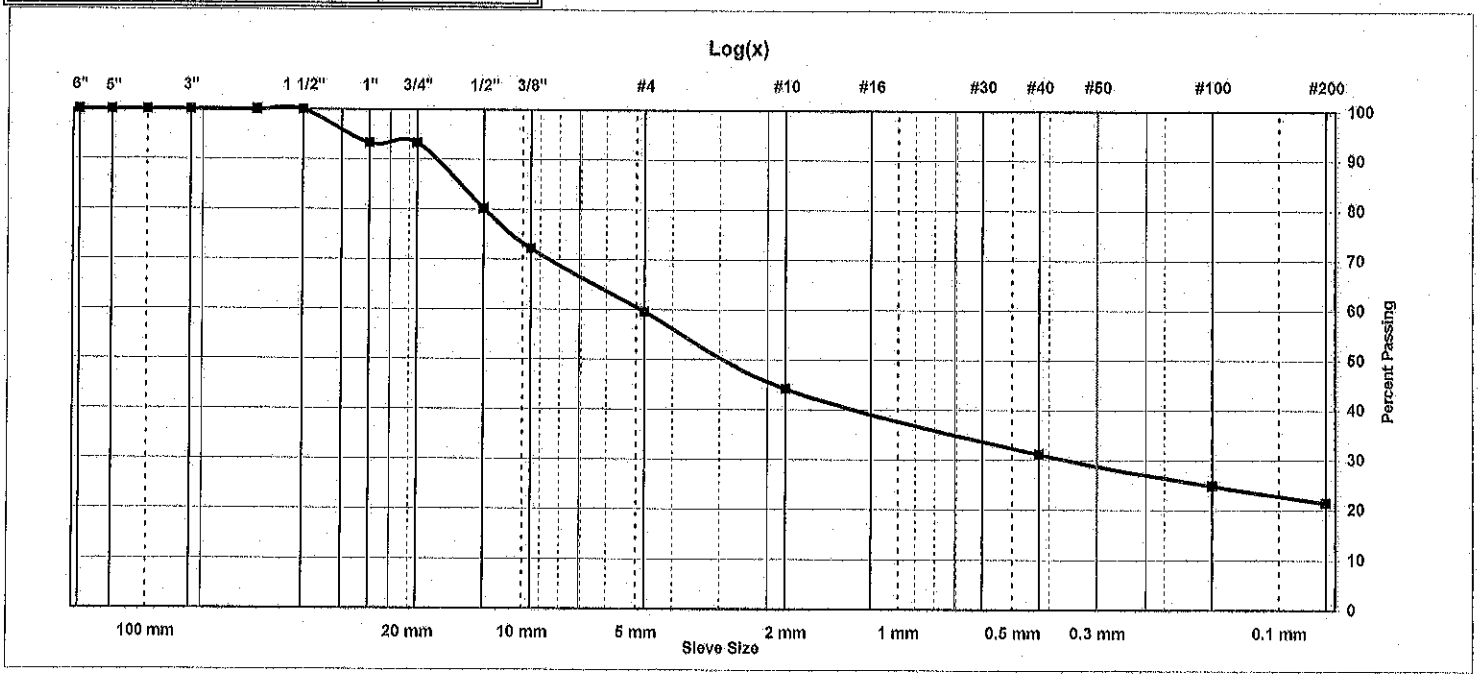
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"	100	
25 mm	1"	93	
19 mm	3/4"	93	
12.5 mm	1/2"	80	
9.5 mm	3/8"	72	
4.75 mm	#4	60	
2.00 mm	#10	44	
425 µm	#40	31	
150 µm	#100	25	
75 µm	#200	21.4	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.8		D2216
Liquid Limit	27		D 4318
Plasticity Index	10		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	40.5	38.1	21.4



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3030

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-4 @ 27' **Authorized By:** Client **Date:** 8/25/2007

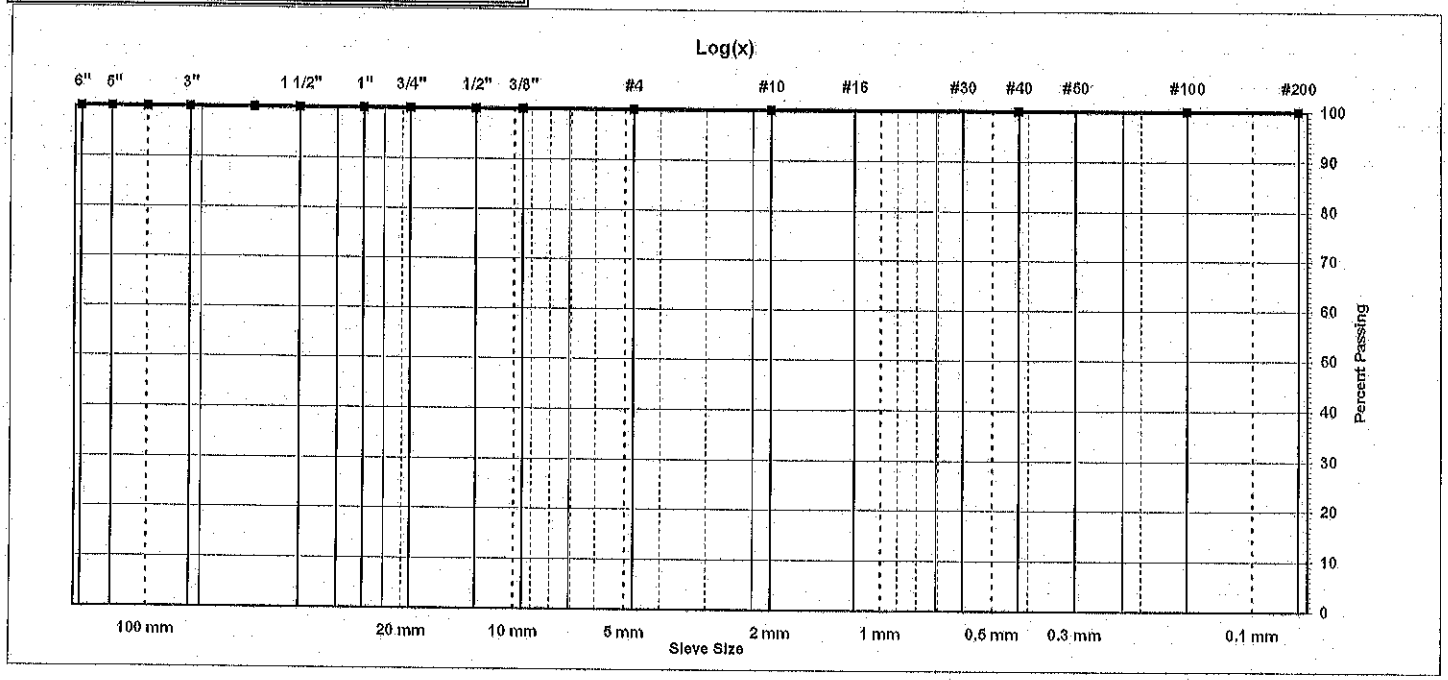
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	22		D 4318
Plasticity Index	6		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3031

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-5 @ 7' **Authorized By:** Client **Date:** 8/25/2007

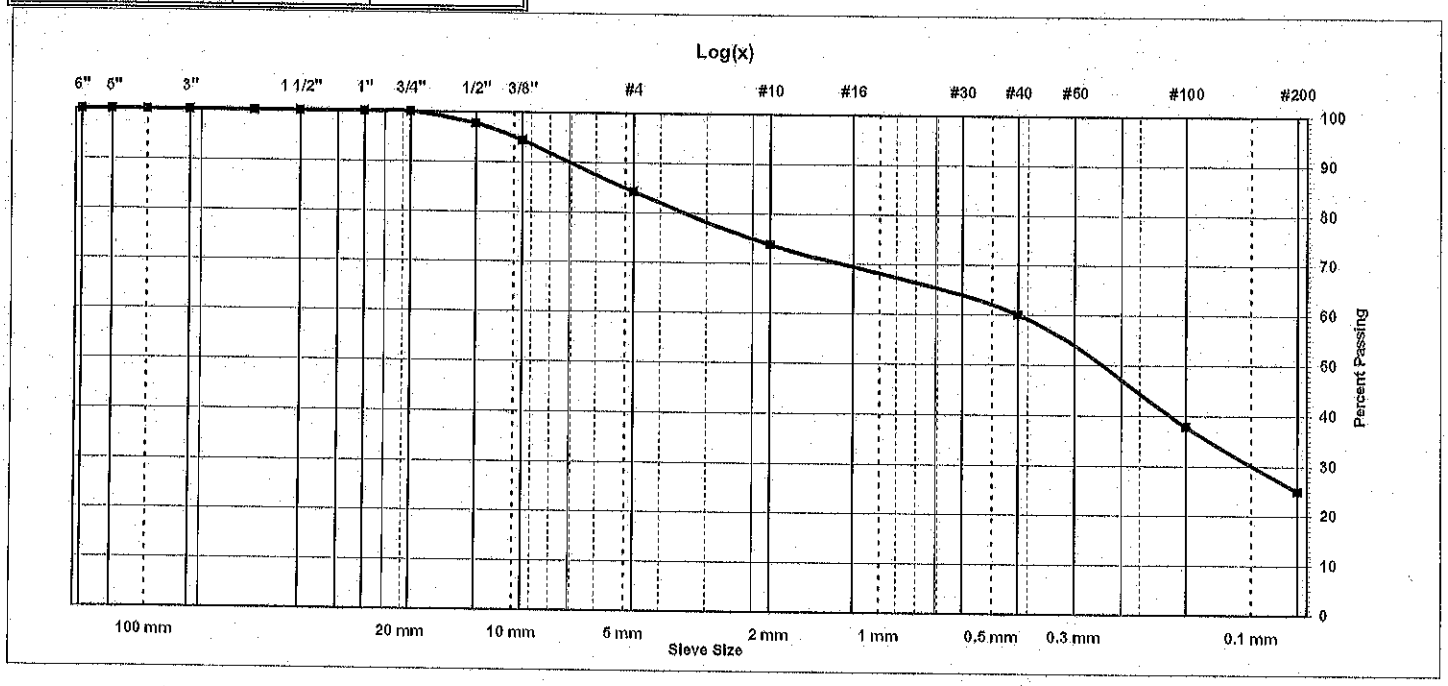
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	98	
9.5 mm	3/8"	94	
4.75 mm	#4	84	
2.00 mm	#10	74	
425 µm	#40	60	
150 µm	#100	38	
75 µm	#200	24.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.7		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	87.8		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	15.8	59.3	24.9



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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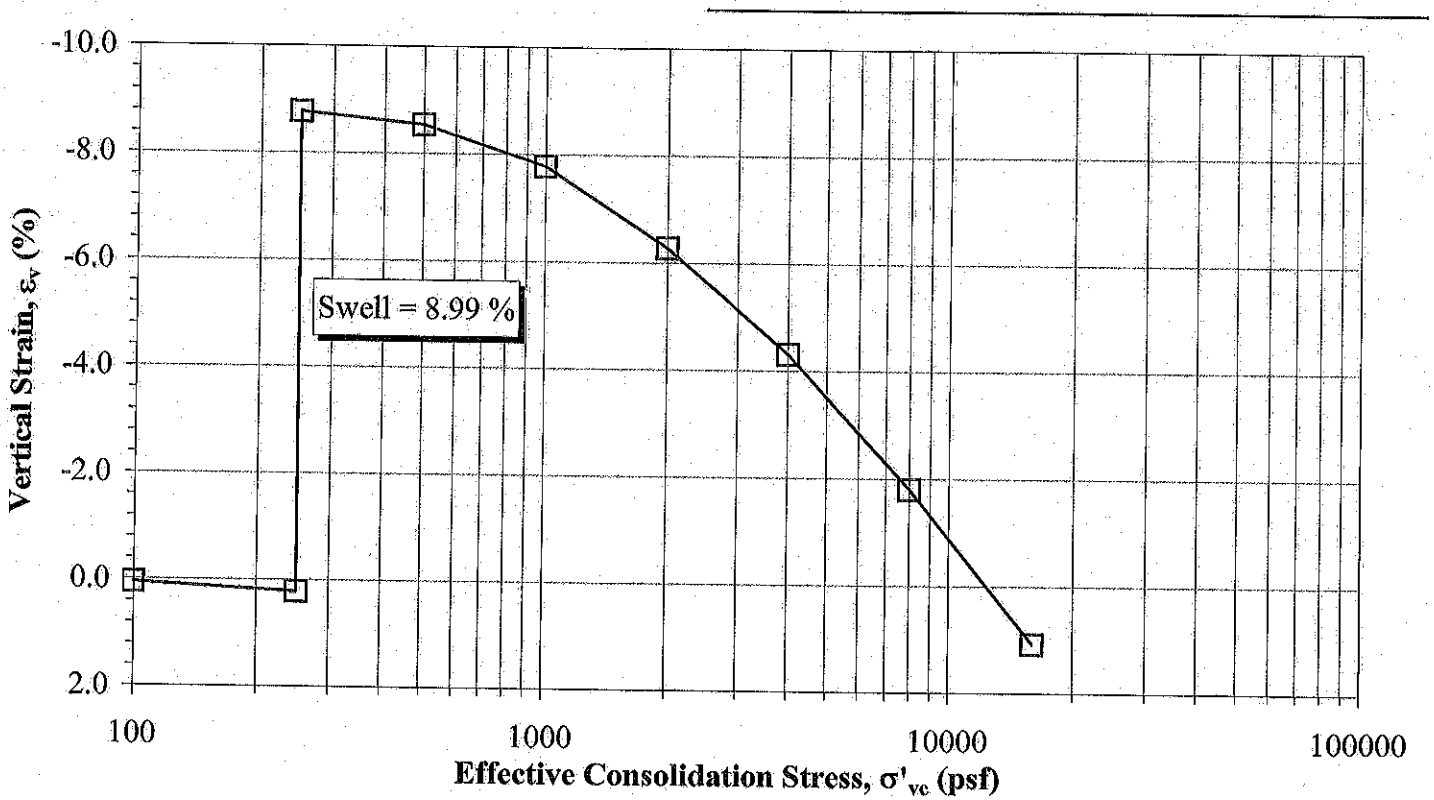
Project: Landmark Testing & Engineering
No: M00431-011
Location:
Date: 9/10/2007
By: BRR

Boring No.: WD-5
Sample:
Depth: 17
Sample Description: purplish brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	8.99	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9893
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	194.87	200.83
Wt. rings/tare (g)	43.00	43.00
Moist unit wt., γ_m (pcf)	126.2	132.6
Wet soil + tare (g)	488.63	
Dry soil + tare (g)	439.12	
Tare (g)	141.35	
Moisture content, w (%)	16.6	21.2
Dry unit wt., γ_d (pcf)	108.2	109.4
Saturation	0.83	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1677	0.00	1.0000	0.529
100	0.1682	0.05	0.9995	0.528
250	0.1698	0.21	0.9979	0.526
250	0.0799	-8.78	1.0878	0.663
500	0.0822	-8.55	1.0855	0.660
1000	0.0898	-7.79	1.0779	0.648
2000	0.1049	-6.28	1.0628	0.625
4000	0.1245	-4.32	1.0432	0.595
8000	0.1496	-1.81	1.0181	0.556
16000	0.1784	1.07	0.9893	0.512



Entered: BRR
Reviewed:

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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3034

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-5 @ 27' **Authorized By:** Client **Date:** 8/25/2007

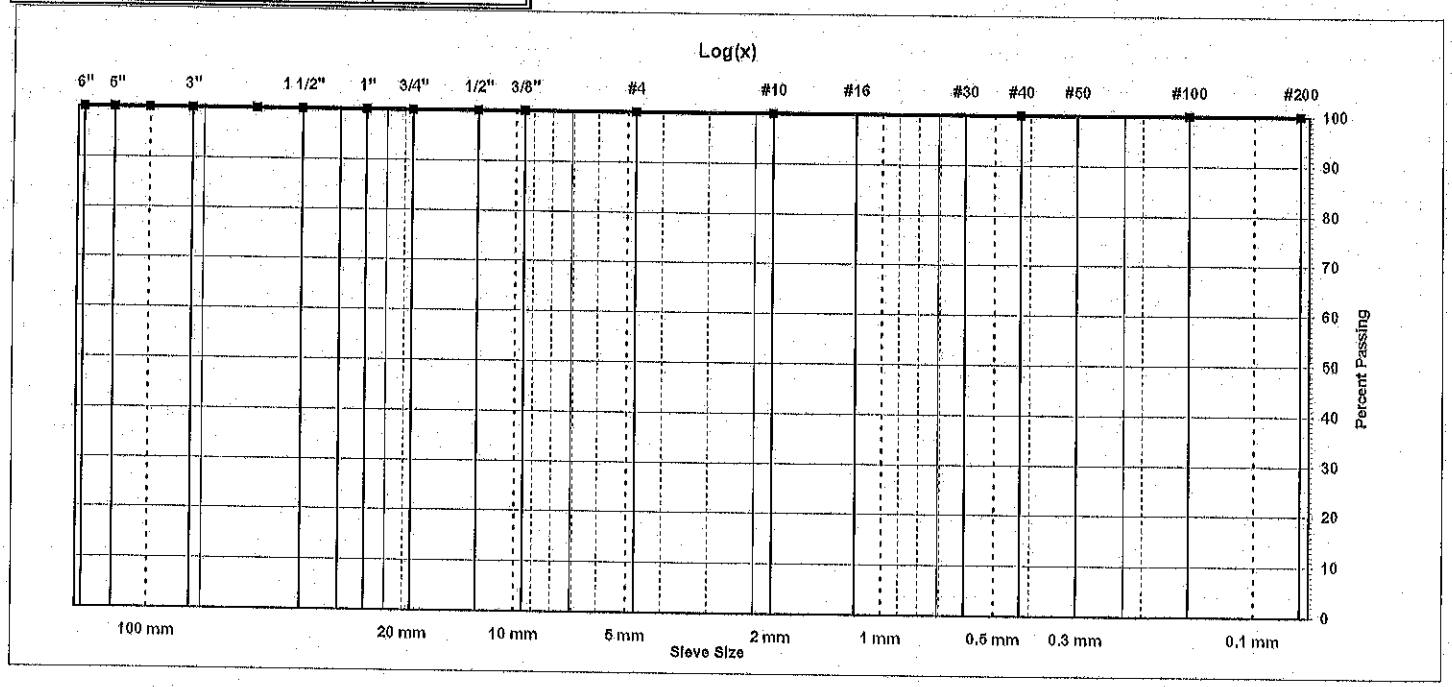
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	61		D 4318
Plasticity Index	36		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3035

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** M. Clements **Date:** 8/25/2007
Location of Sample: WD-6 @ 7' **Authorized By:** Client **Date:** 8/25/2007

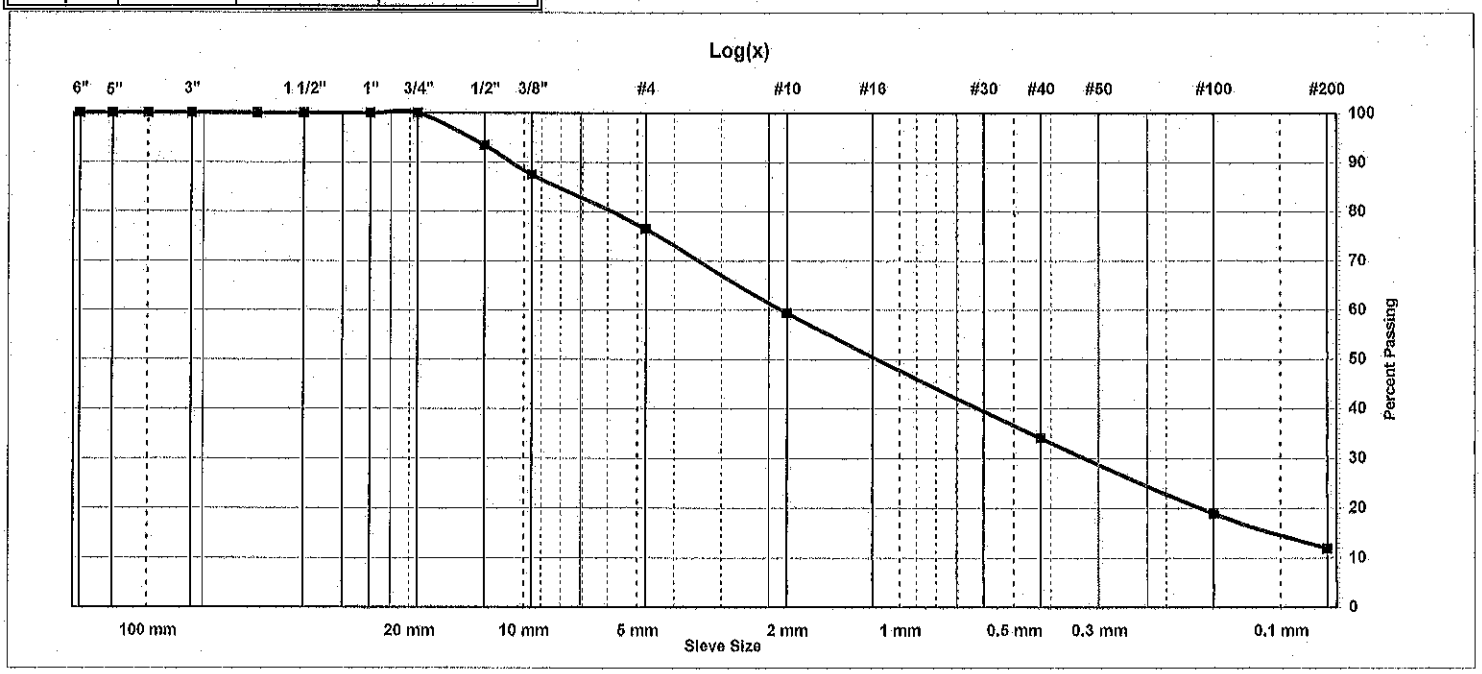
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	93	
9.5 mm	3/8"	87	
4.75 mm	#4	76	
2.00 mm	#10	59	
425 µm	#40	34	
150 µm	#100	19	
75 µm	#200	11.9	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	4.6		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	23.5	64.6	11.9



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3037

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: S. Wells **Date:** 8/25/2007
Location of Sample: WD-6 @ 27'
Authorized By: Client **Date:** 8/25/2007

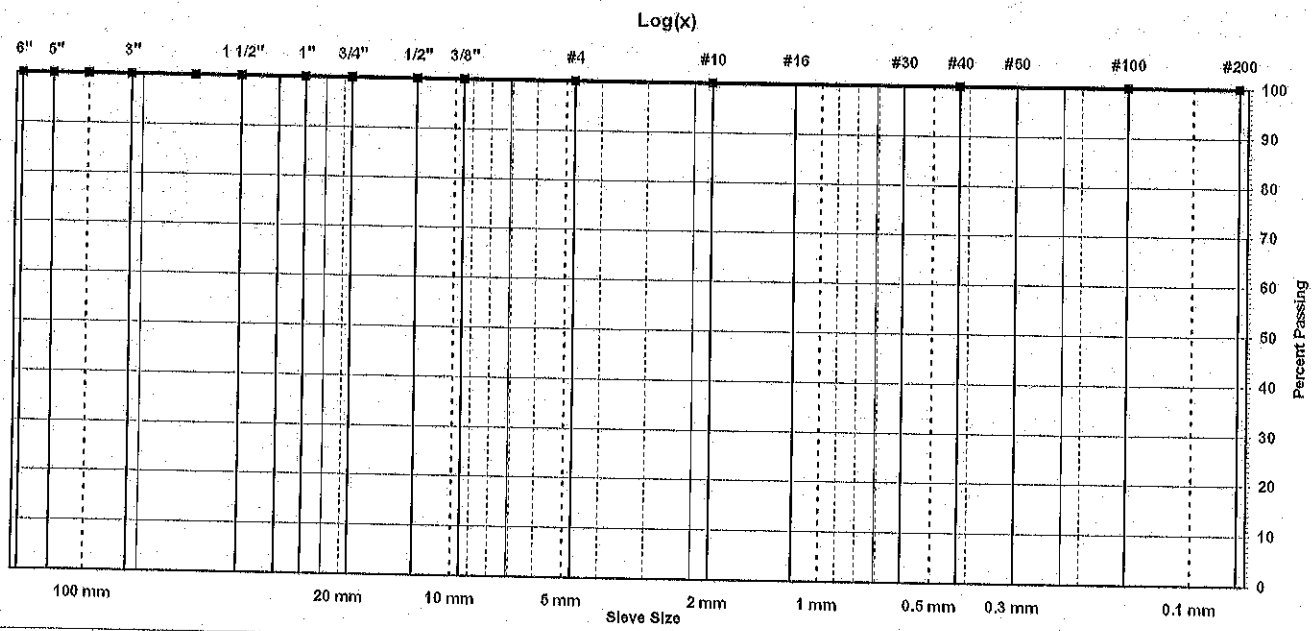
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	39		D 4318
Plasticity Index	17		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

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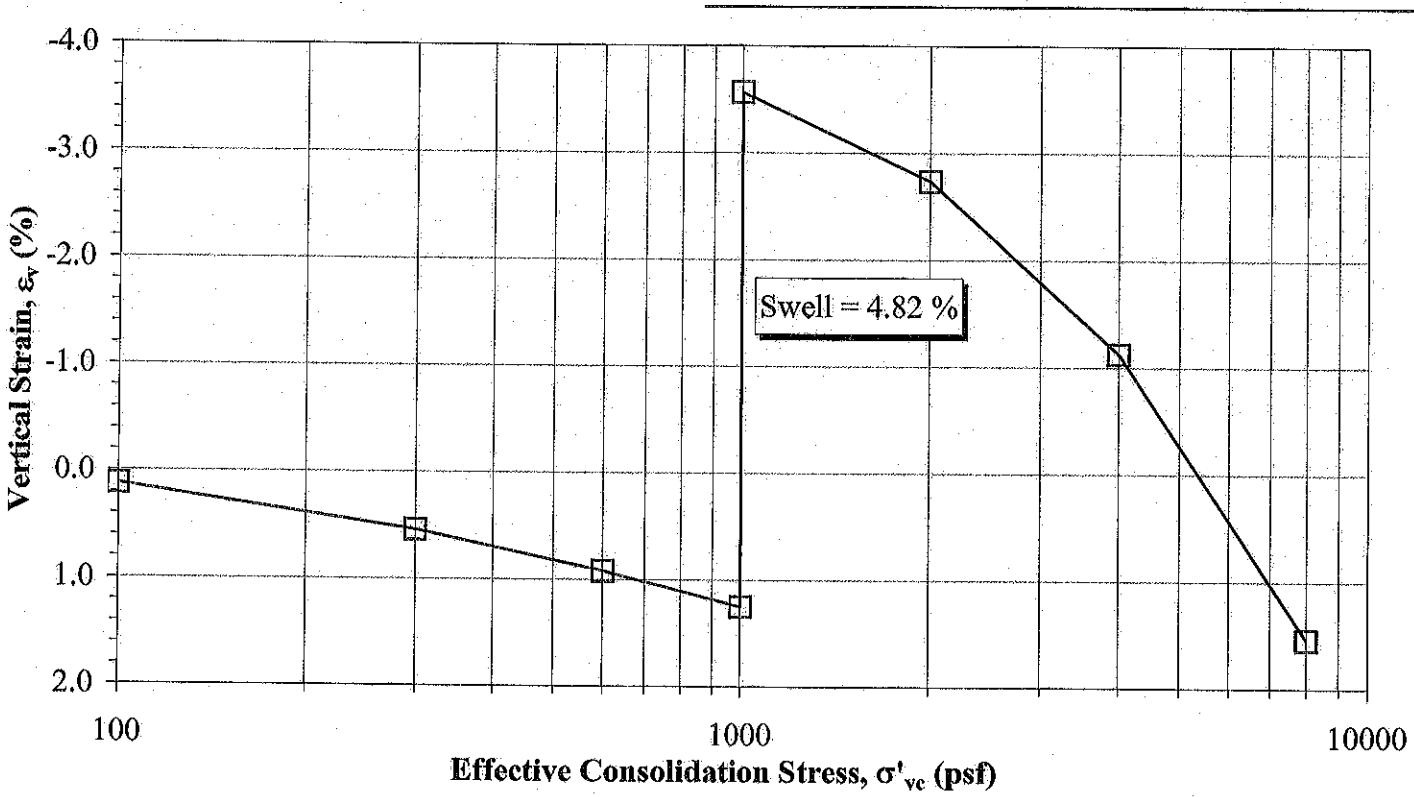
Project: Landmark Testing & Engineering
No: M00431-011
Location:
Date: 9/6/2007
By: BRR

Boring No.: WD-6
Sample:
Depth: 32
Sample Description: purplish brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	4.82	
Swell stress (psf)	1000	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9846
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	188.46	197.33
Wt. rings/tare (g)	45.31	45.31
Moist unit wt., γ_m (pcf)	119.0	128.3
Wet soil + tare (g)	601.48	
Dry soil + tare (g)	544.55	
Tare (g)	153.17	
Moisture content, w (%)	14.5	21.6
Dry unit wt., γ_d (pcf)	103.8	105.5
Saturation	0.65	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.1804	0.00	1.0000	0.593
100	0.1816	0.12	0.9988	0.591
300	0.1858	0.54	0.9946	0.584
600	0.1896	0.92	0.9908	0.578
1000	0.1929	1.25	0.9875	0.573
1000	0.1447	-3.57	1.0357	0.650
2000	0.1530	-2.74	1.0274	0.637
4000	0.1691	-1.13	1.0113	0.611
8000	0.1958	1.54	0.9846	0.568



Entered: BRR
Reviewed:

Z:\PROJECTS\M00431_Landmark_Testing\011_090407\[SWELL_COLLAPSEv1.xls]2

LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3038

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-6 @ 37' **Authorized By:** Client **Date:** 8/25/2007

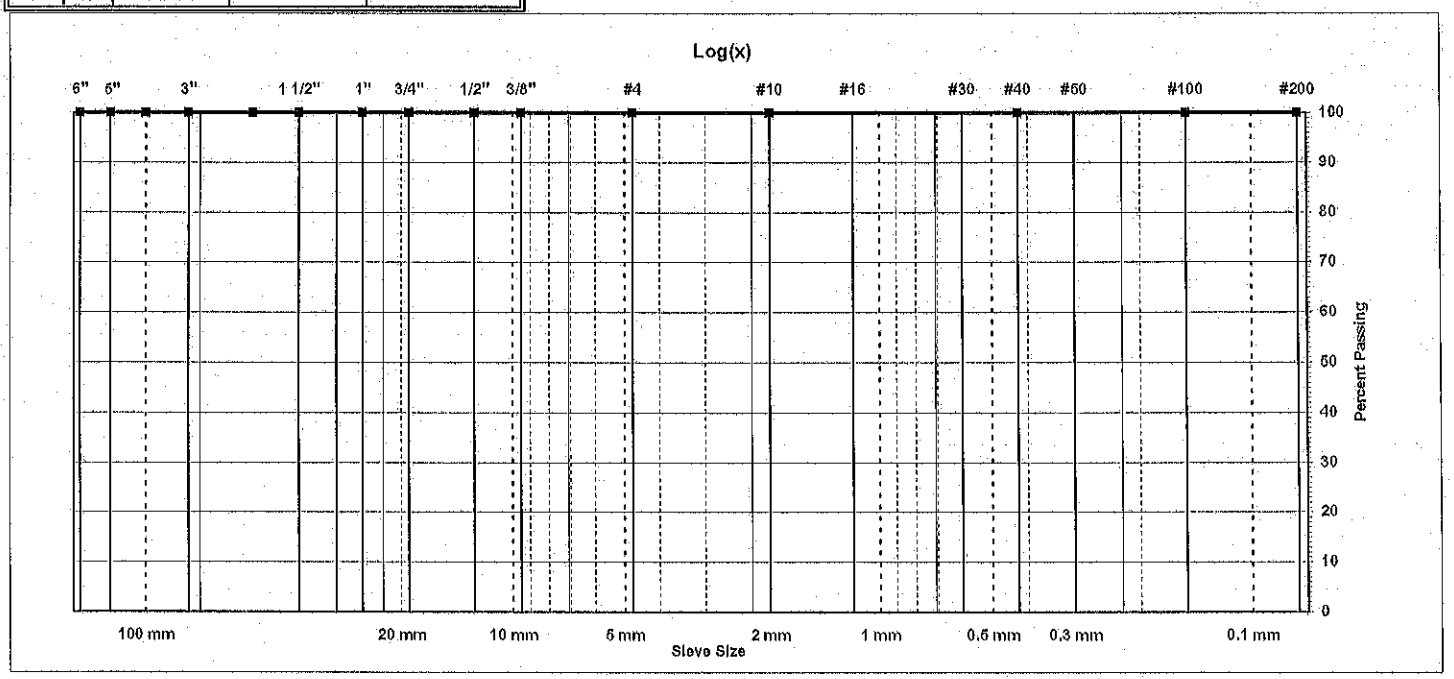
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	51		D 4318
Plasticity Index	27		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3039

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: M. Clements **Date:** 8/25/2007
Location of Sample: WD-7 @ 7'
Authorized By: Client **Date:** 8/25/2007

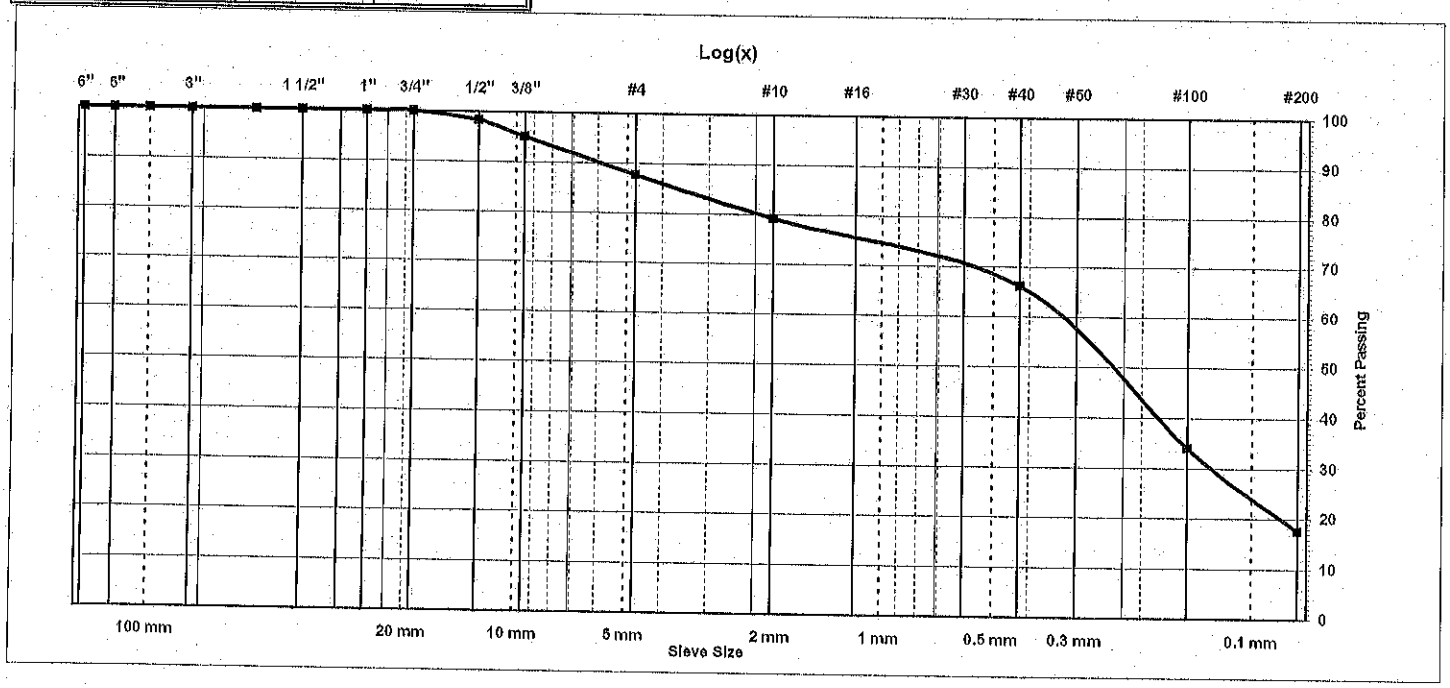
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"	100	
12.5 mm	1/2"	98	
9.5 mm	3/8"	95	
4.75 mm	#4	88	
2.00 mm	#10	79	
425 µm	#40	66	
150 µm	#100	34	
75 µm	#200	17.6	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	5.4		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Dry Unit Weight, pcf	91.6		C 29
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	12.3	70.1	17.6



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3040

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-7 @ 12' **Authorized By:** Client **Date:** 8/25/2007

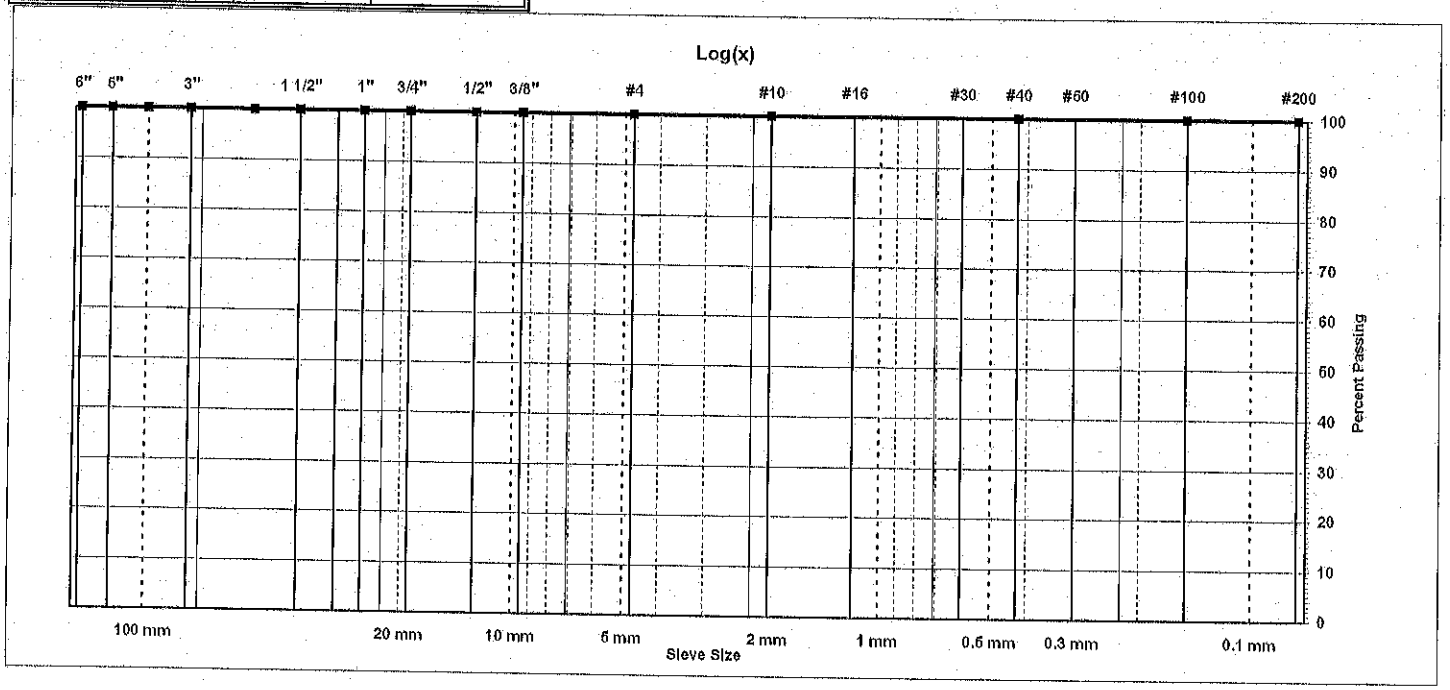
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	59		D 4318
Plasticity Index	33		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3041

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-7 @ 22' **Authorized By:** Client **Date:** 8/25/2007

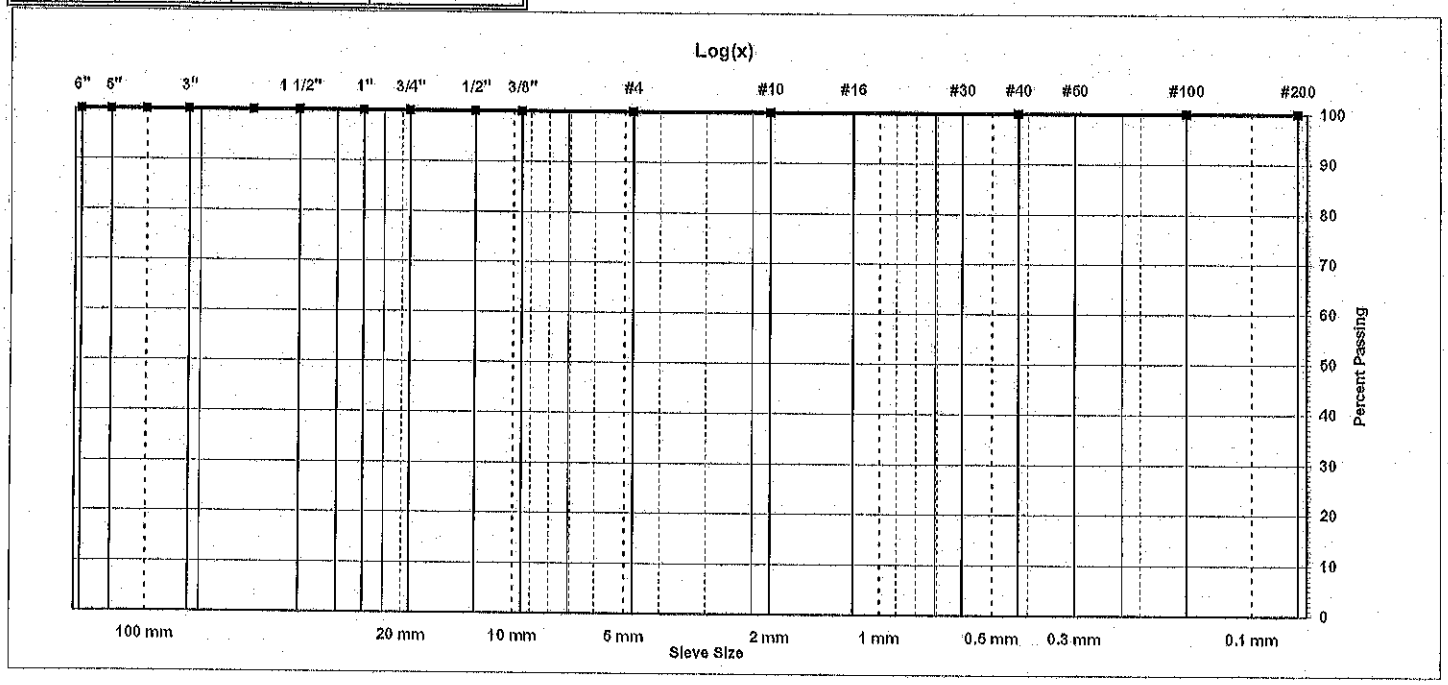
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	67		D 4318
Plasticity Index	35		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3043

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-7 @ 42' **Authorized By:** Client **Date:** 8/25/2007

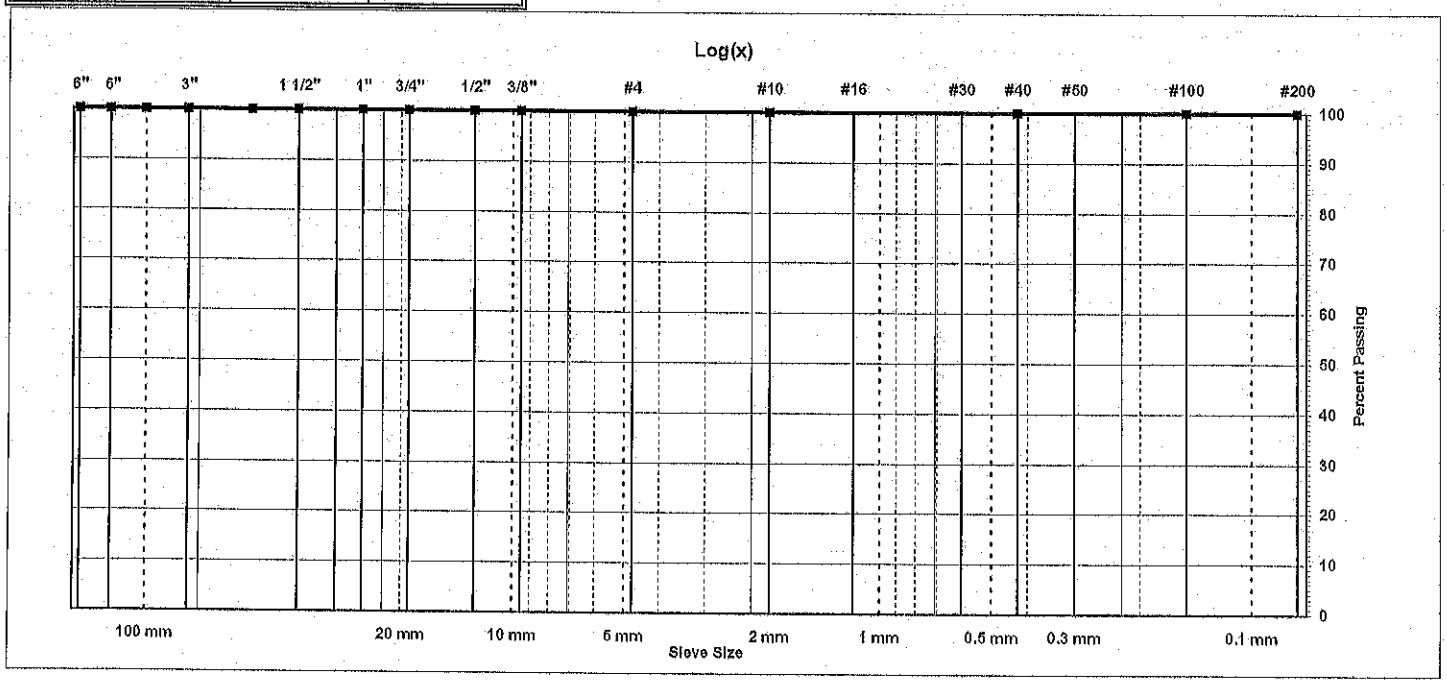
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	40		D 4318
Plasticity Index	21		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3044

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-8 @ 7' **Authorized By:** Client **Date:** 8/25/2007

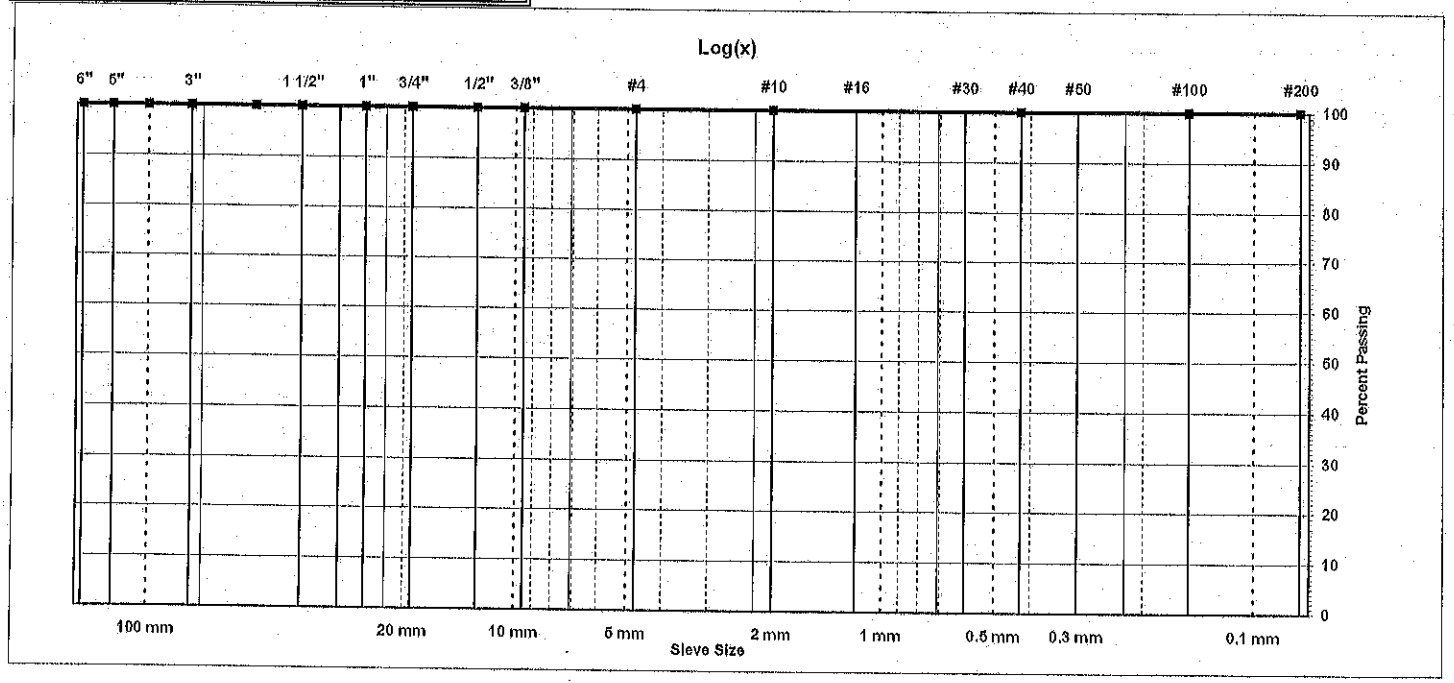
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	60		D 4318
Plasticity Index	34		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

IGES
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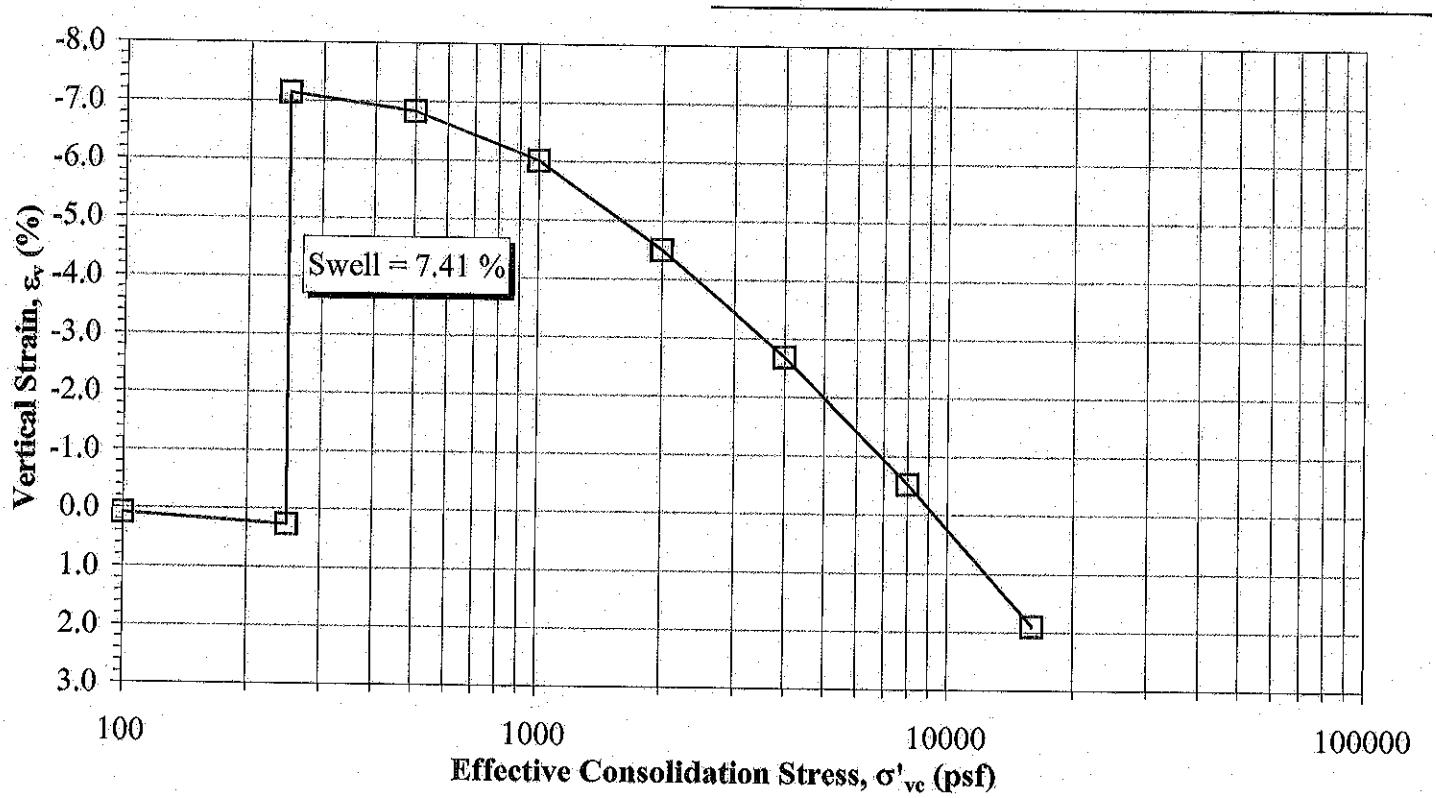
Project: Landmark Testing & Engineering
No: M00431-011
Location:
Date: 9/10/2007
By: BRR

Boring No.: WD-8
Sample:
Depth: 22
Sample Description:
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, G_s	2.65	Assumed
Swell (%)	7.41	
Swell stress (psf)	250	

	Initial (o)	Final (f)
Sample height, H (in.)	1.000	0.9811
Sample diameter, D (in.)	2.416	2.416
Wt. rings + wet soil (g)	197.09	202.62
Wt. rings/tare (g)	43.07	43.07
Moist unit wt., γ_m (pcf)	128.0	135.1
Wet soil + tare (g)	529.75	
Dry soil + tare (g)	482.72	
Tare (g)	151.23	
Moisture content, w (%)	14.2	18.3
Dry unit wt., γ_d (pcf)	112.1	114.2
Saturation	0.79	1.00

Stress (psf)	Dial (in.)	1-D ε_v (%)	H_c (in.)	e
Seating	0.2472	0.00	1.0000	0.476
100	0.2480	0.08	0.9992	0.475
250	0.2498	0.26	0.9974	0.472
250	0.1757	-7.15	1.0715	0.581
500	0.1788	-6.84	1.0684	0.577
1000	0.1870	-6.02	1.0602	0.565
2000	0.2021	-4.51	1.0451	0.543
4000	0.2203	-2.69	1.0269	0.516
8000	0.2419	-0.53	1.0053	0.484
16000	0.2661	1.89	0.9811	0.448



Entered: BRK
Reviewed: AOS

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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3046

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-8 @ 27' **Authorized By:** Client **Date:** 8/25/2007

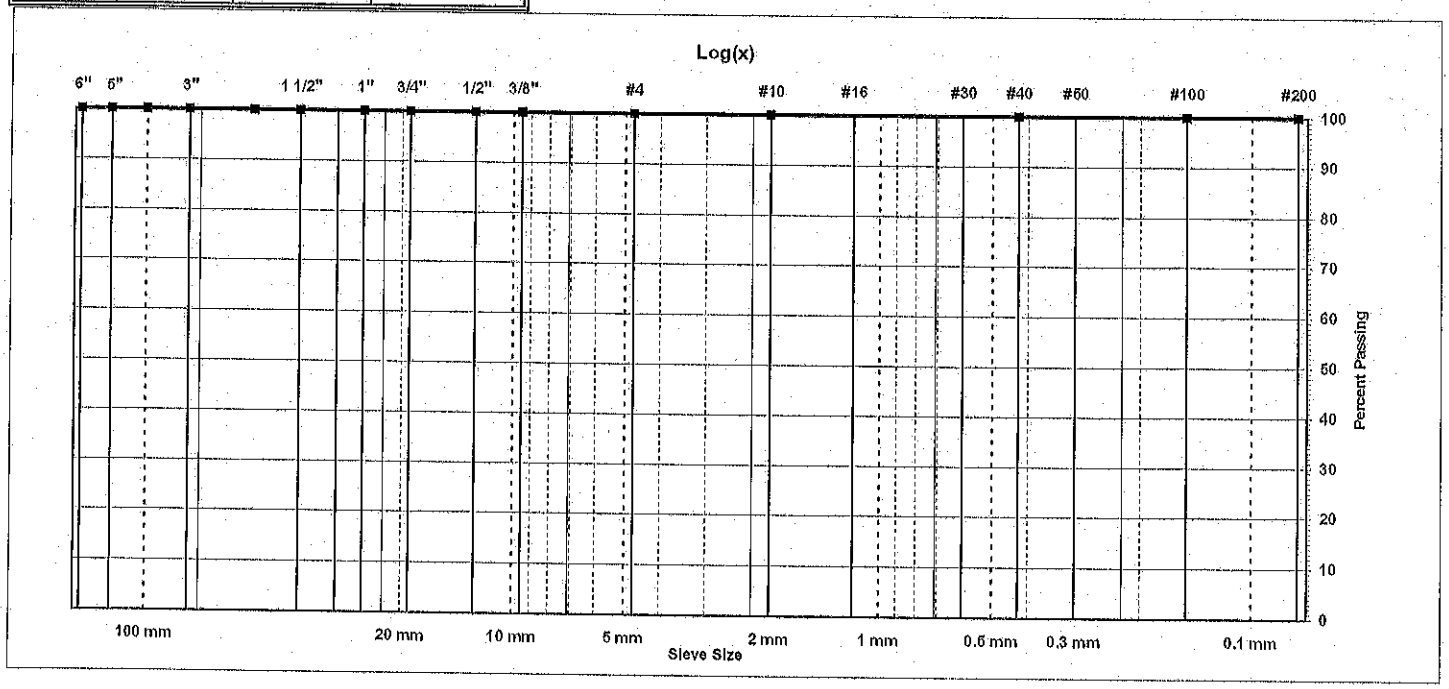
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	33		D 4318
Plasticity Index	16		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3047

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: S. Wells **Date:** 8/25/2007
Location of Sample: WD-8 @ 32'
Authorized By: Client **Date:** 8/25/2007

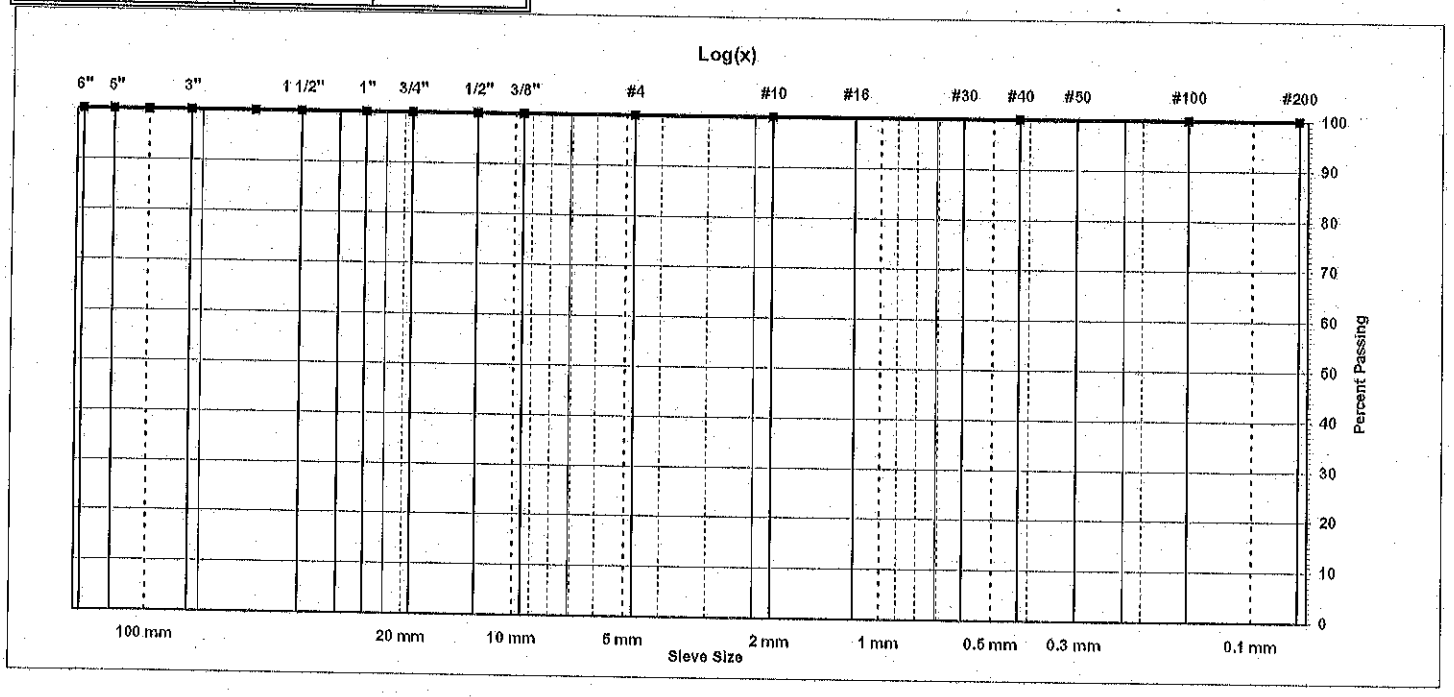
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	35		D 4318
Plasticity Index	16		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3048

Project: St. George Replacement Airport **Project #:** 07330
Location: St. George **Sampled By:** R. Owens **Date:** 8/25/2007
Type of Sample: **Tested By:** S. Wells **Date:** 8/25/2007
Location of Sample: WD-8 @ 43' **Authorized By:** Client **Date:** 8/25/2007

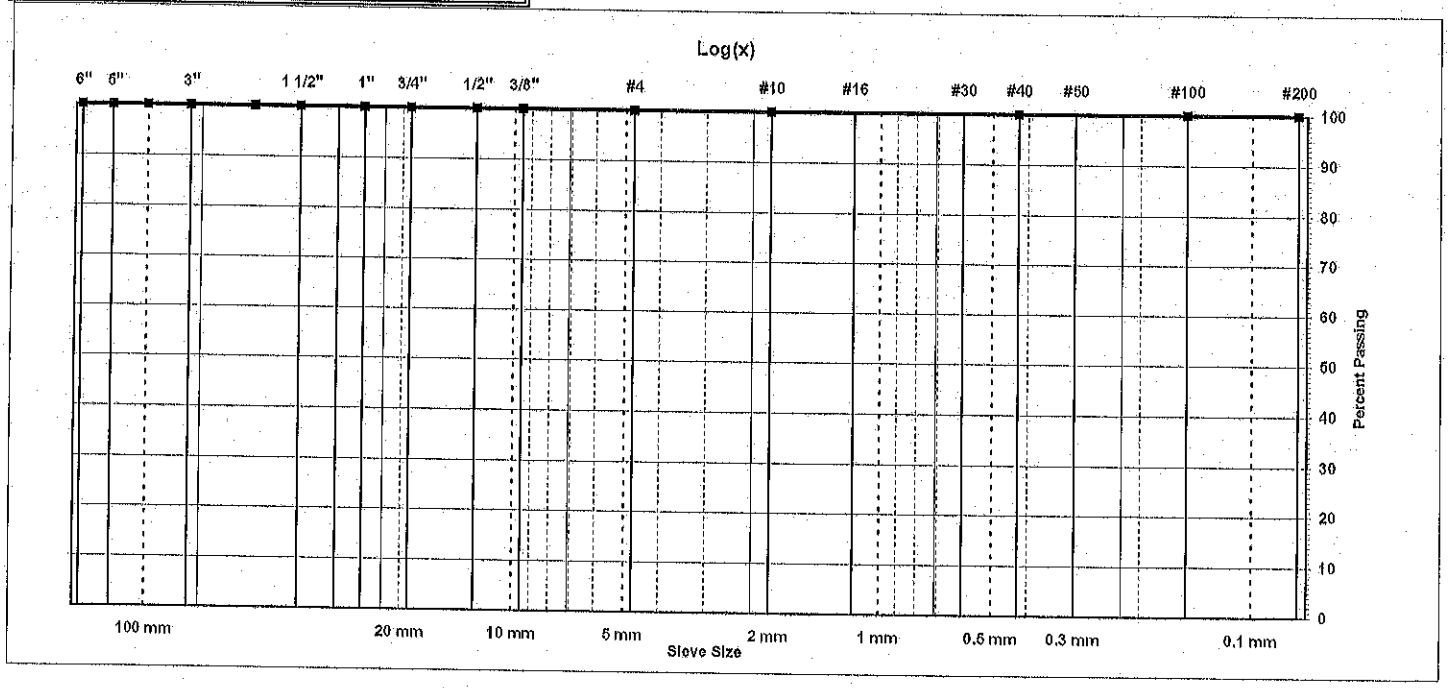
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	25		D 4318
Plasticity Index	5		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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LANDMARK
TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3054

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: M. Clements **Date:** 8/25/2007
Location of Sample: ET-14 @ 4'
Authorized By: Client **Date:** 8/25/2007

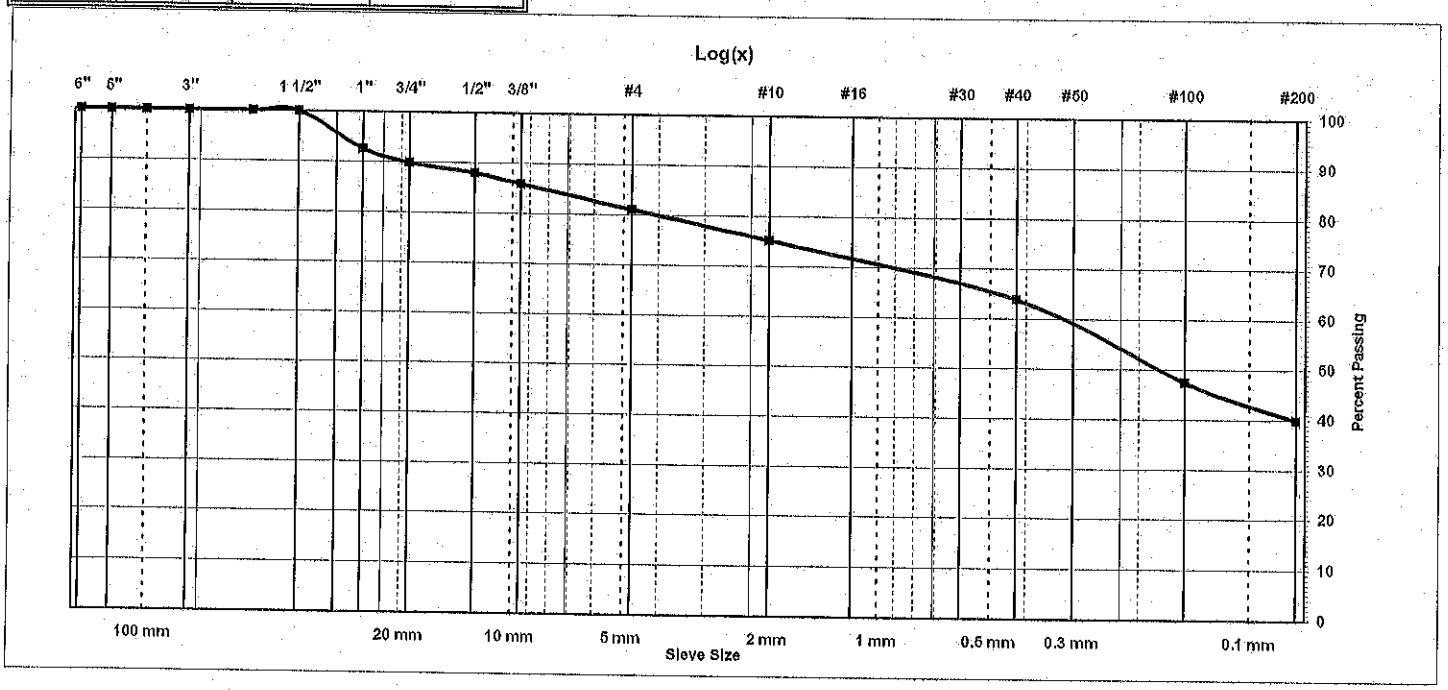
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"	100	
25 mm	1"	93	
19 mm	3/4"	90	
12.5 mm	1/2"	88	
9.5 mm	3/8"	86	
4.75 mm	#4	81	
2.00 mm	#10	75	
425 µm	#40	64	
150 µm	#100	47	
75 µm	#200	39.8	

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %	15.1		D2216
Liquid Limit			D 4318
Plasticity Index			D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	19.0	41.1	39.8



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LANDMARK TESTING & ENGINEERING

SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By:
Lab#: 7SG3055

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens **Date:** 8/25/2007
Type of Sample:
Tested By: S. Wells **Date:** 8/25/2007
Location of Sample: ET-14 @ 17'
Authorized By: Client **Date:** 8/25/2007

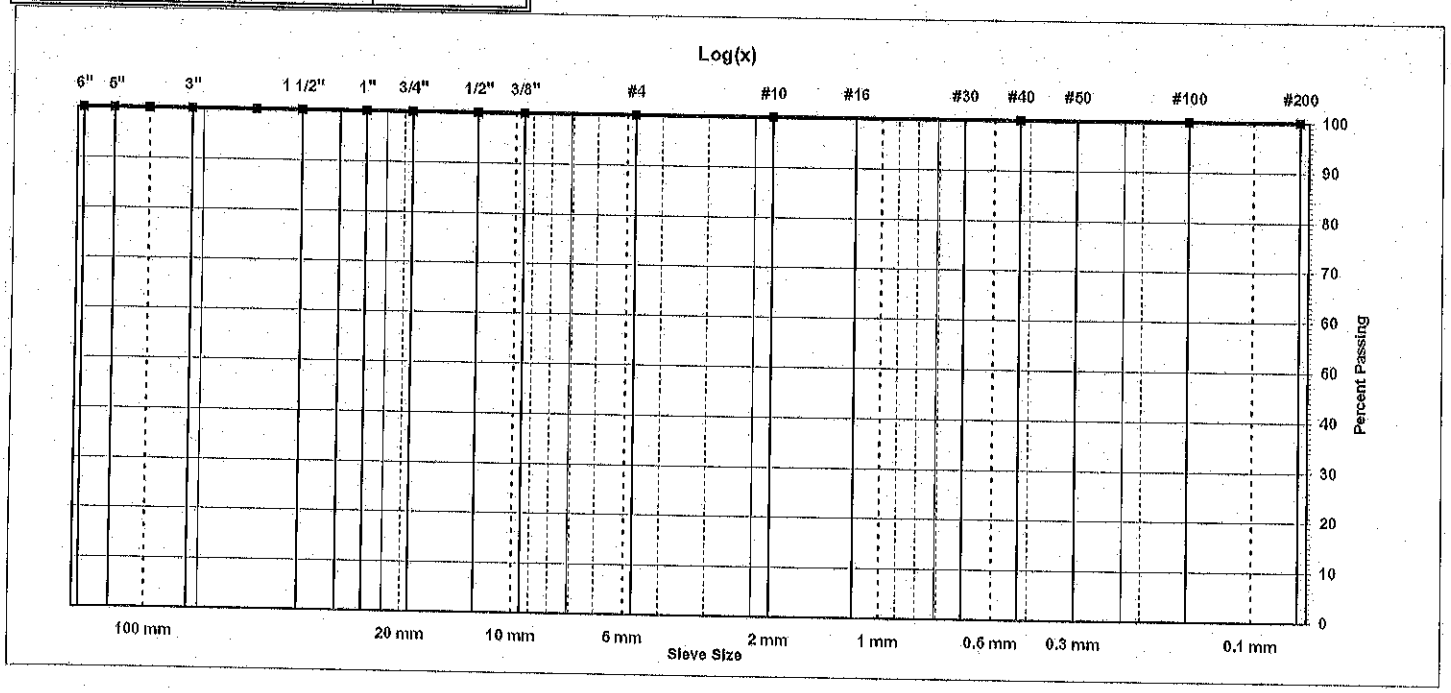
Sieve Analysis, ASTM C136

Sieve Size		% Passing Cumulative	Specification
125 mm	5"		
100 mm	4"		
75 mm	3"		
50 mm	2"		
37.5 mm	1-1/2"		
25 mm	1"		
19 mm	3/4"		
12.5 mm	1/2"		
9.5 mm	3/8"		
4.75 mm	#4		
2.00 mm	#10		
425 µm	#40		
150 µm	#100		
75 µm	#200		

Test Standards are ASTM unless otherwise noted.

Test	Result	Specification	Test Standard
Natural Moisture Content, %			D2216
Liquid Limit	45		D 4318
Plasticity Index	26		D 4318
Unified Classification System			D 2487
AASHTO Classification System			AASHTO M145

% Cobble > 3"	% Gravel < 3" - #4	% Sand < #4 - #200	% Silt-Clay < #200
0.0	0.0	0.0	0.0



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Unconfined Compressive Strength

Project: St. George Replacement Airport

Project #: 07330

Lab #	Location	Length	Diameter	Area	Load	PSI
7SG3049	ET-11 @ 5'	4.00	2.04	3.27	13,340	4,080
7SG3050	ET-12 @ 10'	4.07	2.06	3.33	52,400	15,720
7SG3051	WT-10 @ 6'	4.02	2.02	3.20	29,310	9,150
7SG3052	RW-14 @ 6'	4.18	2.02	3.20	30,000	9,360
7SG3053	WT-13 @ 7'	4.03	2.05	3.30	24,610	7,460
7SG3056	RW-16 @ 5'	4.04	2.04	3.27	14,870	4,550
7SG3057	RW-15 @ 7'	4.07	2.05	3.30	20,890	6,330