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

LANDMARK
TESTING & ENGINEERING

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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:

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Gross Weight (lbs)</th>
<th>Annual Departures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Wheel - 50</td>
<td>50,000</td>
<td>3,680</td>
</tr>
<tr>
<td>Dual Wheel -75</td>
<td>75,000</td>
<td>1,226</td>
</tr>
<tr>
<td>Dual Wheel - 100</td>
<td>100,000</td>
<td>1,200</td>
</tr>
<tr>
<td>B-737-700</td>
<td>153,500</td>
<td>50</td>
</tr>
<tr>
<td>Learjet-35A/65A</td>
<td>18,000</td>
<td>1,200</td>
</tr>
<tr>
<td>Gulfstream-G-IV</td>
<td>75,000</td>
<td>50</td>
</tr>
<tr>
<td>Gulfstream-G-V</td>
<td>90,900</td>
<td>50</td>
</tr>
</tbody>
</table>
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 Consultants¹ 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.

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

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 the Virgin 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.

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\(^3\) 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 (Qae)- 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 contact.

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

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 Geotechnical 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.

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

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

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.

<table>
<thead>
<tr>
<th>Sample Description</th>
<th>Optimum Moisture content and maximum dry density</th>
<th>% Swell -2%</th>
<th>% Swell Optimum</th>
<th>% Swell +2%</th>
<th>% Swell +4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET-7 at 7 feet</td>
<td>114.4 pcf @ 15.2%</td>
<td>5.94%</td>
<td>4.91%</td>
<td>3.11%</td>
<td>1.69%</td>
</tr>
</tbody>
</table>

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.

\(^4\)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\(^6\) 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.

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

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

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\textsuperscript{6} was used to assess the rippability/excavatability of the rock. The rippability is determined from the following formula \( N = M_s (RQD/J_n) J_s (I/J_n) \) 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
- \( J_e \): Joint alteration number

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

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

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.

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\textsuperscript{6}Kirsten, H.A.D., "Case Histories of Groundmass Characterization for Excavatability" 
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:

<table>
<thead>
<tr>
<th>Compaction</th>
<th>0-19 inches</th>
<th>95% Compaction</th>
<th>19-32 inches</th>
<th>90% Compaction</th>
<th>32-46 inches</th>
<th>85% Compaction</th>
<th>46-60 inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td></td>
<td>95%</td>
<td></td>
<td>90%</td>
<td></td>
<td>85%</td>
<td></td>
</tr>
</tbody>
</table>
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.

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

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 be 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 65 are 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 compaction; 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 cruisher 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.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Total Unit Weight (pcf)</th>
<th>$\varepsilon_{50}$ (in/in)</th>
<th>Friction Angle</th>
<th>Cohesion (psf)</th>
<th>Lateral Modulus (pci)</th>
<th>Unconfined Compressive Strength (psf)</th>
<th>Modulus of Elasticity (psi)</th>
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</thead>
<tbody>
<tr>
<td>Lean to fat clay</td>
<td>130</td>
<td>0.004</td>
<td>NA</td>
<td>4,000</td>
<td>5,000</td>
<td>8,000</td>
<td>14,000</td>
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</table>

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 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:
(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 which 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
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.
WEST TAXIWAY

<table>
<thead>
<tr>
<th>WT</th>
<th>EXISTING ELEVATION</th>
<th>PROPOSED FINISHED GRADES</th>
<th>PROPOSED CUT/FILL</th>
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NOTE:
Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.

LANDMARK
TESTING & ENGINEERING
IDEALIZED CROSS SECTION
LANDMARK PROJECT 07330

FIGURE 5
NOTE:
Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.
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.
NOTE: Strata boundaries are only approximate and may vary widely, particularly the location of caliche deposits, between borings and within individual borings.
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.
BENCHED SLOPE DETAIL

ORIGINAL GROUND OR FILL EMBANKMENT

GROUND STRIPPED OF ORGANICS

EMBANKMENT FILL LINE

ORIGINAL GROUND

1'-3' OR AS DIRECTED

10' MIN

3' MIN, BENCH LENGTH TO MATCH CONTOUR OF ORIGINAL GROUND

BENCHING WORK IS INCIDENTAL TO CONSTRUCTION. EXCAVATE AND PLACE FILL IN A CONTINUOUS OPERATION. BENCHES REQUIRED ON SLOPES OF 5H:1V OR STEEPER
NOTE: Strata boundaries are only approximate and may vary widely between borings.
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 D1557).

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**

---

**SUBGRADE PREPARATION**
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content</th>
<th>Unit Weight</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt</th>
<th>Liquid Limit</th>
<th>Plasticity Index</th>
<th>% Solids</th>
<th>% Silt at 2%</th>
<th>Recovery and Rod</th>
<th>Below Per Foot</th>
<th>Core Interval</th>
<th>Sample Number</th>
<th>Soil Type</th>
<th>Description</th>
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<td></td>
<td></td>
<td>GM</td>
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<td></td>
<td>SC</td>
<td>Clayey Sand with Gravel (SC) with up to 20% calcite nodules, dense, dry</td>
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT-1

LANDMARK TESTING & ENGINEERING
535 N. 1650 E, 84790

KEY

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 160 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

FIELD DATE: JUNE 7, 2007
SURFACE ELEVATION: 2862.77
DESCRIPTION

COMPLETE at 16 feet, no groundwater encountered.
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>LABORATORY RESULTS</th>
<th>SAMPLE DATA</th>
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<tbody>
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<td>18</td>
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</tr>
<tr>
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<td>11</td>
<td>55</td>
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<tr>
<td>2.5</td>
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</tbody>
</table>

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG WT-2

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

FIELD DATE: JUNE 7, 2007
SURFACE ELEVATION: 2881.55

LITHOLOGY:
- SM: Silty Sand (SM), brown, dry, with gravel
- SM-ML: Silty Sand (SM-ML), dust, light brown, calcite cemented, dry
- SC-U: Clayey Sand (SC-U), dust, calcite cementation, dry
- Complete 42'- no sample

DESCRIPTION:
- 0 ft: Proposed finished grade 2877.55
- 4": 50 for 4"
- 6": 50 for 6"
- 5": 50 for 5"
- 4": 50 for 4"

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

PAGE 1 OF 1
<table>
<thead>
<tr>
<th>DEPT (FT)</th>
<th>SOIL CONTENT</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% Silt</th>
<th>ELASTIC LIMIT</th>
<th>PLASTICITY INDEX</th>
<th>% SPREAD AT 2%</th>
<th>NAIROPE</th>
<th>% RECOVERY</th>
<th>LIT. POCKET</th>
<th>备注</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>LITHOLGY</th>
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<td>FAT CLAY (CH) CLAYSTONE, dark red, hard, slightly mottled, thinly bedded</td>
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT-3

LANDMARK TESTING & ENGINEERING
525 N. 3400 E. #3, St. George, UT 84770

FIELD DATE: JUNE 7, 2007
SURFACE ELEVATION: 2883.32
DESCRIPTION

\(\text{Relative undisturbed sample obtained with 3.28 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.}\)

\(\text{Core boring}\)

\(\text{Disturbed sample}\)

\(\text{Sampling attempt with no recovery.}\)

\(\text{Groundwater depth at time of excavation}\)
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content</th>
<th>Unit Weight (pcf)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt/Lime</th>
<th>Plasticity Index</th>
<th>Liquid Limit</th>
<th>Standard Penetration</th>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Recovery</th>
<th>Core</th>
<th>Sample Length</th>
<th>LITHOLOGY</th>
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<td>SILTY SAND (SM) reddish brown</td>
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<td>CLAYISH SAND (SC) gravel reddish brown, slightly plastic, anisot</td>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WT-4**

**LANDMARK TESTING & ENGINEERING**
525 N. 3000 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 line of excavation
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Unit Weight (pcf)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Fines</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>% Swell at 2%</th>
<th>Blows per foot</th>
<th>Core Recovery</th>
<th>Core Interval (ft)</th>
<th>Sample Number</th>
<th>Sample Type</th>
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project #07330

**BORING LOG WT-4**

**LANDMARK TESTING & ENGINEERING**  
535 N. 3050 E. 63, St. George, UT 84790

**FIELD DATE: JUNE 26-28 2007**
**DESCRIPTION:**

CLAYSTONE (CL)
- Grades grey
- Brown + grey, very wet, hard

BRICK (BR)
- Poor return on clay
- Grades brown + grey, mottled, very moist, hard
- COMPLETE @ 33' sample very wet

**KEY:**
- Redundant 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
<table>
<thead>
<tr>
<th>BORING LOG - WT-5</th>
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<tbody>
<tr>
<td>LANDMARK TESTING &amp; ENGINEERING</td>
</tr>
<tr>
<td>525 N. 3650 E. 83, St. George, UT 84790</td>
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### LABORATORY RESULTS

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<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content (%)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Finer than 200 mesh</th>
<th>Plastic Index</th>
<th>Plastic Limit</th>
<th>% Swell at 2% Moisture</th>
<th>Penetrometer</th>
<th>Recovery</th>
<th>Core Length</th>
<th>Core Recovery</th>
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<th>Sample Number</th>
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</tbody>
</table>

### DESCRIPTION

- **Silty Sand (SM)**, reddish brown, gravelly
- **Silty Sand (SM-ML)**, lightly cemented, slightly moist
- **Silty Gravel with Sand (GM)**, fine, slightly plastic, reddish brown, moist, gravel up to 1/2" in diameter
- **Lean Clay (CL)**, mudstone, gravelly, (gravel is likely from hard-cuttings)

### 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 base of excavation
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<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT (W/G)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% SAND</th>
<th>% Silt</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>% SWELL AT 2%</th>
<th>% RECOVERY</th>
<th>CORE SPLIT</th>
<th>SAMPLE INTERVAL (FT)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
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ST. GEORGE REPLACEMENT AIRPORT  
Landmark Project # 07330  
BORING LOG - WT-5  
LANDMARK TESTING & ENGINEERING  
525 N. 3650 E. Rd, St. George, UT 84790  

KEY  
- Relatively undisturbed sample obtained with 3.20 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.  
- Core Cutting  
- Disturbed sample  
- Sampling attempt with no recovery.  
- Groundwater depth at time of excavation
<table>
<thead>
<tr>
<th>MOISTURE CONTENT (%)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRavel</th>
<th>% SAND</th>
<th>% Fines</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>S-PHASE</th>
<th>GF-Ratio</th>
<th>N-Density</th>
<th>BLOW N Toot</th>
<th>CORE INTERVAL (ft)</th>
<th>BORING LOG</th>
<th>RAIL CORE</th>
<th>SAMPLING POINT</th>
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<td>LEAN CLAY (CL) CLAYSTONE, purple + gray, very stiff, slightly moist</td>
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</tbody>
</table>

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WT-6**

**LANDMARK TESTING & ENGINEERING**
525 N. 1050 E. 83, St. George, UT 84790

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

**FIELD DATE:** JUNE 18, 2007
**SURFACE ELEVATION:** 2873.25
<table>
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<th>DEPTH (FT)</th>
<th>COHESION CONTENT (%)</th>
<th>COHESIVE CONTENT (%)</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>CONSISTENCY INDEX</th>
<th>% RECOVERY AND VARIABILITY</th>
<th>% RECOVERY</th>
<th>TOOT</th>
<th>INTERVAL (FT)</th>
<th>SAMPLE NUMBER</th>
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</table>

**Description:**
- L Hann Clay (CL): claystone, dark reddish brown, very stiff.
- Gradient gray
- Gradient reddish brown
- Apat Clay (CS): claystone, gray to purple, very stiff.
- Gradient sandy
- Gradient with siltstone intervals
- Complete @ 42; no groundwater encountered

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project #07330

**BORING LOG - WT-6**

**KEY**
- □ Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 1-10 pound hammer falling 30 inches.
- △ Core Drilling
- ⬤ Disturbed sample
- ◆ Sampling attempt with no recovery.
- ⬤ Groundwater depth at time of excavation.

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

**FIELD DATE:** JUNE 18, 2007
**SURFACE ELEVATION:**

---

PAGE 2 of 2
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<tr>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRavel</th>
<th>% SAND</th>
<th>% Fines</th>
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<th>BULK DENSITY</th>
<th>PLASTICITY INDEX</th>
<th>SOIL SWELL AT 60</th>
<th>% RECOVERY</th>
<th>% RECOVERY AND SKID</th>
<th>BLOWS PER FOOT</th>
<th>SAMPLE NUMBER</th>
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<td>CLAYEY SAND (SC), reddish brown and gray</td>
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<td>Intensely fractured LIMAN CLAY (CL) MUDSTONE</td>
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<td>Lighter color, white; grades reddish brown, laminated, fractured grades to white</td>
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<td>COMPLETE @ 25° no groundwater</td>
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WT-7

LANDMARK TESTING & ENGINEERING
525 N. 1650 E. 85, St. George, UT 84790

- Field Date: June 18-19, 2007
- Surface Elevation: 2852.19
- Description: SILTY SAND (SM-ML), light brown
- CLAYEY SAND (SC), reddish brown and gray
- LIMAN CLAY (CL) MUDSTONE, sandy, gray
- Intensely fractured LIMAN CLAY (CL) MUDSTONE
- Lighter color, white; grades reddish brown, laminated, fractured grades to white
- COMPLETE @ 25° no groundwater

Relatedly undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
Core Oiling
Disturbed sample
Sampling attempt without recovery.
Groundwater depth at time of excavation.
<table>
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<th>DEPTH (FT)</th>
<th>DRY WEIGHT (PCF)</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>AT % LIQUID INDEX</th>
<th>AT % PLASTIC INDEX</th>
<th>TMI % SWELL AT 2%</th>
<th>MINS RECOVERY</th>
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<td>LEAN CLAY (CL) MUDSTONE, reddish brown, slightly moist</td>
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<td>LEAN CLAY (CL) MUDSTONE, reddish brown, w/ grey and yellow intervals, thinly bedded, clearly fractured</td>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - SAMPLE CORE**

**LANDMARK TESTING & ENGINEERING**
525 N. 3850 E. 85, St. George, UT 84799

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 340 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation
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<th>DEPTH (Ft)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% FINES</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>DRILLING</th>
<th>BRINDLEY</th>
<th>R/S</th>
<th>SPT</th>
<th>N METER PER</th>
<th>INTERVAL</th>
<th>SAMPLE NR</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE DESCRIPTION</th>
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<td>NREC 88</td>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WT-9**

**LANDMARK TESTING & ENGINEERING**
525 N. 3050 E. 85, St. George, UT 84790

**FIELD DATE:** JUNE 19, 2007
**SURFACE ELEVATION:** 2853.85

**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.
<table>
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<th>DEPTH (FT)</th>
<th>LABORATORY RESULTS</th>
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</table>

**Description**

- **Sandstone**, reddish brown
- **Sandstone**
- **Sandstone**, no variation, no groundwater encountered, completes at 39'

**Field Date:** June 19, 2007

**Surface Elevation:**

**Key**

- Relatively undisturbed sample obtained with 2.25 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 - WT-9**

**Landmark Testing & Engineering**
525 N. 3050 E. #3, St. George, UT 84790
**ST. GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - WT-10**

**LANDMARK TESTING & ENGINEERING**  
525 N. 3890 E., St. George, UT 84790

<table>
<thead>
<tr>
<th>DEPTH (Ft)</th>
<th>MOISTURE CONTENT (%)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>%GRAY</th>
<th>%SAND</th>
<th>%SILT</th>
<th>Silt Floc.</th>
<th>PLASTICITY INDEX</th>
<th>LIQUID LIMIT (%)</th>
<th>SINTONIC COMPRESSION</th>
<th>NA/NC</th>
<th>MINUTES PER FEET</th>
<th>CORE INTERVAL (FT)</th>
<th>SAMPLER NUMBER</th>
<th>SAMPLE TYPE</th>
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</table>

**FIELD DATE:** AUG 16, 2007  
**SURFACE ELEVATION:** 2838

**SM:** Silty Sand (SM), brown, gravelly, loose, dry

**SANDSTONE:** stratified, thinly bedded, grades moderately hard, weathered joints

grades flinty, minor cracking of bore hole

occasional vertical fractures, weathered on fractures

grades slightly flinty, grey, dry

COMPLETE @ 19' no groundwater encountered.

**KEY**
- Relatively undisturbed sample contained with 3.25 inch C.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 - WT-11 Location in sandstone rock.

PHOTO - WT-12 Location in sandstone rock.
| DEPTH (Ft) | MOISTURE CONTENT | UND. LIMIT | % GRAVEL | % SAND | % FINE | LOOSED LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | RECOVERY AND ROC | RECOVERY & FOOT | SAMPLE NUMBER | SAMPLE TYPE | LITHOLOGY | SOIL |
|-----------|------------------|------------|----------|--------|--------|--------------|---------------|------------------|-----------------|----------------|--------------|-------------|-------------|-----------|---------|
| 0         | PROPOSED FINISHED GRADE | FILL AT 25 | 8.42     |        |        |              |               |                  |                 |                |              |             |            | SM       |
| 1         | R/C % | 33 | RQD% | 12 | 1 | 0' | 0' | SM | SILTY GRAVEL (SM), brown, dry, sandstone boulders on surface- DRIED DURING @ 0' | |
| 5         | 5.600 | 7 | 6 | 9 | 11 | 9'-14' | 9'-14' | SEDIMENT | SANDSTONES, mottled, fractured, moderately soft | grade: mottled, laud | |
| 10        | 10.600 | 4 | 4 | 4 | 4 | 4 | 4 | | fractures from 10' to 11', thinly banded, breaks along bedding plane partings | grade: slightly to moderately weathered, slight clay infilling of joints | COMPLETE @ 14' | no groundwater encountered | |
| 15        |                    |           |          |        |        |              |               |                  |                 |                |              |             |           |         |
| 20        |                    |           |          |        |        |              |               |                  |                 |                |              |             |           |         |
| 25        |                    |           |          |        |        |              |               |                  |                 |                |              |             |           |         |

**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WT-13**

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with 1-40 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Boring attempt with no recovery.
- Ground-water depth at time of excavation

**LANDMARK TESTING & ENGINEERING**
525 N. 3600 E. B, St. George, UT 84790
<table>
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<th>DEPTH (FT)</th>
<th>MOISTURE CONCENTRATION</th>
<th>UNDULOSITY</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% Silt</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>NATURAL DENSITY AT 10%</th>
<th>RECOVERY AND CUT</th>
<th>BLOW N W/P</th>
<th>CORE INTERVAL (FT)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLING TYPE</th>
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - RW-1**

**LANDMARK TESTING & ENGINEERING**  
525 N. 36TH E. 83, St. George, UT 84790

**FIELD DATE: JUNE 21, 2007**  
SURFACE ELEVATION: 2874.72

**DESCRIPTION**

- **PROPOSED FINISHED GRADE / FILL AT 2883.30**
- **SM**
  - SILTY SAND (SM) brown, dry with gravel.
  - SILTY SAND (SM), brown, dry with gravel, dense
  - Gravel, white gravel,
  - 9.0 to 10.5% grades more sandy
  - SILTY GRAVEL WITH SAND (GM), brown, slightly roact, dense, COMPLITE @ 10% no groundwater encountered

**KEY**

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core bitting
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>ELASTICITY INDEX</th>
<th>RECOVERY</th>
<th>BLOWN PER FOOT</th>
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<th>LOGO NO.</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW-2**

**LANDMARK TESTING & ENGINEERING**
525 N. 3050 E. 93, St. George, UT 84798

**FIELD DATE:** JUNE 21, 2007
**SURFACE ELEVATION:** 2876.88
**DESCRIPTION**

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**KEY**
- Relatively undisturbed sample obtained with a 3/8 inch OD 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

---

**PAGE 1 OF 1**
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>% GRANULAR</th>
<th>% SAND</th>
<th>% CLAYS</th>
<th>% SILTS</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>% SWELL AT 1% RSF</th>
<th>BLOW N/S</th>
<th>INTERVAL (FT)</th>
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-3

LANDMARK TESTING & ENGINEERING
535 N. 8050 E., R1, St. George, UT 84790

FIELD DATE: JUNE 21, 2007
SURFACE ELEVATION: 2875.70

Page 1 of 1
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<th>% Sand</th>
<th>% Silt</th>
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<th>Plastic Limit</th>
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<th>Recovery %</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW-6**

**LANDMARK TESTING & ENGINEERING**
525 N. 1050 E. 83, St. George, UT 84790

**FIELD DATE:** JUNE 20, 2007
**SURFACE ELEVATION:** 2867.63
**DESCRIPTION**

- **Silty Sand (SM), light brown, dry, with gravel variation from small to large, cobbles**
- **Silty Sand (SM), brown, dry, very low cementation, little gravel**
- **Gardes purple**
- **No ream, very dense**
- **Gardes from 14" to 16" lighter purple white**
- **Lean Clay (CL) Claystone, white, slightly erosive, traces of sand**
- **Lean Clay (CL) Claystone, grey, hard, traces of amiantite interbeds + gypsum, slightly moist**
- **Gardes, yellow clay**
- **Gardes, grey clay**
- **Gardes purple, Lean Clay (CL) Claystone, purple, hard**
- **Complete @ 33' no groundwater**

- **Relatively undisturbed sample obtained with 3' 26 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.**
- **Core Drilling**
- **Disturbed sample**
- **Surfacing attempt with no recovery.**
- **Groundwater depth at time of excavation**

PAGE 1 of 1
**LABORATORY RESULTS**

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<th>PORE WATER %</th>
<th>GRAVITY %</th>
<th>LIQUID LIMIT</th>
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<th>SHRINK</th>
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**ST GEORGE REPLACEMENT AIRPORT**

Landmark Project # 07330

**BORING LOG - RW-7**

**LANDMARK TESTING & ENGINEERING**

525 N. 3650 E. 85, St. George, UT 84790

**FIELD DATE:** JUNE 26, 2007

**SURFACE ELEVATION:** 2843.80

**DESCRIPTION**

- **PROPOSED FINISHED GRADES / FILL AT 2852.28**
- **SM**
- **SILTY SAND (SM), light brown, dry, with loose gravel**
- **SM**
- **SILTY SAND (SM), light brown sand, dry**
- **SC**
- **CLAYEY SAND (SC), grades brown + white, slightly moist, minor cementation**
- **CL**
- **LEAN CLAY (CL), CLAYSTONE, white and purple, slight moisture, hard**
- **CL**
- **LEAN CLAY (CL) CLAYSTONE, white, very little moisture, hard**
- **CL**
- **LEAN CLAY (CL) MUDSTONE, purple with white variations**
- **CL**
- **COMPLETE @ 19' 10" no groundwater encountered**

**KEY**

- □ Relatively undisturbed sample obtained with 0.20-Inch O.D. sampler driven with 1-1/4 pound hammer falling 30 inches.
- ● Disturbed sample
- ○ Stamping attempt with no recovery.
- △ Groundwater depth at time of excavation
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<th>PLASTIC LIMIT</th>
<th>ELASTICITY INDEX</th>
<th>% SWELL AT 0 % VFS</th>
<th>% RECOVERY AND ROD</th>
<th>MONITORS PER FOOT (CORDO)</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW-8**

**LANDMARK TESTING & ENGINEERING**
525 N. 3800 E. B3, St. George, UT 84790

**FIELD DATE:** JUNE 20, 2007

**SURFACE ELEVATION:** 2837.56

**DESCRIPTION:**
| Depth (ft) | Moisture Content (%) | Unit Weight (pcf) | % Gravel | % Sand | % Silt | Plastic Limit (%) | Liquid Limit (%) | Plastic Index | Swell at 8% Moist. | Core / Sample | Interval (ft) | Survey Type | Sample Number | Sample Type | Lithology | Description |
|-----------|----------------------|-------------------|----------|--------|--------|-------------------|-----------------|---------------|-------------------|--------------|---------------|-------------|---------------|--------------|-------------|------------|------------|
| 0         |                      |                   |          |        |        |                   |                 |               |                   |              |               |             |               |              |            |            |
| 2.8       | 100                  | 7                 | 35       | 38     |        |                   |                 |               |                   |              |               |             |               |              |            |            |
| 4.5       | 100                  | 7                 | 35       | 38     |        |                   |                 |               |                   |              |               |             |               |              |            |            |
| 10        | 33                   | 17                | 16       |        |        |                   |                 |               |                   |              |               |             |               |              |            |            |
| 15        | 10                   | 10                |          |        |        |                   |                 |               |                   |              |               |             |               |              |            |            |
| 20        |                      |                   |          |        |        |                   |                 |               |                   |              |               |             |               |              |            |            |
| 25        |                      |                   |          |        |        |                   |                 |               |                   |              |               |             |               |              |            |            |

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW-9**

**LANDMARK TESTING & ENGINEERING**
535 N. 3650 E. 82, St. George, UT 84790

**FIELD DATE:** June 27, 2007
**SURFACE ELEVATION:** 2829.59

**DESCRIPTION:**
- SILTY SAND (SM), tan, dry
- SILTY SAND (SM), brown, dry, weakly cemented
- LEAN CLAY (CL) MUDSTONE, purple, medium stiff, laminated, fissured, grades very hard
- grades white
- grades whiter
- grades white + tan
- LEAN CLAY (CL) MUDSTONE, grades tan
- COMPLETE @ 14'

**KEY:**
- Relatively undisturbed sample obtained with 3.28 inch D.3. 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

**PAGE 1 of 1**
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW - 10

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW - 10

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

FIELD DATE: JUNE 27, 2007
SURFACE ELEVATION: 2852.00

KEY
- Relatively undisturbed sample obtained with 0.25 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

PAGE 1 OF 2
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<th>% FINE</th>
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<th>PLASTIC LIMIT</th>
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<th>% RECOVERY</th>
<th>% ROD</th>
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FIELD DATE: JUNE 27, 2007  
SURFACE ELEVATION:  
DESCRIPTION  
SANDSTONE, hard  
SANDSTONE, hard  
SANDSTONE, hard  
No variations encountered  
COMPLETED AT 39'  

ST GEORGE REPLACEMENT AIRPORT  
Landmark Project # 07330  
BORING LOG - RW-10  

KEY  
- Relatively undisturbed sample obtained with  
  3.25 inch G.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
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<th>LAB TRAVEL</th>
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**LABORATORY RESULTS**

**SAMPLE DATA**

**RW-11**

**FIELD DATE:** JUNE 27, 2007

**SURFACE ELEVATION:** 2857.43

**DESCRIPTION**

- SANDSTONE, moderately weathered sandstone, brown, dry grades hard
- 1.5 to 2.5' SANDSTONE, tan color, weathered, fractured, hard
- SANDSTONE, hard
- 16 to 17' small layer of shale
- SANDSTONE, hard
- SANDSTONE, fractured, hard
- SANDSTONE, hard

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW - 11**

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

**KEY**
- ☐ Rotatively 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
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<th>Depth (ft)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Fines</th>
<th>Liquidity Limit</th>
<th>Plasticity Index</th>
<th>% Swell at 70°F</th>
<th>% Recovery</th>
<th>Maximum scour depth (ft)</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW-11**

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 100 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 - RW - 12

LANDMARK TESTING & ENGINEERING
525 N. 3650 E. 83, St. George, UT 84790
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - RW - 12**

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

**FIELD DATE:** JUNE 26, 2007  
**SURFACE ELEVATION:**  
**DESCRIPTION:**

- **SANDSTONE BEDROCK,** moderately weathered, dry, dark purple,
- **SANDSTONE,** yellow, dry, hard, moderately fractured
- **MUDSTONE,** yellow, dry, cemented, hard
- **SANDSTONE BEDROCK,** hard, slightly fractured
- **MUDSTONE,** gray, moderately hard grades, sandstone, yellow, hard

**COMPLETE AT 42'**

**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.
### LABORATORY RESULTS

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### SAMPLE DATA

- **Sample Number:** 1
- **Sample Type:** SM
- **Lithology:** SILTY SAND (SM), brown, sandstone
- **Surface Elevation:** 2819
- **Description:**
  - Silty sand (SM), brown, sandstone
  - Slightly weathered, gypsum infilling of joints, moderately fractured, dry
  - Grades intensely fractured, slightly weathered
  - occasional gypsum infilling to 1/4" on joints
  - Grades hard, slightly fractured
  - COMPLETE to 13'
  - No groundwater encountered

### KEY
- Relatively undisturbed sample obtained with a 3.25 inch O.D. sampler driven with a 1-40 pound hammer falling 50 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery
- Groundwater depth at time of excavation

---

**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 67330

**BORING LOG - RW-14**

**LANDMARK TESTING & ENGINEERING**
525 N. 9000 E. 83, St. George, UT 84790
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<th>% Clay</th>
<th>% Fine Gravel</th>
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<th>SPT N</th>
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<th>Min. PC</th>
<th>Penetration Rate (in/min)</th>
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<td>grades gray with brownish streaks, dry, slightly weathered</td>
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ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - RW-15

LANDMARK TESTING & ENGINEERING
525 N. 3000 E. 83, St. George, UT 84790

KEY:
- Relatively undisturbed sample obtained with 1-3/8 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

FIELD DATE: AUG 20, 2007
SURFACE ELEVATION: 2795
DESCRIPTION

SANDSTONE, weathered thinly to thickly bedded, featureless, dry
grades slightly weathered, less weathered, moderately hard to hard
grades gray with brownish streaks, dry, slightly weathered
COMPLETE at 14'
no groundwater encountered
**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - RW-16**

**LANDMARK TESTING & ENGINEERING**
525 N. 3600 E., #, St. George, UT 84790

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<th>CORE INTERVAL (Ft)</th>
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<td>COMPLETE @ 14'</td>
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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
<table>
<thead>
<tr>
<th>BORING LOG - E-2</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - E-2**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Moisture Content</th>
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<th>% Gravel</th>
<th>% Sand</th>
<th>% Fines</th>
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<th>Plastic Limit</th>
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**FIELD DATE:** JUNE 21, 2007

**SURFACE ELEVATION:** 2867.91

**DESCRIPTION**

- **PROPOSED FINISHED GRADE / FILL AT 2872.92**

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<thead>
<tr>
<th>Layer</th>
<th>Description</th>
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<tr>
<td>3</td>
<td>SILTY SAND (SM), brown, dry</td>
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<tr>
<td>5</td>
<td>SILTY SAND WITH GRAVEL (SM), brown, dry, dense</td>
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<tr>
<td>3.3</td>
<td>SILTY GRAVEL (SM) dense, dry</td>
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<tr>
<td>0.1</td>
<td>POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM) white, dry, very dense, caliche cemented, grays reddish white</td>
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<tr>
<td>10</td>
<td>SILTY GRAVEL (SM), brown, dry</td>
</tr>
<tr>
<td>15</td>
<td>SILTY SAND (SM) brown + maroon, dry, no return, COMPLETE @ 18’ no groundwater</td>
</tr>
</tbody>
</table>

**KEY**

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

| Depth (ft) | Moisture Content | Unit Weight (pcf) | % Clay | % Sand | % Silt | Liquid Limit | Plastic Limit | Soil Type | Neck | % Plastic | % Shrinkage | Shrinkage % | Moisture % |Edit  |
|------------|------------------|-------------------|--------|--------|--------|--------------|---------------|-----------|------|------------|-------------|-------------|------------|--------|-------|
| 0          |                  |                   |        |        |        |              |               |           |      |            |             |             |            |        |       |

#### SAMPLE DATA

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<th>Sample Type</th>
<th>Lithology</th>
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<tr>
<td>20/5'</td>
<td>1</td>
<td>SM</td>
<td>SILTY SAND (SM) brown, dry, gravel</td>
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<tr>
<td>20/5'</td>
<td>2</td>
<td>SM</td>
<td>SILTY SAND WITH GRAVEL (SM-GM), white, dry, calcite cemented</td>
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<tr>
<td>30/6'</td>
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<td>SC</td>
<td>SILTY SAND WITH GRAVEL (SM), reddish brown, moist, dark, light calcite cementation</td>
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<td>50/2'</td>
<td>4</td>
<td>CL</td>
<td>CLAYEY SAND (SC), red and maroon w/ white variations, moist, very dense</td>
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<tr>
<td>50/2'</td>
<td>5</td>
<td></td>
<td>LEAN CLAY (CL) MUDSTONE, grey, dry, hard</td>
</tr>
</tbody>
</table>

#### ET-3

- **FIELD DATE:** JUNE 22, 2007
- **SURFACE ELEVATION:** 2870.05
- **DESCRIPTION:**
  - SILTY SAND (SM) brown, dry, gravel
  - SANDSTONE BEDROCK
  - LEAN CLAY (CL) MUDSTONE, grey, dry, hard
  - LEAN CLAY (CL) MUDSTONE, grey, dry, hard
  - LEAN CLAY (CL) MUDSTONE, grey, dry, hard

---

**ST GEORGE REPLACEMENT AIRPORT**

Landmark Project # 07330

**BORING LOG - ET-3**

**LANDMARK TESTING & ENGINEERING**

533 N. 2090 E. R3, St. George, UT 84790

---

**KEY**

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with 140 pound hammer falling 30 inches.
- Coring Drilling
- Undisturbed samples
- Sampling attempted with no recovery.
- Groundwater depth at time of excavation
| Depth (ft) | Sample | MOISTURE CONTENT | HYDRAULIC CONDUCTIVITY | % GRAVEL | % SAND | % FINES | LIQUID LIMIT | PLASTIC LIMIT | RECOVERY FOOT | REMOVAL AT 40 | BLANKER | BLANKER | BLANKER | BOREhole LOCATION |
|-----------|--------|------------------|------------------------|----------|--------|---------|--------------|---------------|--------------|---------------|-----------|-----------|-----------|-----------|-------------------|
| 0         |        |                  |                        |          |        |         |              |               |              |             |           |           |           | SM                  |
| 1         |        | 4                | 70                     | 26        |        |         |              |               | 66           |             |           |           |           | SILTY SAND (SM), reddish brown, dry, with gravel. |
| 4.1       |        | 95.4             | 7.5                    | 49        |        |         |              |               | 62           |             |           |           |           | SILTY SAND (SM), brown, dry, dense, very fine sand. |
| 8.8       |        | 32               | 53                     | 15        |        |         |              |               | 50/50        |             |           |           |           | SILTY SAND WITH GRAVEL (SM-GM), reddish brown, mold, weak consolidation, dense. |
| 15        |        |                  |                        |          |        |         |              |               | 50/50        |             |           |           |           | SILTY SAND WITH GRAVEL (SM-GM), red/brown, dry, slightly more consolidation, dense. |
| 20        |        |                  |                        |          |        |         |              |               |              |             |           |           |           | grades reddish brown. |
| 25        | Broan Coring @ 25' |                  |                        |          |        |         |              |               |              |             |           |           |           | grades purple. |

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - ET-4**

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with 1140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation.
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT (%)</th>
<th>WEIGHT DENSITY (pcf)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>ELASTIC MODULUS</th>
<th>RECOVERY</th>
<th>CORE INTERVAL (FT)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - ET-4**

**LANDMARK TESTING & ENGINEERING**  
325 W. 300 E. 88, St. George, UT 84790

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 1-1/2 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

**FIELD DATE:** JUNE 22, 2007  
**SURFACE ELEVATION:** DESCRIPTION

- SANDSTONES, continue coring
- SANDSTONE, grey, dry, hard
- LEAN CLAY (CL) MUDSTONE, brown, moist, consolidated. COMPLETE @ 33.5', no groundwater encountered
### Laboratory Results

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content</th>
<th>Unit Weight</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Fines</th>
<th>Plastic Limit</th>
<th>Liquid Limit</th>
<th>% Swell at 1%</th>
<th>% Recovery and Loss</th>
<th>Blows per Foot</th>
<th>Core Interval (ft)</th>
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**Field Date:** June 23, 2007

**Surface Elevation:** 2863.75

**Description:**
- Silty sand (SM), brown, dry, with gravel
- Silty sand (SM), brown + white, dry, minor gravel, moist dense, weak cohesion
- Silty sand (SM), reddish brown, moist, dense, grades cemented
- Lean clay (CL) claystone, grey, in situ, heaved
- Lean clay (CL) claystone, grey, moist, heaved
- Lean clay (CL) mudstone, grey, slightly moist, heaved
- Lean clay (CL) claystone, grey, slightly moist, heaved
- Lean clay (CL) claystone, maroon, slightly moist, heaved, complete @ 32' no groundwater

---

**St George Replacement Airport**

Landmark Project # 07330

**Boring Log - ET-5**

**Landmark Testing & Engineering**

525 N. 3800 E., R3, St. George, UT 84790

- Relatively undisturbed sample obtained with 9.25 inch O.D. sampler driven with a 140 pound hammer falling 90 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery
- Groundwater depth at time of excavation
<table>
<thead>
<tr>
<th>LABORATORY RESULTS</th>
<th>SAMPLE DATA</th>
<th>ET-6</th>
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<td>DEPTH (ft)</td>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07336

**BORING LOG ET-6**

**LANDMARK TESTING & ENGINEERING**
225 N. 39TH E. 81, 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 boring
- Complete sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

**FIELD DATE:**
JUNE 25, 2007

**SURFACE ELEVATION:** 2372.08

**DESCRIPTION**
### LABORATORY RESULTS

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<th>DEPTH (FT)</th>
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<th>UNIT WEIGHT</th>
<th>% GRAVEL</th>
<th>% SAND</th>
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<th>ELASTIC LIMIT</th>
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### SAMPLE DATA

- **FIELD DATE:** JUNE 25, 2007
- **SURFACE ELEVATION:** 2872.08

**ET-6**

- **DESCRIPTION:**
  - **FAT CLAY (CH) CLAYSTONE**, grey, dry, moderately hard, gypsiferous interbeds
  - **FAT CLAY (CH) CLAYSTONE**, grey, dry, moderately hard, contains gyspum
  - **FAT CLAY (CH) CLAYSTONE**, purple-grey, dry, moderately hard, contains traces of gypsum
  - COMPLETE at 46' no groundwater

### KEY
- □ Relatively undisturbed sample obtained with 3.5" O.D. sampler driven with a 140 pound hammer falling 30 inches.
- □ Core Drilling
- □ Disturbed sample
- ○ Sampling attempt with no recovery.
- □ Groundwater depth at line of excavation

---

**ST GEORGE REPLACEMENT AIRPORT**

Landmark Project # 07330

**BORING LOG ET-6**

**LANDMARK TESTING & ENGINEERING**

325 N. 1000 E, Eureka, UT 84730

---

PAGE 2 OF 2
**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG ET-7**

**LANDMARK TESTING & ENGINEERING**  
525 N. 3850 W. 83, St. George, UT 84790

<table>
<thead>
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<th>UNIT WEIGHT (pcf)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% Silt</th>
<th>LIQUID LIMIT</th>
<th>ELASTICITY LIMIT</th>
<th>% SWELL AT 1%</th>
<th>% RECOVERY AND RECOVERY RATE</th>
<th>BORE</th>
<th>EXTERNAL FT</th>
<th>TOTAL FT</th>
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</table>

**FIELD DATA:**  
**SURFACE ELEVATION:** 2832.71

**DESCRIPTION**  
- **SILTY SAND (SM)**: Light brown, dry, light gravel,
- **SILT WITH SAND (ML-5M)**: Brown, slight moisture, weakly cemented fine sand, gradea purple - brown
- **LEAN CLAY (CL)**: MUDSTONE, dark brown, moist, hard
- **LEAN CLAY (CL)**: MUDSTONE, dark brown, moist, hard

**KEY**  
- Relatively undisturbed sample obtained with 8.25 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**
## Laboratory Results

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<tr>
<th>Depth (ft)</th>
<th>Proposed Finished Grade / Fill at 2899.32</th>
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<td>50'5&quot;</td>
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## Sample Data

- **Sample Number**: SM
- **Lithology**: SILTY SAND (SM)
- **Description**: Brown, dry, with gravel
- **Field Date**: JUNE 25, 2007
- **Surface Elevation**: 2827.41
- **Notes**: No return at 7', sample taken from auger (SM) brown, dry, grades, grey

**St George Replacement Airport**

Landmark Project # 07330

**Boring Log - ET - 8**

**Landmark Testing & Engineering**

525 N. 2050 E. #3, St. George, UT 84790

**Key**

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer listing 30 inches.
- Cored Drilling
- Disturbed sample
- Sampling attempt with no recovery
- Groundwater depth at time of excavation
| Depth (ft) | Moisture Content | Unit Weight (pcf) | % Gravel | % Sand | % Fine | Liquid Limit | Plasticity Index |_regression coefficient | Sample Number | Sample Type | Lithology | Description |
|-----------|------------------|-------------------|----------|--------|--------|--------------|-----------------|--------------------|----------------|--------------|-----------|------------|-------------|
| 2         | 0                | 11                | 89       |        |        |              |                 | SM                 | 61             | CL-ML       | CL        | SILTY SAND (SM) brown, dry with gravel |
| 5         |                  |                   |          |        |        |              |                 | CL                 | 500'²         |            |            | SILTY CLAY (CL-ML) brown, dry, hard no cementation, grades purple |
| 10        |                  |                   | 33       | 18     | 15     |              |                 | CL                 | 990'²       |            |            | grades grey / maroon, LEAN CLAY (CL) MUDSTONE, grey + yellow + maroon, moist, low cementation, soft |
| 15        |                  |                   |          |        |        |              |                 |                     |                |            |            | 10' to 11.5' grades slight yellow |
| 20        |                  |                   |          |        |        |              |                 |                     |                |            |            | LEAN CLAY (CL) MUDSTONE, very yellow with slight grey and maroon, dry, hard |
| 25        |                  |                   |          |        |        |              |                 |                     |                |            |            | COMPLETE AT 13' sc groundwater, |

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - ET-9**

**LANDMARK TESTING & ENGINEERING**
525 N. 3100 E. 93, St. George, UT 84790

**KEY**
- $\mathbb{I}$: Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- $\mathbb{D}$: Core Drilling
- $\mathbb{X}$: Disturbed sample
- $\mathbb{O}$: Sampling attempt with no recovery.
- $\mathbb{V}$: Groundwater depth at time of excavation.
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<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (G/CY)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% Silt</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>RAPID INDEX</th>
<th>CONS</th>
<th>FROZEN FLEX POINT</th>
<th>CONS</th>
<th>Sampler Type</th>
<th>Lithology</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - ET-10**

**LANDMARK TESTING & ENGINEERING**
525 N. 3000 E., St. George, UT 84790

**KEY**
- Relatively undisturbed sample obtained with 3.20 inch O.D. sampler driven with 140 pound hammer hitting 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

**FIELD DATE:** JUNE 25, 2007
**SURFACE ELEVATION:** 2814.64
**DESCRIPTION**
- SILTY SAND (SM-GM) brown, dry, with gravel
- SILTY SAND WITH GRAVEL (SM-GR-4) brown, moist, with gravel, medium dense
- SILTY SAND (SM) brown, moist, minor gravel, dense, slightly cemented.
- Sandstone bedrock
- SANDSTONE BEDROCK
- SANDSTONE, tan, dry, hard.
- COMPLETE @ 9' no groundwater

[Signature]

Page 1 of 1
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT (%)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% Silt</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>H坚solid</th>
<th>ABRASION RESISTANCE</th>
<th>% RECOVERY</th>
<th>MINUTES PER FOOTH</th>
<th>CORE INTERVAL (FT)</th>
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<th>SAMPLE TYPE</th>
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<td>SM</td>
<td>SILTY SAND (SM), brown, with weathered sandstone cobbles, dry.</td>
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<td></td>
<td></td>
<td>SANDSTONE, moderately hard, slightly weathered</td>
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<td>occasional healed vertical joints, gypsum infilling grayer hard, fresh</td>
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**ST. GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - ET-11**

**LANDMARK TESTING & ENGINEERING**  
525 N. 3000 E. #3, St. George, UT 84790

**FIELD DATE:** AUG 16, 2007  
**SURFACE ELEVATION:** 2814

**KEY**
- ![Relatively undisturbed sample obtained with 8.25 inch O.D. sampler driven with a 140 pound hammer falling 50 inches.](image)
- ![Core Drilling](image)
- ![Disturbed sample](image)
- ![Sampling attempt with no recovery](image)
- ![Groundwater depth at time of excavation](image)
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Laboratory Results</th>
<th>Sample Data</th>
<th>ET-12</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - ET-12**

**LANDMARK TESTING & ENGINEERING**
525 N. 3450 E. #3, St. George, UT 84790

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven 90 inches.
- 140 pound hammer falling 90 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery
- Groundwater depth at time of excavation

**FIELD DATE:** AUG 16, 2007
**SURFACE ELEVATION:** 2807
**DESCRIPTION**
- Silt clay (SM), brown with weathered sandstone fragments, dry
- Sandstone, fractured, moderately hard
- Grades slightly weathered, fractured from 4'-9' to 9'-0'
- Grades gray, hard
- Silty sandstone, at 11', gray, weathered on joint surfaces
- Grades yellow, gray
- COMPLETE @ 14' no groundwater encountered
<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>LITHOLOGY</th>
<th>USCS</th>
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**KEY**
- Core Drilling
- Diamond Core
- Groundwater depth at the time of boring
- Surface Date: Aug 16, 2007
- Description: 295

**ST. GEORGE REPLACEMENT AIRPORT**

**BORE HOLE RECONSTRUCTION**

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (PSF)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% FINE</th>
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**LABORATORY RESULTS**

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<th>% SWELL AT 60 MINUTES</th>
<th>% RECOVERY RQD</th>
<th>MINUTES PER FOOT</th>
<th>CORE INTERVAL (FT)</th>
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<tbody>
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</tbody>
</table>

**FIELD DATA**

- TOTAL DRY STACK MATERIAL
- COATINGS AND DETRITAL MATERIAL
- PORE VOLUME
- MOISTURE CONTENT
- UNIT WEIGHT
- % GRAVEL
- % SAND
- % FINE
## Laboratory Results

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content (LOI)</th>
<th>Unit Weight (psf)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Fine</th>
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<th>Liquid Limit</th>
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<th>Soil Type</th>
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<th>Sample Type</th>
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</table>

## Sample Data

**ET-14**

**Field Date:** AUG 20, 2007

**Surface Elevation:** 2820

**Description:**

- **Proposed Finished Grade:** 2817.08

- **Blows (per Foot):**
  - 0 ft: 3
  - 5 ft: 1
  - 10 ft: 6
  - 15 ft: 16
  - 20 ft: 10
  - 25 ft: 15

- **Remarks:**
  - **Silty Sand:** Brown, gravelly, loose, moist.
  - **Silty Gravel:** Numerous silty zones, very poor recovery.
  - **Sandy-gravelly:** Slightly weathered, tan, dry.
  - **Claystone:** Brown, fractured, moderately soft, dry.
  - **Complete:** 22 ft; no groundwater encountered.

**Key:**

- **Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 80 inches.**
- **Core Dulling:**
- **Disturbed sample:**
- **Sampling attempt with no recovery:**
- **Groundwater depth at end of excavation:**
<table>
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<th>DEPTH (FT)</th>
<th>LABORATORY RESULTS</th>
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<th>DESCRIPTION</th>
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<tr>
<td>0</td>
<td>PROPOSED FINISHED GRADE / FILL AT 2872.59</td>
<td>SM</td>
<td>SILT SAND (SM), brown, dry, no recovery</td>
</tr>
<tr>
<td>5</td>
<td>5/8&quot;</td>
<td>SM-ML</td>
<td>poor recovery SILT SAND (SM-ML) caliche, light brown, dense</td>
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<tr>
<td>10</td>
<td>9/11&quot;</td>
<td></td>
<td>no recovery, COMPLETE TO 10' no groundwater</td>
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</tbody>
</table>

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-1

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

LANDMARK TESTING & ENGINEERING
535 N. 3050 E. IU, St. George, UT 84790

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2861.45
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<th>UNIT WEIGHT (pcf)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>&amp; FIBERS</th>
<th>LIQUID LIMIT</th>
<th>PLASTICITY INDEX</th>
<th>% SWELL AT 60</th>
<th>% RECOVERY AND RND</th>
<th>BLOW RECOVERY PER FOOT</th>
<th>CORE INTERVAL (ft)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE LOG</th>
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<td>SILTY SAND (SM), reddish brown</td>
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<td>37</td>
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<td>9</td>
<td>50 / 5^o</td>
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<td>SC</td>
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<td>cemented, gravelly, calcite, dense very little recovery</td>
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<td>50 / 4^o</td>
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<td>SC-SM</td>
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<td>CLAYEY SAND WITH GRAVEL (SC) cemented, dry</td>
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<td></td>
<td></td>
<td></td>
<td>50 / 4^o</td>
<td></td>
<td>SM</td>
<td></td>
<td>SILTY / CLAYEY SAND (SC-SM) grades darker, more cemented, occasional pinholes, dry</td>
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<td></td>
<td>SILTY SAND (SM) WITH GRAVEL reddish brown, slightly cemented, dense, COMPLETE at 15' No groundwater encountered</td>
</tr>
</tbody>
</table>

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project #: 07330

**BORING LOG - A-2**

**LANDMARK TESTING & ENGINEERING**
525 N. 3089 E. #81, St. George, UT 84790
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-3

Boring Log Description:
- Silty sand (SM), reddish brown, dry
- CLAYEY SAND (SC-SCM), reddish brown, cemented, minor phillips, gravelly
- CLAYEY SAND (SC), reddish brown, slightly cemented, dry
- LEAN CLAY (CL) CLAYSTONE, purple, slightly moist, stiff, hard
- COMPLETE to 20' no groundwater

KEY:
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 50 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery
- Groundwater depth at time of excavation

LANDMARK TESTING & ENGINEERING
525 N. 3050 E. #5, St. George, UT 84790

PAGE 1 of 1
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - A-4**

**LANDMARK TESTING & ENGINEERING**  
525 N. 3950 E. 85, St. George, UT 84790

**FIELD DATE:** JUNE 25, 2007  
**SURFACE ELEVATION:** 2870.90  
**DESCRIPTION**

- CLAYEY SANDS (SC-SM), gravelly, dense
- POORLY-GRACED GRAVEL WITH SILT AND SAND (GP-GM) reddish brown, fine gravel
- Grades hard
- SILTSTONE / MUDSTONE, small amount of gypsum, purple, hard, silty
- SILTSTONE / MUDSTONE, grades. with more sand, dark grey to purple, hard, silty
- No recovery, hard

**KEY**  
- Relatively undisturbed sample obtained with 3.26 inch O.D. sampler driven with 1.140 pound hammer falling 30 inches.  
- Core Drilling  
- Disturbed sample  
- Sampling attempt with no recovery.  
- Groundwater depth at time of excavation
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<th>% SAND</th>
<th>% FINE</th>
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<th>ELONGATION</th>
<th>% SWEAT AT 60°F</th>
<th>% RECOVERY</th>
<th>FLUIDS PER FOOT</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - A-4**

**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

**FIELD DATE:** JUNE 25, 2007
**SURFACE ELEVATION:**
**DESCRIPTION:**
- SILTSTONE/ MUDSTONE, hard
- SILTSTONE/ MUDSTONE, reddish brown - purple, hard
- no recovery, very dense
- no recovery, very dense
- COMPLETE to 40.0'
- no groundwater
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project #: 07330

**BORING LOG - A-5**

**LANDMARK TESTING & ENGINEERING**  
325 N. 3650 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
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-6

KEY
- Relatively undisturbed sample obtained with 3.26 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.
- Coring Drilling
- Disturbed sample
- Damping attempt with no recovery.
- Groundwater depth at time of excavation

FIELD DATE: JUNE 25, 2007
SURFACE ELEVATION: 2828.98

DESCRIPTIVE
- SILTY SAND (SM), reddish brown, dry, with gypsum
- SILTY CLAYEY SAND (SC-SM), medium dense, dry
- LEAN CLAY (CL) MUDSTONE, silty pockets, dark red, dry
- LEAN CLAY (CL) MUDSTONE, some gypsum crystals, slightly moist COMPLETE at 10' no groundwater encountered

LANDMARK TESTING & ENGINEERING
525 N. 300 E, #3, St. George, UT 84790
## BORING LOG - A-7

**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

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**FIELD DATE:** JUNE 25, 2007  
**SURFACE ELEVATION:** 2817.72  
**DESCRIPTION**

- SC-0M: SILT CLAYEY SAND (SC-SM), reddish brown, dry
- LEAN CLAY (CL) MUDSTONE, grey, hard
- COMPLETE @ 10': No groundwater encountered

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch C.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

**LANDMARK TESTING & ENGINEERING**  
525 N. 3050 E. Bld, St. George, UT 84790
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ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - A-8

LANDMARK TESTING & ENGINEERING
525 N. 3850 E. 83, St. George, UT 84799

KEY
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 1/4 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Stamping attempt with no recovery
- Groundwater depth at time of excavation
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<td>50 / 5&quot;</td>
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<td>Silty / Clayey Sand (SC-SM), Reddish brown, moderate cementation</td>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - LS-1**

**KEY**
- Relatively undisturbed sample obtained with 9.25 inch D.D. sampler driven with a 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at line of excavation
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Moisture Content</th>
<th>Unit Weight (pcf)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Clay</th>
<th>% Silt</th>
<th>Plasticity Index</th>
<th>UCS</th>
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**PROPOSED FINISHED GRADE / FILL AT 2866**

**ST GEORGE REPLACEMENT AIRPORT**

Landmark Project # 07330

**BORING LOG - LS-2**

**LANDMARK TESTING & ENGINEERING**

825 N. 3650 E., St. George, UT 84790

**KEY**

- Relative undisturbed sample obtained with 3.55 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

**FIELD DATE:** JUNE 26, 2007

**SURFACE ELEVATION:** 2861.78

**DESCRIPTION**

(SM), reddish brown, gravel at surface, loose
caliche, poor recovery,
grades, easier to drill
Silty sand with gravel (SM-MIL), occasional pisolitic, medium cemented, dry
Lean clay (CL); loose pisolites, hard, dry,
Sandy silty clay (CL-ML), reddish brown, dense
COMPLETE to 15'; no groundwater
| Depth (ft) | Moisture Content (%) | Unit Weight (pcf) | % Gravel | % Sand | % Fines | Liquid Limit | Plasticity Index | % Swell at 60 PSF | % Recovery and RQD | CORE INTERVAL (ft) | SAMPLE NUMBER | SAMPLE TYPE | FOOTAGE | USES CS | COLS CS | DESCRIPTION |
|-----------|----------------------|-------------------|----------|--------|---------|-------------|-----------------|--------------------|------------------|-------------------|----------------|-------------|-------------|---------|---------|---------|-------------|
| 0         |                      |                   |          |        |         |             |                 |                    |                  | SM               | C             | SM GM       |            |         |         | SILTY SAND (SM) brown |
| 5         |                      |                   |          |        |         |             |                 |                    |                  | SM               | C             | SM GM       |            |         |         | SILTY SAND TO SILTY GRAVEL (SM-GM), caliche, very dense, dry |
| 10        | 8.8                  | 33                | 50       | 17     |         | 40          | 50 / 3"         |                    |                  | SM               | C             | SM GM       |            |         |         | no recovery, caliche, very dense |
| 15        | 4.4                  | 14                | 62       | 24     |         | 40          | 50 / 3"         |                    |                  | SM               | C             | SM GM       |            |         |         | SILTY SAND WITH GRAVEL (SMa), reddish brown, cemented, slightly moist |
| 20        |                      |                   |          |        |         |             |                 |                    |                  | SM               | C             | SM GM       |            |         |         | SILTY SAND (SM) minor pinnacles, well cemented |
| 25        |                      |                   |          |        |         |             |                 |                    |                  | SM               | C             | SM GM       |            |         |         | COMPLETELY to 15.0' no groundwater |

ST GEORGE REPLACEMENT AIRPORT  
Landmark Project # 07330  

BORING LOG - LS-3  

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

FIELD DATE: JUNE 26, 2007  
SURFACE ELEVATION: 2850.05  
DESCRIPTION  

KEY  
- Relatively undisturbed sample obtained with 3.26 inch O.D. sampler driven with a 140 pound hammer falling 30 inches.  
- Core Drilling  
- Disturbed sample  
- Sampling attempt with no recovery.  
- Groundwater depth or time of excavation
| Depth (ft) | Moisture Content (%) | Unit Weight (pcf) | % Gravel | % Sand | Plasticity Index | Liquid Limit (LS) | Plasticity (PL) | % SWELL AT 40°F | BLOWNS PER FOOT | Core Interval (ft) | Sample Number | Sample Type | Meteorology | Metaphor | Description |
|-----------|----------------------|-------------------|----------|--------|-----------------|-----------------|-----------------|----------------|----------------|----------------|---------------|-------------|-------------|-------------|-----------|-------------|
| 0         | 1.4                  | 16                | 54       | 30     | 50 / 3º         | SM              | SM              | SM            | SM            | SM            | SM           | SM         | SM         | SM         | SM        | SILO SAND (SM), reddish brown, dry grades hard |
| 10        | 103                  | 4                 | 46       | 30     | 50 / 4º         | SM              | SM              | SM            | SM            | SM            | SM           | SM         | SM         | SM         | SM        | SILO SAND WITH GRAVEL, buff reddish brown, cahibe cemented |
| 15         | 100                   | 4                 | 46       | 30     | 50 / 5º         | SM              | SM              | SM            | SM            | SM            | SM           | SM         | SM         | SM         | SM        | no recovery, cuttings reddish brown |
| 20         | 34                   | 50 / 3º           | SM-SP    | SM-SP  | SM-SP           | SM-SP           | SM-SP           | SM-SP         | SM-SP         | SM-SP         | SM-SP        | SM-SP      | SM-SP      | SM-SP      | SM-SP     | SILO TO POORLY GRADED SAND (SM-SP), reddish brown, grades purple at end of sampler, COMPLETE to 20, no groundwater encountered |

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - LS-4**

**LANDMARK TESTING & ENGINEERING**
325 N. 3050 E. #8, 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

**FIELD DATE:** June 26, 2007
**SURFACE ELEVATION:** 2863.90
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<tr>
<th>Depth (ft)</th>
<th>Moisture Content</th>
<th>Unit Weight (pcf)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Pea Gravel</th>
<th>Liquid Limit</th>
<th>Plastic Limit</th>
<th>Elasticity</th>
<th>% Silt</th>
<th>% Clay</th>
<th>% Organic Mat</th>
<th>% Recovery</th>
<th>Recovery Method</th>
<th>Blows per Foot</th>
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<th>Sample Type</th>
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<td>SM, brown, dry, with gravel</td>
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<td>SILTY SAND WITH GRAVEL (SM), reddish brown/buff, cemented pebbles, dry</td>
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<td>LEAN CLAY (CL) CLAYSTONE, dark red/purple, dry, same sand, dry</td>
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<td>grades white, COMPLETE at 20' no groundwater encountered</td>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - LS-5**

**LANDMARK TESTING & ENGINEERING**
525 N. 3600 E. # 13, St. George, UT 84790

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 20 inches.
- Core Drilling
- Dilated sample
- Sampling attempt with no recovery.
- Groundwater depth at time of excavation

**FIELD DATE:** JUNE 26, 2007

**SURFACE ELEVATION:** 2858.60

**DESCRIPTION**
| DEPTH (FT) | MOISTURE CONTENT | UNIT WEIGHT (pcf) | % GRAVEL | % SAND | % FINE | LIQUID LIMIT | PLASTIC LIMIT | % SWELL AT 80°F | RECOVERY PER FOOT | SAMPLE NUMBER | SAMPLE TYPE | LITHOLOGY | USCS | DESCRIPTION |
|------------|------------------|-------------------|----------|--------|--------|--------------|---------------|-----------------|-----------------|---------------|-------------|------------|----------|----------|-------|-------------|
| 0          |                  |                   |          |        |        |              |               |                 |                 |               |             |           |          |        |               |
| 5          | 8.7              | 98.3              | 11       | 37     | 31     | 71           | 50 / 5"       |                 |                 |               |             |           |          |        | no recovery, calcic cemented |
| 10         |                  |                   |          |        |        |              |               |                 |                 |               |             |           |          |        |               |
| 15         | 50               | 27                | 23       | 50 / 4"|        |              |               |                 |                 |               |             |           | CH       |        | PAT CLAY (CH) CLAYSTONE, grey |
| 20         | 44               | 36.6              | 18       | 50 / 5"|        |              |               |                 |                 |               |             |           |          |        | grades purple               |
| 25         |                  |                   |          |        |        |              |               |                 |                 |               |             |           |          |        | (CL) CLAYSTONE, gray / purple, slightly moist. COMPLETE @ 20' no groundwater encountered |

ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - LS-6

KEY
- Relatively undisturbed sample obtained with 3.25 ton C.D. sampler driven with a 1 x 4 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery.
- Groundwater depth at area of excavation.

LANDMARK TESTING & ENGINEERING
525 N. 3950 E. 63, St. George, UT 84790

FIELD DATE: JUNE 26, 2007
SURFACE ELEVATION: 2860.51
DESCRIPTION
<table>
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<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (pce)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>% SWELL AT 60</th>
<th>BLOWS PER FOOT</th>
<th>F ORE INTERVAL (FT)</th>
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**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - LS-7**

**LANDMARK TESTING & ENGINEERING**
421 N. 3650 E. 88, St. George, UT 84790

**FIELD DATE:** JUNE 26, 2007
**SURFACE ELEVATION:** 2847.98

**SILTY SAND (SM), reddish brown, loose, dry**

**SILTY / CLAYEY SAND (SC - SM), cemented, coarse gravel, small pisolites, dry**

**LEAN CLAY (CL), MUDSTONE, sample, hard, dry, no recovery**

**KEY**
- Relatively undisturbed sample obtained with 3.56 inch O.D. sampler driven with a 160 pound hammer falling 30 inches
- Core Drilling
- Sampling attempt with no recovery
- Groundwater depth at time of excavation
## LABORATORY RESULTS

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<th>DEPTH (Ft)</th>
<th>MOISTURE CONTENT (%G)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>RATIO</th>
<th>% SWELL AT 70°F</th>
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</table>

### SAMPLE DATA

- **FIELD DATE:** JUNE 26, 2007
- **SURFACE ELEVATION:** 2852.53

**DESCRIPTION**

- **Silty Sand (SM), reddish brown, dry**
- **Silty Sand (SM), intervals of coarse sand, reddish brown, buff, small yellowish/brown layer, dry, minor cementation**
- **Grades buff**
- **Mudstone / Siltstone, sandy grey, cemented**
- **Grades buff**
- **No recovery**
- **Complete to 15' no groundwater**

---

**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project # 07330

**BORING LOG - LS-8**

**LANDMARK TESTING & ENGINEERING**  
323 N. 3050 E. 8th, St. George, UT 84790
| Depth (ft) | Moisture Content | Unit Weight (pcf) | % Gravel | % Sand | % Silt | Liquid Limit | Plastic Limit | Index | % Swell at 4% | Recovery | Blows per Foot | Coring Core | Sample Number | Sample Type | Lithology | Field Date: June 28, 2007 | Surface Elevation: 2868.38 |
|-----------|------------------|-------------------|----------|--------|--------|--------------|---------------|-------|---------------|----------|----------------|-------------|---------------|-------------|------------|-----------|----------------------|-------------------|
| 0         |                  |                   |          |        |        |              |               |       |               |          |                |             |               |             |           | SM        |                      |                   |
| 5         |                  |                   |          |        |        |              |               |       |               |          |                |             |               |             |           | CL        |                      |                   |
| 10        |                  |                   |          |        |        |              |               |       |               |          |                |             |               |             |           | CL        |                      |                   |
| 15        |                  |                   |          |        |        |              |               |       |               |          |                |             |               |             |           | CL        |                      |                   |
| 20        |                  |                   |          |        |        |              |               |       |               |          |                |             |               |             |           | CL        |                      |                   |

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - LS - 9**

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

**KEY**

- Relatively undisturbed sample obtained with 2.25 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
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT</th>
<th>% GRAVEL</th>
<th>% SAND</th>
<th>LLaqued Limit</th>
<th>PLASTIC LIMIT</th>
<th>% SWELL</th>
<th>RECOVERY AND ROP</th>
<th>BLOWS/IN</th>
<th>CORE INTERVAL (IN)</th>
<th>SAMPLE NUMBER</th>
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<th>LITHOLOGY</th>
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**FIELD DATE:** JUNE 28, 2007

**SURFACE ELEVATION:**

**DESCRIPTION:**

LEAN CLAY (CL) CLAYSTONE maroon with grey variations, dry, soft, very minor gypsum

LEAN CLAY (CL) CLAYSTONE gray + yellow tint, dry, hard

Grades purple, COMPLETE @ 30" no groundwater encountered

### ST GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

**BORING LOG - LS - 9**

**KEY**
- Relatively undisturbed sample obtained with 3.26 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

**LANDMARK TESTING & ENGINEERING**
525 N. 5050 E. 85, St. George, UT 84790
### LABORATORY RESULTS

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<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRAY</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>% SWELL AT 60</th>
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### FIELD DATE: August 9, 2007

### SURFACE ELEVATION: 2891.0

### DESCRIPTION

**SM**
- Silty sand (SM), brown, loose to medium dense, dry
- No recovery, calcite cemented
- Calcite, reddish brown, dense, dry
- Gravels slightly moist, less cementation, dense
- Gravels, more gravel, cinnabar
- Clay (CH), claystone
- Purple, slightly moist, medium stiff
- Gravels brownish purple, dry, hard
- Complete to 27'
- No groundwater encountered

**CH**

**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WD-1**

**LANDMARK TESTING & ENGINEERING**
525 N. 3050 E, #3, St. George, UT 84799

Page 1 of 1
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<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT (%)</th>
<th>UNIT WEIGHT (PC)</th>
<th>% GRANULE</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>SWELL AT 50%</th>
<th>FUSE</th>
<th>% SOIL recovery AND ROD</th>
<th>BLOW PER FOOT</th>
<th>SAMPLE DEPTH (FT)</th>
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ST. GEORGE REPLACEMENT AIRPORT  
Landmark Project # 07330

BORING LOG - WD-2

LANDMARK TESTING & ENGINEERING  
525 N. 3850 E. 85, St. George, UT 84790

FIELD DATE: August 9, 2007  
SURFACE ELEVATION: 2905

DESCRIPTION:
- SM: SILTY SAND(SM), gravelly, bell, medium dense, dry
- CL: LEAN CLAY(CL), MUDSTONE, dark reddish brown, hard, dry...

Notes:
- Core Drilling
- Disturbed sample
- Sampling attempt with no recovery
- Groundwater depth at time of excavation
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<th>Moisture Content</th>
<th>Unit Weight (pcf)</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Fines</th>
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<th>% Swell at 60 lbs</th>
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**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WD-3**

**LANDMARK TESTING & ENGINEERING**
525 N. 3850 E. #4, St. George, UT 84799

- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 1+0 pound hammer to a depth of 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempt without recovery
- Groundwater depth at time of excavation
<table>
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<th>DEPTH (Ft)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (pcf)</th>
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**ST GEORGE REPLACEMENT AIRPORT**  
Landmark Project #: 07330

**BORING LOG - WD-4**

**LANDMARK TESTING & ENGINEERING**  
525 N. 3850 E, SU, St. George, UT 84799

**FIELD DATE:** Aug. 13-14, 2007
**SURFACE ELEVATION:** 2393
**DESCRIPTION:**

- Completes at 24', no groundwater encountered.
- Relatively undisturbed sample obtained with 3-1/2 inch O.D. sampler driven with a 146 pound hammer falling 30 inches.
- Core Drilling
- Undisturbed sample
- Damping attempt with no recovery.
- Groundwater depth at time of excavation.
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT (%)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRAY</th>
<th>% SAND</th>
<th>% FINE</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>CONSOLIDATION BEHAVIOR</th>
<th>BLOWS PER FT.</th>
<th>SAMPLE DEPTH (ft)</th>
<th>SAMPLE TYPE</th>
<th>LITHOLOGY</th>
</tr>
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<td></td>
<td></td>
<td></td>
<td>3</td>
<td>4</td>
<td>SM</td>
<td>SILTY SAND (SM), trace of gravel, dry</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>47</td>
<td>84</td>
<td>16</td>
<td>59</td>
<td>25</td>
<td></td>
<td>35</td>
<td>7.0</td>
<td>ML</td>
<td>SILT (ML), brown, loose, dry</td>
</tr>
<tr>
<td>10</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>50/4&quot;</td>
<td>12.0</td>
<td>SM-GM</td>
<td>SILTY SAND AND GRAVEL, white, calcite cemented, very dense, dry</td>
</tr>
<tr>
<td>15</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CH</td>
<td>POOR RETURN, brown/white, dry, gravelly, very dense</td>
</tr>
<tr>
<td>16.6</td>
<td>108</td>
<td></td>
<td>9</td>
<td>24</td>
<td>17.0</td>
<td>4</td>
<td>CH</td>
<td></td>
<td></td>
<td></td>
<td>CH</td>
<td>POOR RETURN, brown/white, dry, gravelly, very dense</td>
</tr>
<tr>
<td>20</td>
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<td></td>
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<td>29/50/6&quot;</td>
<td>22.0</td>
<td>CH</td>
<td>GRAY CLAY (CL), CLAYSTONE, maroon grey, very silty, dry</td>
</tr>
<tr>
<td>25</td>
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<td></td>
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<td></td>
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<td></td>
<td>61</td>
<td>23</td>
<td>CH</td>
<td>GRAY CLAY (CL), CLAYSTONE, maroon grey, very silty, dry</td>
</tr>
<tr>
<td>30</td>
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<td>CH</td>
<td>GRAY MORE PLASTIC</td>
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</table>

**ST GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WD-5**

**LANDMARK TESTING & ENGINEERING**
525 N. 3000 E. #3, St. George, UT 84790

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

**DESCRIPTION**

- **SAMPLE DATA**

  - **Sample Type:** SM
  - **Lithology:** SILTY SAND (SM), trace of gravel, dry
  - **Sample Type:** ML
  - **Lithology:** SILT (ML), brown, loose, dry
  - **Sample Type:** SM-GM
  - **Lithology:** SILTY SAND AND GRAVEL, white, calcite cemented, very dense, dry
  - **Lithology:** POOR RETURN, brown/white, dry, gravelly, very dense
  - **Sample Type:** CH
  - **Lithology:** GRAY CLAY (CL), CLAYSTONE, maroon grey, very silty, dry
  - **Lithology:** GRAY CLAY (CL), CLAYSTONE, maroon grey, very silty, dry
  - **Lithology:** GRAY MORE PLASTIC

**Completes @ 32' no groundwater**

- **Note:** Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with a 140 pound hammer falling 50 inches.
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT (%)</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRANULAR</th>
<th>% SAND</th>
<th>% Silt</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>CONSISTENCY</th>
<th>SHAPE OF PORES</th>
<th>BLOWS PER INCH</th>
<th>RECOVERY</th>
<th>SAMPLE DEPTH (FT)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
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<td></td>
<td>SILTY SAND(SM), trace of gravel</td>
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<td>continues caliche cemented</td>
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<td>4.6</td>
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<td></td>
<td></td>
<td></td>
<td>grades brown / white, dry, with gravel, slight cementation</td>
</tr>
<tr>
<td>10</td>
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<td></td>
<td></td>
<td></td>
<td>grades dark maroon, with white striations, slightly moist, moderately soft</td>
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<tr>
<td>30</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>grades with sandy lenses</td>
</tr>
</tbody>
</table>

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-6

LANDMARK TESTING & ENGINEERING
S25 N. 3050 E. R3, St. George, UT 84790
| DEPTH (FT) | MOISTURE CONTENT (%) | UNIT WEIGHT (pcf) | % GRAY | % SAND | % Silt | % Clay | LIQUID LIMIT | PLASTIC LIMIT | D RATIO | S S | W S | S WELL AT | SAMPLE DEPTH (FT) | BLOWS PER FOOT | SAMPLE NUMBER | SAMPLE TYPE | LITHOLOGY | USCS |
|------------|----------------------|-------------------|--------|--------|--------|--------|-------------|--------------|--------|-----|-----|---------|-----------------|----------------|---------------|-------------|------------|-----------|------|
| 35         |                      |                   |        |        |        |        |             |              |        |     |     |         |                 |                |               |             |            |           |      |
| 40         |                      |                   |        |        |        |        |             |              |        |     |     |         |                 |                |               |             |            |           |      |
| 45         |                      |                   |        |        |        |        |             |              |        |     |     |         |                 |                |               |             |            |           |      |
| 50         |                      |                   |        |        |        |        |             |              |        |     |     |         |                 |                |               |             |            |           |      |
| 55         |                      |                   |        |        |        |        |             |              |        |     |     |         |                 |                |               |             |            |           |      |
| 60         |                      |                   |        |        |        |        |             |              |        |     |     |         |                 |                |               |             |            |           |      |

**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WD-6**

**LANDMARK TESTING & ENGINEERING**
525 N. 3060 E. 63, St. George, UT 84790

**FIELD DATE:** August 13, 2007
**SURFACE ELEVATION:** 2894

**DESCRIPTION**
graded grey @ 34

**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

**COMPLETE to 43'**
no groundwater encountered
| DEPTH (FT) | MOISTURE CONTENT | UNIT WEIGHT | % GRANULE | % SAND | LIQUID LIMIT | PLASTIC LIMIT | PROPERTIES AT 23 F | NATURE OF NATURE | SAMPLE DEPTH (F) | SAMPLE NUMBER | SAMPLE TYPE | LITERATURE | USES |
|------------|------------------|-------------|-----------|--------|--------------|---------------|-------------------|-----------------|-----------------|--------------|-------------|------------|-----------|-------|
| 0          |                  |             |           |        |              |               |                   | SM              | 30              | 2.0          | 1           |            |          |
| 5.4        | 59               | 12          | 70        | 18     |              |               |                   | SM              | 59              | 7.0          | 2           |            |          |
| 10          |                  |             |           |        |              |               |                   | SM              | 10             | 23           | 3           |            |          |
| 15          |                  |             |           |        |              |               |                   | CH              | 15             | 23           | 5           |            |          |
| 20          |                  |             |           |        |              |               |                   | CH              | 20             | 25           | 4           |            |          |
| 25          |                  |             |           |        |              |               |                   | CH              | 25             | 25           | 5           |            |          |
| PROPOSED FINISHED GRADE: 2869.79 |
| 30          |                  |             |           |        |              |               |                   | SM              | 30             | 21           | 6           |            |          |
| 44          |                  |             |           |        |              |               |                   | SM              | 44             | 44           | 7           |            |          |

FIELD DATE: August 14, 2007
SURFACE ELEVATION: 2896

ST. GEORGE REPLACEMENT AIRPORT
Landmark Project # 07330

BORING LOG - WD-7
LANDMARK TESTING & ENGINEERING
520 N. 3850 E, #5, St. George, UT 84799

- Relatively undisturbed sample obtained with 3.29 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
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT</th>
<th>UNIT WEIGHT (pcf)</th>
<th>% GRANULAR</th>
<th>% FINESED</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>BLOWS PER FOOT</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>LITHOLOGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
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<td></td>
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</tr>
<tr>
<td>40</td>
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<td></td>
<td>19</td>
<td>21</td>
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<td>50/2&quot;</td>
<td>32</td>
<td>8</td>
<td>Grades yellow / light grey, less plastic</td>
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<td>45</td>
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<td></td>
<td>Grades yellow, no recovery</td>
</tr>
<tr>
<td>60</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>50/6&quot;</td>
<td>40</td>
<td>10</td>
<td>Claystone (CL), yellowish grey, dry</td>
</tr>
</tbody>
</table>

ST. GEORGE REPLACEMENT AIRPORT  
Landmark Project #: 07330  

BORING LOG - WD-7  

KEY  
- Relatively undisturbed sample obtained with 3.26 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

FIELD DATE: AUG 14, 2007  
SURFACE ELEVATION: 2836  
DESCRIPTION  

COMPLETED @ 48' no groundwater encountered
### LABORATORY RESULTS

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MOISTURE CONTENT (%)</th>
<th>% SAND</th>
<th>% SILT</th>
<th>% CLAY</th>
<th>LIQUID LIMIT</th>
<th>PLASTIC LIMIT</th>
<th>% WET AT</th>
<th>RECOVERY &amp; RESIDUE</th>
<th>BLOWN PER FOOT</th>
<th>SAMPLE DEPTH (FT)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>LITHOLOGY</th>
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</thead>
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<td></td>
<td></td>
<td>50/5*</td>
<td>2.0</td>
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</tr>
<tr>
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<td>60 26 34</td>
<td>24 25</td>
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<td>CH</td>
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<td>26 29</td>
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<tr>
<td>15</td>
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<td>19 50/5*</td>
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<tr>
<td>20</td>
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<td></td>
<td>33 17 16</td>
<td>50/5*</td>
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</tr>
<tr>
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<td></td>
<td></td>
<td>35 19 16</td>
<td>REC% 71 RQD%</td>
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</tbody>
</table>

### SAMPLE DATA

**PROPOSED FINISHED GRADE: 2866.61**

- **SM**: Silty sand (SM), brown, gravely, dry, gounde cemented.
- **CH**: Fat clay (CH), claystone, white, plastic, ground grey, slightly moist, moderately soft.
- **CL**: Mudstone, yellowish, grey, hard, dry, ground yellowish / grey.
- **CL**: Mudstone, brownish, grey, MUDSTONE.

**FIELD DATE**: AUG 15, 2007

**SURFACE ELEVATION**: 2891

**DESCRIPTION**

**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WD-8**

**LANDMARK TESTING & ENGINEERING**
525 N. 3950 E. KS, 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
- Stemping attempt with no recovery.
- Groundwater depth at time of excavation.
| Depth (ft) | MOISTURE CONTENT | DRY UNIT WEIGHT | % GRAVEL | % SAND | LIQUID LIMIT | PLASTIC LIMIT | % SWELL AT 60°F | % RECOVERY AND RQD | MINS FOR CORING | CORE INTERVAL (FT) | SAMPLE NUMBER | SAMPLE TYPE | Lithology | UCS | Field Date | Surface Elevation | Description |
|-----------|------------------|-----------------|----------|--------|--------------|---------------|----------------|---------------------|-----------------|-------------------|---------------|-------------|-----------|---------|---------|-----------------|----------------|-----------------|
| 33        |                  |                 |          |        |              |               |                |                     |                 |                   |               |             | CL        |        | AUG 15, 2007 | 2391            | MUDSTONE      |
| 35        |                  |                 |          |        |              |               |                |                     |                 |                   |               |             |           |        |           |                 | SANDSTONE WITH MUDSTONE |
| 40        |                  |                 |          |        |              |               |                |                     |                 |                   |               |             |           |        |           |                 | INTERBEDS, slightly weathered, moderately soft, fractured |
| 45        |                  |                 |          |        |              |               |                |                     |                 |                   |               |             |           |        |           |                 | grades mottled |
| 50        |                  |                 |          |        |              |               |                |                     |                 |                   |               |             |           |        |           |                 | grades heavily fractured |

**ST. GEORGE REPLACEMENT AIRPORT**
Landmark Project # 07330

**BORING LOG - WD-8**

**FIELD DATE:** AUG 15, 2007
**SURFACE ELEVATION:** 2391

**KEY**
- Relatively undisturbed sample obtained with 3.25 inch O.D. sampler driven with 140 pound hammer falling 30 inches.
- Core Drilling
- Disturbed sample
- Sampling attempted with no recovery.
- Groundwater depth at time of excavation
<table>
<thead>
<tr>
<th>MAJOR DIVISIONS</th>
<th>GRAPH SYMBOLS</th>
<th>LETTER SYMBOL</th>
<th>TYPICAL DESCRIPTIONS</th>
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<tbody>
<tr>
<td>COARSE GRAINED SOILS</td>
<td>CLEAN GRAVELS (LITTLE OR NO FINES)</td>
<td>GW</td>
<td>WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES</td>
</tr>
<tr>
<td></td>
<td>GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)</td>
<td>GP</td>
<td>POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES</td>
</tr>
<tr>
<td></td>
<td>CLEAN SAND (LITTLE OR NO FINES)</td>
<td>GM</td>
<td>SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES</td>
</tr>
<tr>
<td></td>
<td>SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)</td>
<td>GC</td>
<td>CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES</td>
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<tr>
<td>SAND AND SANDY SOILS</td>
<td>DUAL SYMBOLS</td>
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<td>WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES</td>
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<td>DUAL SYMBOLS</td>
<td>SP</td>
<td>POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES</td>
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<td>DUAL SYMBOLS</td>
<td>SM</td>
<td>SILTY SANDS, SAND-SILT MIXTURES</td>
</tr>
<tr>
<td></td>
<td>DUAL SYMBOLS</td>
<td>SC</td>
<td>CLAYEY SANDS, SAND-CLAY MIXTURES</td>
</tr>
<tr>
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<td>DUAL SYMBOLS</td>
<td>ML</td>
<td>INORGANIC SILTS AND VERY FINE SAND, ROCK FLOUR, SILTY FINE SAND OR CLAYEY SILTS</td>
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<td></td>
<td>DUAL SYMBOLS</td>
<td>CL</td>
<td>INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY OR SANDY OR SILTY CLAY, LEAN CLAY</td>
</tr>
<tr>
<td></td>
<td>DUAL SYMBOLS</td>
<td>OL</td>
<td>ORGANIC SERTS AND ORGANIC SERTY CLAYS OF LOW PLASTICITY</td>
</tr>
<tr>
<td></td>
<td>DUAL SYMBOLS</td>
<td>MH</td>
<td>INORGANIC SERTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SERTS</td>
</tr>
<tr>
<td></td>
<td>DUAL SYMBOLS</td>
<td>CH</td>
<td>INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS</td>
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<td>DUAL SYMBOLS</td>
<td>OH</td>
<td>ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SERTS</td>
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<td>HIGHLY ORGANIC SOILS</td>
<td>DUAL SYMBOLS</td>
<td>PT</td>
<td>PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS</td>
</tr>
</tbody>
</table>

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

LANDMARK TESTING & ENGINEERING
## CORE DESCRIPTION DEFINITIONS

### ROCK HARDNESS

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>CRITERIA</th>
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<tbody>
<tr>
<td>Hard</td>
<td>Can be scratched with knife or sharp pick with difficulty (heavy pressure). Heavy hammer blow required to break core specimen.</td>
</tr>
<tr>
<td>Moderately Hard</td>
<td>Can be scratched with knife or sharp pick with light to moderate pressure. Core or fragment breaks with moderate hammer blow.</td>
</tr>
<tr>
<td>Moderately Soft</td>
<td>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.</td>
</tr>
<tr>
<td>Soft</td>
<td>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.</td>
</tr>
<tr>
<td>Very Soft</td>
<td>Can be readily indented, grooved, or gouged with fingernail or carved with a knife. Breaks with light manual pressure.</td>
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### ROCK WEATHERING

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<tr>
<th>DESCRIPTOR</th>
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<tbody>
<tr>
<td>Fresh</td>
<td>No visible sign of decomposition or discoloration. Rings under hammer impact.</td>
</tr>
<tr>
<td>Slightly Weathered</td>
<td>Slight discoloration inwards from open fractures, otherwise similar to fresh.</td>
</tr>
<tr>
<td>Moderately Weathered</td>
<td>Discoloration throughout. Weaker minerals such as feldspar decomposed.</td>
</tr>
<tr>
<td>Highly Weathered</td>
<td>Strength somewhat less than fresh rock but cores cannot be broken by hand or scraped by knife. Texture preserved.</td>
</tr>
<tr>
<td>Completely Weathered</td>
<td>Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Texture becoming indistinct but fabric preserved.</td>
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### BEDDING SPACING

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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
PHONE: (435) 986-0566 • FAX: (435) 986-0568
## Table 1
### LABORATORY TEST SUMMARY

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<th>DRY UNIT WEIGHT (pcf)</th>
<th>MECHANICAL</th>
<th>ATTERBERG LIMITS</th>
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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: 8/29/2007
Type of Sample: Silty / clayey sand
Tested By: A. Whipple Date: 7/2/2007
Location of Sample: WT-1 @ 2'
Authorized By: Client Date: 8/29/2007

Sieve Analysis, ASTM C136
Test Standards are ASTM unless otherwise noted.

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Log(x) vs Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Location of Sample:** WT-1 @ 3.5'  
**Authorized By:** Client  
**Date:** 6/29/2007

### Sleeve Analysis, ASTM C136

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**Log(x)**

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525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
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
Tested By: A. Whipple Date: 7/2/2007
Authorized By: Client Date: 6/29/2007

Type of Sample: Clayey sand with gravel
Location of Sample: WT-1 @ 5'

Sieve Analysis, ASTM C136
Test Standards are ASTM unless otherwise noted.

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Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0588
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7862043

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: 6/20/2007

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<tr>
<td>12.5 mm</td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>79</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>77</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>74</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>63</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>37</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>23.4</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>2.9</td>
<td>D2218</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>23.2</td>
<td>53.5</td>
<td>23.4</td>
</tr>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Client: Cremer & 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
Sampled By: R. Owens Date: 6/29/2007
Tested By: A. Whipple Date: 7/2/2007

Location: St. George
Location of Sample: WT-2 @ 2'
Authorized By: Client Date: 6/29/2007

Type of Sample: Silty / clayey sand with gravel

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>95</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>92</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>83</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>74</td>
</tr>
<tr>
<td>1.25 mm</td>
<td>#40</td>
<td>61</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>29</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>17.9</td>
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</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
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<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>16.9</td>
<td>65.3</td>
<td>17.9</td>
</tr>
</tbody>
</table>

Log(x)

100 mm 20 mm 10 mm 5 mm 2 mm 1 mm 0.5 mm 0.2 mm 0.1 mm

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>98</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>96</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>89</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>82</td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td>72</td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td>46</td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>33.7</td>
</tr>
</tbody>
</table>

### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>7.9</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>43</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>19</td>
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<td>D 4318</td>
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<tr>
<td>Unified Classification System</td>
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<td>AASHTO Classification System</td>
<td>A-2-7(1)</td>
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<td>AASHTO M145</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>10.8</td>
<td>55.5</td>
<td>33.7</td>
</tr>
</tbody>
</table>

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525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 78G2048

Project: St. George Replacement Airport
Project #: 07330

Location: St. George
Sampled By: R. Owens
Date: 6/29/2007
Tested By: A. Whipple
Date: 7/2/2007

Location of Sample: WT-3 @ T
Authorized By: Client
Date: 6/29/2007

Type of Sample: Silty / clayey sand with gravel

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>98</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>93</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>87</td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>74</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>62</td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td>51</td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td>36</td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>29.4</td>
</tr>
</tbody>
</table>

Natural Moisture Content, % 8.4 D2216
Liquid Limit
Plasticity Index
Unified Classification System
AASHTO Classification System

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Cobble &gt; 3&quot;</td>
<td>0.0</td>
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<td></td>
</tr>
<tr>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>25.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Sand &lt; #4 - #200</td>
<td>44.3</td>
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<td></td>
</tr>
<tr>
<td>% Silt-Clay &lt; #200</td>
<td>29.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### Soil Classification Report

**Client:** Cremer & 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  
**Sampled Date:** 6/29/2007

**Type of Sample:** Clayey sand  
**Tested By:** A. Whipple  
**Tested Date:** 7/2/2007

**Location of Sample:** WT-4 @ 8'

**Authorized By:**  
**Date:** 6/29/2007

**Soil Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
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<td>19 mm</td>
<td>3/4&quot;</td>
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<tr>
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<td>99</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>97</td>
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<tr>
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<td>90</td>
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<tr>
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<td>86</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>79</td>
</tr>
<tr>
<td>150 μm</td>
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<td>53</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>36.3</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
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<tbody>
<tr>
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<td>D4318</td>
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<td>AASHTO M148</td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>9.9</td>
<td>53.8</td>
<td>36.3</td>
</tr>
</tbody>
</table>

**Log(x)**

525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
**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**

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
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<tr>
<td>75 mm</td>
<td>3&quot;</td>
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</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>99</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>97</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>95</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>91</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>79</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>41</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>25.1</td>
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</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test Standards</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
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<tr>
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<tr>
<td>Plasticity Index</td>
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</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
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</thead>
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<tr>
<td>0.0</td>
<td>5.4</td>
<td>69.5</td>
<td>25.1</td>
</tr>
</tbody>
</table>

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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# Soil Classification Report

**Client:** Creamer & Noble Engineers  
**Address:** 435 East Tabernacle  
**City:** 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  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/28/2007

**Type of Sample:** Sandy lean clay  
**Location of Sample:** WT-4 @ 22'

## Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>97</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>95</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>91</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>90</td>
</tr>
<tr>
<td>250 μm</td>
<td>#40</td>
<td>87</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>71</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>61.0</td>
</tr>
</tbody>
</table>

## Test Standards

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>14.8</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>45</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>26</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td>CL</td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td>A-7-6(13)</td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

## Additional Table

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>8.9</td>
<td>30.0</td>
<td>61.0</td>
</tr>
</tbody>
</table>

## Log(x) Graph

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:

Lab#: 78G2053

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

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>8.1</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
<tbody>
<tr>
<td>0.0</td>
<td>13.9</td>
<td>66.4</td>
<td>19.7</td>
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</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# 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:** 8/28/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Location of Sample:** WT-9 @ 32'  
**Authorized By:** Client  
**Date:** 8/29/2007

## Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td></td>
<td>Natural Moisture Content, %</td>
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<td></td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
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<td></td>
<td>D4318</td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight,pcf</td>
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<td>C29</td>
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<tr>
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<td>Unified Classification System</td>
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<td></td>
<td>D2487</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
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<td></td>
<td>AASHTO M143</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
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<td></td>
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<tr>
<td>75 µm</td>
<td>#200</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

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### Logarithmic Graph

![Log(x) Graph](image)

---

525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

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

**Project:** St. George Replacement Airport  
**Sampled By:** R. Owens  
**Tested By:** A. Whipple  
**Sampled Date:** 6/29/2007  
**Tested Date:** 7/2/2007  
**Location:** St. George  
**Location of Sample:** RW-1 @ 2'

**Authorized By:** Client  
**Authorized Date:** 6/29/2007

**Type of Sample:** Silty / clayey sand

### Slope Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>96</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>93</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>92</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>89</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>87</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>83</td>
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<tr>
<td>150 μm</td>
<td>#100</td>
<td>41</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>25.9</td>
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<table>
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<tr>
<th>Test Specifications</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>1.5</td>
<td>D2216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Unit Weight,pcf</td>
<td>111.9</td>
<td>C 29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M143</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>11.1</td>
<td>63.0</td>
<td>25.9</td>
</tr>
</tbody>
</table>

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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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:** 8/29/2007

**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:** 8/29/2007

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>5.1</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>67.1</td>
<td>C20</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
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<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>23.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
<td>48.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td>% Silt-Clay</td>
<td>29.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00 mm</td>
<td>#100</td>
<td></td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td>29.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Log(x)**

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Client: Creamer & Noble Engineers  
435 East Tabernacle  
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By: ________________
Lab#: TSG2077

SOIL CLASSIFICATION REPORT

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  
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>6.9</td>
<td></td>
<td>D2210</td>
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<tr>
<td>100</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
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<td>D2487</td>
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<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
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<td>AASHTO Classification System</td>
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<td>AASHTO M145</td>
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<tr>
<td>25</td>
<td>1&quot;</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
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<td>12.5</td>
<td>1/2&quot;</td>
<td>99</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td>98</td>
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</tr>
<tr>
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</tr>
<tr>
<td>0.425</td>
<td>#40</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.150</td>
<td>#100</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.075</td>
<td>#200</td>
<td>28.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>8.2</td>
<td>63.0</td>
<td>28.8</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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:  RWI-2 @ 12'
Authorized By:  Client  Date: 6/29/2007

Soil Analysis, ASTM C136
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Dry Unit Weight, pcf</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>Unified Classification System</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>AASHTO Classification System</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>96</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>93</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>89</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>84</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>78</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>42</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>19.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>11.2</td>
<td>66.0</td>
<td>10.7</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: ______________________
Lab#: 7SG2070

Project: St. George Replacement Airport
Project #: 07330

Location: St. George
Sampled By: R. Owens
Date: 6/29/2007
Tested By: A. Whipple
Date: 7/2/2007
Authorized By: Client
Date: 6/29/2007

Type of Sample: Silty/clayey sand

Location of Sample: RW-2 @ 17'

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>6.6</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>10 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>7.5 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>5.0 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>106.8</td>
<td></td>
<td>C 29</td>
</tr>
<tr>
<td>3.75 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>2.5 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>1.9 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.25 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>0.95 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.475 mm</td>
<td>#4</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.200 mm</td>
<td>#10</td>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0425 mm</td>
<td>#40</td>
<td>94</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0150 mm</td>
<td>#100</td>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0075 mm</td>
<td>#200</td>
<td>23.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>0.3</td>
<td>76.6</td>
<td>23.1</td>
</tr>
</tbody>
</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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

Location: St. George

Type of Sample: Silty / clayey sand with gravel

Location of Sample: RW-3 @ 2'

Sampled By: R. Owens
Date: 6/29/2007

Tested By: A. Whipple
Date: 7/22/2007

Authorized By: Client
Date: 8/20/2007

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>1.4</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>15.9</td>
<td>63.6</td>
<td>20.4</td>
</tr>
</tbody>
</table>

Log(x)

Area under the curve graphically represents the percentage passing.
**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  
**Sample By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/29/2007

**Type of Sample:** Silty / clayey sand with gravel  
**Location of Sample:** RW-3 @ 12’

---

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5”</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4”</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3”</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2”</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2”</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1”</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4”</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2”</td>
<td>97</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8”</td>
<td>92</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>80</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>69</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>55</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>37</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>27.5</td>
</tr>
</tbody>
</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>7.1</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Dry Unit Weight, pcf</td>
<td>90.1</td>
<td>C29</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

---

**% Cobble > 3”**<br>**% Gravel < 3” - #4**<br>**% Sand < #4 - #200**<br>**% Silt-Clay < #200**

0.0 | 19.8 | 52.7 | 27.5

---

**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>94</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>90</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>80</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#40</td>
<td>70</td>
</tr>
<tr>
<td>425 µm</td>
<td>#10</td>
<td>50</td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td>35</td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>24.8</td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>8.9</td>
<td>D2218</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>27</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>9</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td>SC</td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td>A-2-4(0)</td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>0.0</td>
<td>20.0</td>
<td>55.2</td>
</tr>
<tr>
<td>100 mm</td>
<td>2 mm</td>
<td>1 mm</td>
<td>0.5 mm</td>
</tr>
<tr>
<td>50 mm</td>
<td>25 mm</td>
<td>75 µm</td>
<td>150 µm</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1 mm</td>
<td>2 mm</td>
<td>50 µm</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>1/2&quot;</td>
<td>3/8&quot;</td>
<td>100 µm</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>1/8&quot;</td>
<td>1/16&quot;</td>
<td>200 µm</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

**Client:** Cremer & 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:** 8/29/2007

**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**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>67</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>95</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>94</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>92</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>89</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>85</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>42</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>26.9</td>
</tr>
</tbody>
</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test Standards</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>2.0</td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
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<td>26.9</td>
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</table>

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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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  
**Sampled By:** R. Owens  
**Date:** 8/28/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Location:** St. George  
**Location of Sample:** RW-4 @ 12'  
**Authorized By:** Client  
**Date:** 6/29/2007

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>91</td>
</tr>
<tr>
<td>9.5 mm</td>
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<tr>
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<tr>
<td>2.00 mm</td>
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<td>44</td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td>32</td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td>22</td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>15.4</td>
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**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>0.3</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
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<td>41.2</td>
<td>15.4</td>
</tr>
</tbody>
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**Log(x)**

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Project: St. George Replacement Airport

Type of Sample: Poorly-graded sand with silt and gravel

Location of Sample: RW-4 @ 17'

Natural Moisture Content, %

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>73</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>150 µm</td>
<td>#100</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 µm</td>
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<td>8.4</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>27.0</td>
<td>64.7</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**Client:** Creamer & Noble Engineers  
435 East Tabernacle  
St. George, Utah 84770

**Date of Report:** 7/3/2007

**Lab#:** 7SG2137

---

**Project:** St. George Replacement Airport  
**Project #:** 07330

**Location:** St George  
**Sampled By:** R. Owens  
**Date:** 8/28/2007

**Type of Sample:** Silty / clayey sand with gravel  
**Tested By:** A. Whipple  
**Date:** 7/22/2007

**Location of Sample:** RW-5 @ 2'

**Authorized By:** Client  
**Date:** 8/26/2007

---

**SOIL CLASSIFICATION REPORT**

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
<tbody>
<tr>
<td>0.0</td>
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<td>47.9</td>
<td>26.0</td>
</tr>
</tbody>
</table>

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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Client: Creamer & Noble Engineers
435 East Tebennacle
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: 8/29/2007
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: 8/29/2007

Sieve Analysis, ASTM C136  Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td></td>
<td>Natural Moisture Content, %</td>
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<td>D2216</td>
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<tr>
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<td>Liquid Limit</td>
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<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
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<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
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<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
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<td></td>
<td>AASHTO Classification System</td>
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<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>35</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>7.1</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble  &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
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<td>7.1</td>
</tr>
</tbody>
</table>

Log(k)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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

Location: St. George

Type of Sample: Silty/clayey sand

Location of Sample: RW-7 @ 2'

Sampled By: R. Owens Date: 6/29/2007
Tested By: A. Whipple Date: 7/2/2007

Authorized By: Client Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>0.8</td>
<td></td>
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<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
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<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td>Dry Unit Weight, pcf</td>
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<td></td>
<td>C 29</td>
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<tr>
<td>37.5 mm</td>
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<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
<td>0.0</td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
<td>77.1</td>
<td>% Silt-Clay &lt; #200</td>
<td></td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>100</td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>1.0</td>
<td>% Sand &lt; #4 - #200</td>
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<tr>
<td>4.75 mm</td>
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<td>% Cobble &gt; 3&quot;</td>
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<td>% Gravel &lt; 3&quot; - #4</td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>98</td>
<td>% Sand &lt; #4 - #200</td>
<td>77.1</td>
<td>% Silt-Clay &lt; #200</td>
<td></td>
</tr>
<tr>
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<tr>
<td>150 μm</td>
<td>#100</td>
<td>40</td>
<td>% Sand &lt; #4 - #200</td>
<td>77.1</td>
<td>% Silt-Clay &lt; #200</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>21.9</td>
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<td>0.0</td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td></td>
</tr>
</tbody>
</table>

Log(x)

% Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

**Client:** Creamer & Noble Engineers  
435 E 90 Tabernacle  
St. George, Utah 84770

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 7S92090

**Project:** St. George Replacement Airport  
**Project #:** 07330  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/29/2007

**Location:** St. George  
**Type of Sample:** Lean clay  
**Location of Sample:** RW-7 @ 17'

---

**Sieve Analysis, ASTM C136**

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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<tr>
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<th>Result</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>8.7</td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>43</td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>19</td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
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</table>

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**Log(x)**

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

Date of Report: 7/3/2007

Reviewed By:  
Lab#: TSG2084

Project #: 07330

Project: St. George Replacement Airport  
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**

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>Size (in)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td></td>
<td>Natural Moisture Content, %</td>
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<td>100 mm</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Liquid Limit</td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Plasticity Index</td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dry Unit Weight, pcf</td>
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</tr>
<tr>
<td>37.5 mm</td>
<td>1½&quot;</td>
<td>100</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>98</td>
<td></td>
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<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>7.4</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>98</td>
<td></td>
<td></td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
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<td>93</td>
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<td>% Silt-Clay &lt; #200</td>
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<td>2.00 mm</td>
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<td>150 µm</td>
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</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>37.8</td>
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**Logarithmic Graph**
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 78G2097

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

Swale Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sleeve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125</td>
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<td>Natural Moisture Content, %</td>
<td>3.0</td>
<td></td>
<td>D2216</td>
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<tr>
<td>100</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>57.9</td>
<td></td>
<td>C29</td>
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<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>25</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
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<tr>
<td>19</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>1/2&quot;</td>
<td>99</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td>96</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>4.75</td>
<td>#4</td>
<td>91</td>
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<td>#200</td>
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</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

% Cobble
> 3"
< 3" - #4

% Gravel
< #4 - #200

% Sand
< #200

% Silt-Clay
< #200

Log(x) vs. Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: ___________________________
Lab#: TSG2098

Project#: 07330

Location: St. George
Sampled By: R. Owens
Date: 8/29/2007

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: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td></td>
<td>Natural Moisture Content, %</td>
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<td>100 mm</td>
<td>4&quot;</td>
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<td></td>
<td></td>
<td>Liquid Limit</td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td></td>
<td></td>
<td>Plasticity Index</td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td></td>
<td></td>
<td>Unified Classification System</td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>150 μm</td>
<td>#100</td>
<td>8</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>6.7</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 6/28/2007

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

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>11.8</td>
<td>D2218</td>
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</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>28.8</td>
<td>55.1</td>
<td>16.1</td>
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</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

Log(x) vs. Sieve Size

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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 Airpot
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

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>7.2</td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td></td>
<td>Liquid Limit</td>
<td>32</td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
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<td></td>
<td></td>
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<td>15</td>
<td>D 4318</td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
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<td>Dry Unit Weight, pcf</td>
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<td>C 29</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>Unified Classification System</td>
<td>SC</td>
<td>D 2487</td>
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<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<td></td>
<td>AASHTO Classification System</td>
<td>A-5(1)</td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
<td>95</td>
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</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td>% Slit-Clay &lt; #200</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td>63</td>
<td></td>
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<tr>
<td>425 μm</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Log(x) vs. Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## 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 | SL George Replacement Airport  
| Location | SL George  
| Sampled By | R. Owens  
| Tested By | A. Whipple  
| Authorized By | Client  
| Date | 6/29/2007

**Sample Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>1.0</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
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<tr>
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<td>1-1/2&quot;</td>
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<td>1&quot;</td>
<td></td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td>97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>#40</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>25.7</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<tbody>
<tr>
<td>0.0</td>
<td>3.9</td>
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<td>25.7</td>
</tr>
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</table>

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**Diagram**

---

**Address:** 525 N. 3050 E. Suite 3, St. George, UT 84790  
**Phone:** (435) 986-0566  
**Fax:** (435) 986-0568
**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**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>76 mm</td>
<td>3&quot;</td>
<td></td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1-1/2&quot;</td>
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<td>3/8&quot;</td>
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<td>4.75 mm</td>
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<td>73</td>
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<td>61</td>
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<td>75 μm</td>
<td>#200</td>
<td>48.7</td>
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**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>4.1</td>
<td>D2218</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Dry Unit Weight, pcf</td>
<td>95.4</td>
<td>C 29</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
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</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
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**% Cobble**

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
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<tbody>
<tr>
<td>&gt; 3&quot;</td>
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<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<td>48.7</td>
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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

Client: Creamer & Noble Engineers  
435 East Tabemacle  
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: Silly clayey sand with gravel  
Tested By: A. Whipple  
Date: 7/2/2007

Location of Sample: ET-4 @ 12'  
Authorized By: Client  
Date: 6/20/2007

### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>8.5</td>
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<td></td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
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<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<td></td>
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</tr>
<tr>
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<td>4.75 mm</td>
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<tr>
<td>2.00 mm</td>
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<td>53</td>
<td></td>
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<tr>
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<tr>
<td>150 μm</td>
<td>#100</td>
<td>29</td>
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<td></td>
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<tr>
<td>75 μm</td>
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<table>
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<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<td>14.7</td>
</tr>
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![Logarithmic graph showing particle size distribution](image-url)
**Client:** Creamer & Noble Engineers  
435 East Tabernacle  
St. George, Utah 84770

**Date of Report:** 7/3/2007

**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

---

**SOIL CLASSIFICATION REPORT**

---

**SOIL Analysis, ASTM C138**

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>3.5</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>105.2</td>
<td></td>
<td>C 29</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt;#4 - #200</th>
<th>% Silty-Clay &lt;#200</th>
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<tbody>
<tr>
<td>0.0</td>
<td>8.5</td>
<td>63.2</td>
<td>28.4</td>
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</table>

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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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

<table>
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<th>Slope Size</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Dry Unit Weight, psf</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>Unified Classification System</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>AASHTO Classification System</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>100</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>99</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>96</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>85</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>45</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>27.0</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>3.4</td>
<td>D2218</td>
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<td>Liquid Limit</td>
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<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Dry Unit Weight, psf</td>
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<td>C29</td>
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<tr>
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<td>AASHTO Classification System</td>
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<td>AASHTO M145</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Slit-Clay &lt; #200</th>
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<tbody>
<tr>
<td>0.0</td>
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</table>

Graph: Log(x) vs Percent Passing
### 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  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 8/2/2007

#### Project #: 07330  
**Location:** St. George  
**Location of Sample:** ET-9 @ 2'

### Sieve Analysis, ASTM C136

<table>
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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>100</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>99</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>93</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>88.8</td>
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### Test Standards

<table>
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<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
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<tbody>
<tr>
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<tr>
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<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
</tr>
<tr>
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<td>AASHTO M145</td>
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### Particle Size Distribution

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
<tbody>
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<td>0.0</td>
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<td>11.2</td>
<td>88.8</td>
</tr>
</tbody>
</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
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: 8/28/2007

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: 8/29/2007

SOIL CLASSIFICATION REPORT

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>3.3</td>
<td>D2216</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
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<td>2.00 mm</td>
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<td>#200</td>
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<table>
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<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silty-Clay</th>
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</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<td>0.0</td>
<td>20.7</td>
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<td>27.9</td>
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</table>

Log(x)

Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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
Tested By: A. Whipple
Date: 6/29/2007
Date: 7/2/2007

Location of Sample: ET-10 @ 5'
Authorized By: Client
Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
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<td>Natural Moisture Content, %</td>
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<td>4.2</td>
<td></td>
<td>D2216</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
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<td>3&quot;</td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
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<td>C29</td>
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<td>100</td>
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<td>#200</td>
<td></td>
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<td>23.8</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
<tbody>
<tr>
<td>0.0</td>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# 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  
**Sampled By:** R. Owens  
**Sample Date:** 6/29/2007

**Type of Sample:** Clayey sand with gravel  
**Tested By:** A. Whipple  
**Test Date:** 7/2/2007

**Location:** St. George  
**Location of Sample:** A-2 @ 5'  
**Authorized By:** Client  
**Authorized Date:** 6/29/2007

## Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
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<td>Liquid Limit</td>
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</tr>
<tr>
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<td>3&quot;</td>
<td>Plasticity Index</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Dry Unit Weight,pcf</td>
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<td>3/4&quot;</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.18 mm</td>
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<td>0.18 mm</td>
<td>#200</td>
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<td></td>
<td></td>
<td></td>
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</table>

### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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</table>

## Log-normal Distribution

![Log-normal Distribution Graph]

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:
Lab#: 78G2221

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
Test Standards are ASTM unless otherwise noted.

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<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>7.5</td>
<td>D2218</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
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<td>D4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
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<td>D2487</td>
<td></td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>AASHTO M145</td>
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<td>1&quot;</td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<td></td>
<td>100</td>
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</tr>
<tr>
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<td>97</td>
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<tr>
<td>425 μm</td>
<td>#40</td>
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<td></td>
<td>72</td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<td>0.0</td>
<td>8.4</td>
<td>70.0</td>
<td>21.0</td>
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</table>

Log(x)

% Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 78G2222

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

<table>
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<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>7.3</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
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<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
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<td></td>
<td>Unified Classification System</td>
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<td>D 2487</td>
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<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
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<td></td>
<td>AASHTO M145</td>
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<td>25 mm</td>
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<td></td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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<tr>
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<td>#10</td>
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</tr>
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% Cobble > 3", % Gravel < 3" - #4, % Sand < #4 - #200, % Silt-Clay < #200

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

**Client:** Cremer & Noble Engineers  
435 East Tebnercla  
St. George, Utah 84770

**Date of Report:** 7/3/2007

**Reviewed By:**

**Lab#:** 78G2223

**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

---

### Slope Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
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<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>100</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>99</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>93</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>83</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>37.4</td>
</tr>
</tbody>
</table>

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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td></td>
<td></td>
<td>D2210</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>33</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>11</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Dry Unit Weight,pcf</td>
<td>55.8</td>
<td></td>
<td>C 29</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M144</td>
</tr>
</tbody>
</table>

---

![Logarithmic Percent Passing Chart](chart.png)

---

525 N. 3050 E. Suite 3, St. George, UT 84790  •  Phone: (435) 986-0566  •  Fax: (435) 986-0568
Project: St. George Replacement Airport

Location: St. George

Type of Sample: Poorly-graded gravel with silt and sand

Location of Sample: A-4 at 5'

SOIL CLASSIFICATION REPORT

Client: Cremer & Noble Engineers
435 East Tabernacle
St. George, UT 84770

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

Project #: 07330

Sampled By: R. Owens
Date: 6/29/2007

Tested By: A. Whipple
Date: 7/2/2007

Authorized By: Client
Date: 6/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>56</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>50</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>46</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>31</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>26</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>16</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>11.5</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
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<tr>
<td>Natural Moisture Content, %</td>
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<td></td>
<td>D2216</td>
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<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M148</td>
</tr>
</tbody>
</table>

% Cobble

% Gravel

% Sand

% Silt-Clay

0.0 54.0 34.5 11.5

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 76G2233

**Project:** St. George Replacement Airport  
**Project #:** 07330

**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/29/2007

**Type of Sample:** Silty/Clayey sand

**Location of Sample:** A-6 at 2'

---

### Slope Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test Standards</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>5.8</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
<td>D 23487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>49</td>
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</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>29.1</td>
<td></td>
</tr>
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</table>

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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Split-Clay &lt; #200</th>
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<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>70.9</td>
<td>29.1</td>
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</tbody>
</table>

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**Graph:** Log(X) vs. Percent Passing

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## 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:** 8/29/2007

**Type of Sample:** Silty / clayey sand  
**Tested By:** A. Whipple  
**Date:** 7/2/2007

**Location of Sample:** A-7 @ 2'  
**Authorized By:** Client  
**Date:** 8/29/2007

### Test Standards

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<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
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<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
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<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>120.7</td>
<td>C 29</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td>40</td>
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</tr>
<tr>
<td>75 μm</td>
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<td>27.8</td>
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### Cumulative Percent Passing

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<tr>
<td>20 mm</td>
<td>90</td>
</tr>
<tr>
<td>10 mm</td>
<td>80</td>
</tr>
<tr>
<td>5 mm</td>
<td>70</td>
</tr>
<tr>
<td>2 mm</td>
<td>60</td>
</tr>
<tr>
<td>1 mm</td>
<td>50</td>
</tr>
<tr>
<td>0.5 mm</td>
<td>40</td>
</tr>
<tr>
<td>0.3 mm</td>
<td>30</td>
</tr>
<tr>
<td>0.1 mm</td>
<td>20</td>
</tr>
<tr>
<td>0.05 mm</td>
<td>10</td>
</tr>
<tr>
<td>0.01 mm</td>
<td>0</td>
</tr>
</tbody>
</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 8/29/2007

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

<table>
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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
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<td></td>
<td>D2218</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>116.1</td>
<td></td>
<td>C 29</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>100</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>92</td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td>55.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Client: Cremer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:

Lab#: 7SG2239

Project #: 07330
Sampled By: R. Owens  Date: 6/29/2007
Tested By: A. Whipple  Date: 7/2/2007

Location of Sample: A-8 at 10'
Location: St. George

Type of Sample: Silty/Clayey sand

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Slove Size</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>7.3</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
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<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>94</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
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<td></td>
</tr>
<tr>
<td>2.00 mm</td>
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<td>82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>70</td>
<td></td>
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</tr>
<tr>
<td>150 μm</td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td>15.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- % Cobble: 0.0
- % Gravel: 11.8
- % Sand: 71.5
- % Silt-Clay: 16.8

Log(x)

Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 8/28/2007
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: 8/28/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>90</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>82</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>77</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>69</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>59</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>49</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>36</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>24.3</td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>8.6</td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Dry Unit Weight, pcf</td>
<td>107.6</td>
<td>C 29</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>31.4</td>
<td>44.3</td>
<td>24.3</td>
</tr>
</tbody>
</table>

Diagram of Log(x) vs. Sieve Size
<table>
<thead>
<tr>
<th>Sample Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
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<td></td>
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<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>% Cobble &lt; 3&quot;</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Gravel &gt; 3&quot;</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Sand &lt; #4</td>
<td>39.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td>% Silt-Clay &lt; #200</td>
<td>58.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.15 mm</td>
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<td>#100</td>
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<tr>
<td>0.75 mm</td>
<td>#200</td>
<td></td>
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</tbody>
</table>

Logarithmic graph showing particle size distribution.
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: ___________
Lab#: 76G2265

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

Type of Sample: Silty / clayey sand with gravel

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>8&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>63 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>98</td>
</tr>
<tr>
<td>16 mm</td>
<td>1/2&quot;</td>
<td>85</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>80</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>67</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>56</td>
</tr>
<tr>
<td>1.188 mm</td>
<td>#40</td>
<td>49</td>
</tr>
<tr>
<td>63 µm</td>
<td>#100</td>
<td>31</td>
</tr>
<tr>
<td>25 µm</td>
<td>#200</td>
<td>17.1</td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted:

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>6.8</td>
<td>D 2216</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M143</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>33.0</td>
<td>50.0</td>
<td>17.1</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# Soil Classification Report

**Client:** Cremer & 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  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/29/2007

**Type of Sample:** Silty / clayey sand

**Location of Sample:** LS-3 @ 15'

---

## Slake Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Slake Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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<td></td>
<td></td>
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<td>4&quot;</td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
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<td></td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
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<td></td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td></td>
<td>AASHTO M143</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1/2&quot;</td>
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<td></td>
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</tr>
<tr>
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<td></td>
<td>91</td>
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<td>4.75 mm</td>
<td>#4</td>
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<td>86</td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td>61</td>
<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td>52</td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td>23.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

% Cobble  
% Gravel  
% Sand  
% Silt-Clay

<table>
<thead>
<tr>
<th></th>
<th>&gt; 3&quot;</th>
<th>&lt; 3&quot; - #4</th>
<th>&lt; #4 - #200</th>
<th>&lt; #200</th>
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</thead>
<tbody>
<tr>
<td>% Cobble</td>
<td>0.0</td>
<td>13.8</td>
<td>62.3</td>
<td>23.9</td>
</tr>
</tbody>
</table>

---

## Log(x) Plot

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: ____________________________
Date: ____________________________
Lab#: 78G2267

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

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>9.4</td>
<td></td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
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<td></td>
<td>AASHTO M145</td>
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<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>97</td>
<td></td>
<td></td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<tr>
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<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>58</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>42</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>30.7</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>15.9</td>
<td>53.4</td>
<td>30.7</td>
</tr>
</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0566
## 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  

**Location:** St. George  

**Sampled By:** R. Owens  
**Date:** 8/29/2007  

**Type of Sample:** Sandy silt / clay  

**Tested By:** A. Whipple  
**Date:** 7/2/2007  

**Location of Sample:** LS-4 @ 10'  

**Project #:** 07330

---

**Sieve Analysis, ASTM C136**  

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>Test Standards are ASTM unless otherwise noted.</td>
<td>Natural Moisture Content, %</td>
<td>9.3</td>
<td>D2216</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td>Liquid Limit</td>
<td>D4316</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td>Plasticity Index</td>
<td>D4316</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>C29</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>1/4&quot;</td>
<td></td>
<td></td>
<td>Unified Classification System</td>
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<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

---

### Log(x) Plot

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---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 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

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>15.4</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, psf</td>
<td>83.0</td>
<td></td>
<td>C29</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
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<td>D2487</td>
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<tr>
<td>25 mm</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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<tr>
<td>9.0 mm</td>
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<tr>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1.00 mm</td>
<td>#40</td>
<td></td>
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</tr>
<tr>
<td>0.425 mm</td>
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</tbody>
</table>

% Cobble
- > 3"
- < 3" - #4

% Gravel
- < #4 - #200
- < #200

% Sand
- 38.6
- 40.4

% Silt-Clay
- 21.0

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## Soil Classification Report

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 78G2272  

**Project:** St. George Replacement Airport  
**Sampled By:** R. Owens  
**Date:** 6/20/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 8/29/2007

**Type of Sample:** Silty/crhythmic sand  
**Location of Sample:** LS-6 @ 5'

### Sleeve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>9.7</td>
<td></td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>98.3</td>
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<td>C29</td>
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<tr>
<td>37.5 mm</td>
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<td>Unified Classification System</td>
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<td></td>
<td></td>
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<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>98</td>
<td></td>
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<tr>
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<tr>
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<td>79</td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>70</td>
<td></td>
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<tr>
<td>150 μm</td>
<td>#100</td>
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<td></td>
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<tr>
<td>76 μm</td>
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</table>

### Grading Table

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>10.7</td>
<td>57.2</td>
<td>32.1</td>
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</tbody>
</table>

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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## Soil Classification Report

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

**Date of Report:** 7/3/2007

**Reviewed By:**

**Lab#:** 73G2278

**Project:** St. George Replacement Airport  
**Project #:** 07330

**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/29/2007

**Type of Sample:** Silty / clayey sand  
**Tested By:** A. Whipple  
**Date:** 7/2/2007

**Location of Sample:** LS-7 @ 2’  
**Authorized By:**

**Date:** 8/29/2007

### Soil Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>93</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>93</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>93</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>92</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>90</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>87</td>
</tr>
<tr>
<td>1.18 mm</td>
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<td>80</td>
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<tr>
<td>0.60 mm</td>
<td>#100</td>
<td>55</td>
</tr>
<tr>
<td>0.40 mm</td>
<td>#200</td>
<td>43.4</td>
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### Test Standards

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>6.0</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Dry Unit Weight, pcf</td>
<td>97.8</td>
<td>C29</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

### Particle Size Distribution

| Percentage Passing (%) | 100 mm | 20 mm | 10 mm | 6 mm | 3 mm | 1-1/2" | 1-3/4" | 1/2" | 3/8" | #4 | #10 | #16 | #30 | #40 | #60 | #100 | #200 | 100 |

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Client: Cremer & 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
Tested By: A. Whipple
Date: 7/2/2007
Authorized By: Client
Date: 6/29/2007

Type of Sample: Silty/clayey sand
Location of Sample: LS-8 @ 2'

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>Natural Moisture Content, %</td>
<td>2.9</td>
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<td>D2216</td>
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<tr>
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<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
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<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>97</td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>92</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>58</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>25.7</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7802280

Project: St. George Replacement Airport
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

Project #: 07330

Sieve Analysis, ASTM C136 Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>5.7</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
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</tr>
<tr>
<td>50 mm</td>
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<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td>A-6(3)</td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>100</td>
<td></td>
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<td></td>
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<tr>
<td>150 µm</td>
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<td>61</td>
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<td></td>
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<tr>
<td>75 µm</td>
<td>#200</td>
<td>38.5</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.4</td>
<td>61.1</td>
<td>38.5</td>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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: 8/29/2007

### Sieve Analysis, ASTM C138

<table>
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<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
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<td>125</td>
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<td>Natural Moisture Content, %</td>
<td>Liquid Limit</td>
<td>53</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
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<td>4&quot;</td>
<td>Plasticity Index</td>
<td>25</td>
<td>D 4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>3&quot;</td>
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<td></td>
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</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
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<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
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</tr>
<tr>
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<td>1&quot;</td>
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<td>12.5</td>
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<tr>
<td>9.5</td>
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<td>4.75</td>
<td>#4</td>
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</tr>
<tr>
<td>2.00</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>425 µm</td>
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</tr>
<tr>
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<tr>
<td>75 µm</td>
<td>#200</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

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

![Graph](image-url)
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:
Lab# 78G2051

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens Date: 8/29/2007
Type of Sample: Lean clay
Tested By: A. Whipple Date: 7/2/2007
Location of Sample: WT-3 @ 22'
Authorized By: Client Date: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
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<td>Natural Moisture Content, %</td>
</tr>
<tr>
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<td>4&quot;</td>
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</tr>
<tr>
<td>75</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50</td>
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</tr>
<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
</tr>
<tr>
<td>25</td>
<td>1&quot;</td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>19</td>
<td>3/4&quot;</td>
<td>Test Standards are ASTM unless otherwise noted.</td>
</tr>
<tr>
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<td>D2216</td>
</tr>
<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td>D4318</td>
</tr>
<tr>
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<td>#4</td>
<td>D4318</td>
</tr>
<tr>
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<td>#10</td>
<td>2.00</td>
</tr>
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<td>150</td>
<td>#100</td>
<td>150</td>
</tr>
<tr>
<td>75</td>
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</tr>
<tr>
<td>1</td>
<td>#20</td>
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Test Standards are ASTM unless otherwise noted.

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<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
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<tbody>
<tr>
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<td></td>
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</tr>
<tr>
<td>Liquid Limit</td>
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<td></td>
<td>D4318</td>
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<td>Plasticity Index</td>
<td>16</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
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<td></td>
<td>D2437</td>
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<td>AASHTO M145</td>
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Legend:

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
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<td>&lt; #4 - #200</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Log(x) vs. Percent Passing Graph

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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 @30'
Authorized By: Client
Date: 6/29/2007

Sieve Analysis, ASTM C136

<table>
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<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
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<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>D2216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td>46</td>
<td>D 4318</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>22</td>
<td>D 4318</td>
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<tr>
<td>50 mm</td>
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<td>Unified Classification System</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>160 μm</td>
<td>#100</td>
<td></td>
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<tr>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<td>0.0</td>
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</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 7SG2054

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

Project: St. George Replacement Airport
Project #: 07330

Location: St. George
Sampled By: R. Owens
Date: 6/29/2007
Tested By: A. Whipple
Date: 7/2/2007
Location of Sample: WT-5 @ 22'
Authorized By: Client
Date: 6/29/2007

Type of Sample: Lean clay

<table>
<thead>
<tr>
<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
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<tbody>
<tr>
<td>125 mm</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
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<td></td>
<td>D2216</td>
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<tr>
<td>Liquid Limit</td>
<td>38</td>
<td></td>
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</tr>
<tr>
<td>Plasticity Index</td>
<td>18</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>#4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# SOIL CLASSIFICATION REPORT

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

**Date of Report:** 7/3/2007

**Reviewed By:**

**Lab#:** 7SG2050

**Project:** St. George Replacement Airport  
**Project #:** 07330

**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/29/2007

**Type of Sample:** Lean clay  
**Tested By:** A. Whipple  
**Date:** 7/2/2007

**Location of Sample:** WT-8 @ 12'  
**Authorized By:** Client  
**Date:** 8/29/2007

## Sleeve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
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<tr>
<td>125 mm</td>
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<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
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</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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</tbody>
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<table>
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<tr>
<th>Test Standards</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>Liquid Limit</td>
<td>49</td>
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</tr>
<tr>
<td>Plasticity Index</td>
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<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
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<td>AASHTO M 145</td>
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</tbody>
</table>

## Grading Limitations

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<tr>
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<th>% Gravel</th>
<th>% Sand</th>
<th>% Slit-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt;#200</td>
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<td>0.0</td>
</tr>
</tbody>
</table>

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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 8/29/2007

Type of Sample: Fat clay  
Tested By: A. Whipple  
Date: 7/2/2007

Location of Sample: WT-6 @ 32'  
Authorized By: Client  
Date: 8/29/2007

Test Standards are ASTM unless otherwise noted.

<table>
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<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
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<th>Test Standard</th>
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<tr>
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<td>D 4318</td>
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<tr>
<td>75 mm</td>
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<td>D 2487</td>
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</tr>
<tr>
<td>37.5 mm</td>
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<td>AASHTO Classification System</td>
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<td>AASHTO M145</td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
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<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
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<td></td>
</tr>
</tbody>
</table>

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

0.0  
0.0  
0.0  
0.0

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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: Leen clay  
Tested By: A. Whipple  
Date: 7/2/2007

Location of Sample: WT-7 @ 7'

---

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>9.3</td>
<td>D2218</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
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<td>D 4318</td>
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<tr>
<td>75 mm</td>
<td>3&quot;</td>
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<td>D 4318</td>
<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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</table>

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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

---

Log(s)

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### 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

#### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>24</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>8</td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

#### % Cobble
- **% Cobble > 3"**
  - 0.0

#### % Gravel
- **% Gravel < 3" - #4**
  - 0.0

#### % Sand
- **% Sand < #4 - #200**
  - 0.0

#### % Silt-Clay
- **% Silt-Clay < #200**
  - 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#: 7SG2068

Project #: 97330

Project: St. George Replacement Airport
Location: St. George
Type of Sample: Lean clay
Location of Sample: WT-8 @ 7'
Sampled By: R. Owens
Tested By: A. Whipple
Date: 6/29/2007
Date: 7/2/2007

Authorized By: Client
Date: 6/29/2007

Slieve Analysis, ASTM C136

<table>
<thead>
<tr>
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<th>% Passing Cumulative</th>
<th>Specification</th>
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<tbody>
<tr>
<td>125 mm 5&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 mm 4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 mm 3&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 mm 2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.5 mm 1-1/2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm 1&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm 3/4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm 1/2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm 3/8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm #4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm #10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 µm #40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 µm #100</td>
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</tr>
<tr>
<td>75 µm #200</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td></td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>30</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>13</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

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

Log(x)

% Passing
**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:** 7/12/2007  
**Location of Sample:** WT-8 @ 11'  
**Authorized By:** Client  
**Date:** 6/29/2007

---

### Soil Classification Report

#### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>60 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td></td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>24</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>9</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2437</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

### Log(x) Graph

<table>
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<th>Percent Passing</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
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<tbody>
<tr>
<td>Sieve Size</td>
<td>100</td>
<td>50</td>
<td>25</td>
<td>10</td>
<td>5</td>
<td>2.5</td>
<td>1</td>
<td>0.5</td>
<td>0.3</td>
<td>0.1</td>
<td></td>
</tr>
</tbody>
</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
## 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

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>20.1</td>
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<td>D2216</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
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<td>Liquid Limit</td>
<td>50</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
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<td>D4318</td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>4/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Log(p)

The graph shows the log of the percentage passing (p) for various sieve sizes, ranging from 100 mm down to 0.1 mm. The x-axis represents the sieve sizes, while the y-axis shows the log of the percentage passing.

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: ____________________________
Lab#: 78G2291

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
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
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<tbody>
<tr>
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<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content,%</td>
<td>19.7</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
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<td>Liquid Limit</td>
<td>47</td>
<td>D 4318</td>
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<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>25</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
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<td>2.00 mm</td>
<td>#10</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Log(x)

Percent Passing

Sieve Size

100 mm 20 mm 10 mm 5 mm 2 mm 1 mm 0.5 mm 0.3 mm 0.1 mm

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

Date of Report: 7/3/2007  
Reviewed By:  
Lab#: 78G2134

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

---

### Soil Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>14.5</td>
<td>D2216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
<td>55</td>
<td>D4318</td>
<td></td>
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<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td>32</td>
<td>D4316</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Dry Unit Weight, pcf</td>
<td>40.1</td>
<td>C29</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
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</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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<tr>
<td>75 μm</td>
<td>#200</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&gt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
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</tr>
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</table>

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**Log(x)**

![Logarithmic graph showing particle size distribution](image-url)

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### 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:**

**Test Standards are ASTM unless otherwise noted.**

#### Sieve Analysis, ASTM C138

<table>
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<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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<td>62</td>
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<td>3&quot;</td>
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<td>37</td>
<td></td>
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</tr>
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<tr>
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<td>3/4&quot;</td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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</tr>
<tr>
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</tr>
<tr>
<td>4.75 mm</td>
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</tr>
<tr>
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<td>#10</td>
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</table>

#### Graph

- Log(x)
- Percent Passing

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# SOIL CLASSIFICATION REPORT

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab# C:** 78G02141  

**Project:** St. George Replacement Airport  
**Project #:** 07330  

**Location:**  
**Type of Sample:** Lean clay  
**Location of Sample:** RW-5 @ 22'  

**Samples By:** R. Owens  
**Tested By:** A. Whipple  
**Approved By:** Client  
**Date:** 6/29/2007

## Sleeve Analysis, ASTM C136

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<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
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<tr>
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<tr>
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<td>2&quot;</td>
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<td>D2487</td>
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<tr>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<td>9.5 mm</td>
<td>3/8&quot;</td>
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</tr>
<tr>
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<td>#10</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
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<td></td>
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</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
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<td>#200</td>
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## Log(x)

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
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<tr>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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 #: 07330
Location: St. George
Sampled By: R. Owens
Date: 6/29/2007
Tested By: A. Whipple
Date: 7/2/2007
Location of Sample: RW-5 @ 32'
Authorized By: Client
Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

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<th>% Passing Cumulative</th>
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<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
<td>125 mm</td>
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<td>D 2487</td>
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</tr>
<tr>
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<td>1-1/2&quot;</td>
<td></td>
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<td>AASHTO M145</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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</tr>
<tr>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
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<tr>
<td>150 μm</td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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</tr>
</tbody>
</table>

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

Log(x) graph with sieves sizes ranging from 0.1 mm to 100 mm.
### Soil Classification Report

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

**Date of Report:** 7/3/2007

**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

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<tr>
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<td>1/2&quot;</td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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</tr>
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<tr>
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<tr>
<td>75 μm</td>
<td>#200</td>
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</tr>
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</table>

#### % Cobble  
% Gravel  
% Sand  
% Silt-Clay

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

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## 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:**  Lean clay  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Location of Sample:** RW-8 @ 11'  
**Authorized By:** Client  
**Date:** 8/29/2007

### Sieve Analysis, ASTM C136

<table>
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<th>Sieve Size (mm)</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
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<tr>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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</tr>
<tr>
<td>75 μm</td>
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<tr>
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<td></td>
<td><strong>% Silt-Clay</strong></td>
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</tbody>
</table>

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

---

**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
## Soil Classification Report

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

**Date of Report:** 7/3/2007

**Reviewed By:** [Blank]

**Lab #:** 7SG2099

**Project #:** 07330

**Project:** St. George Replacement Airport

**Location:** St. George

**Sampled By:** R. Owens  
**Date:** 8/29/2007

**Tested By:** A. Whipple  
**Date:** 7/12/2007

**Authorized By:** Client  
**Date:** 8/29/2007

### Sieve Analysis, ASTM C136

<table>
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<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
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<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>Liquid Limit</td>
<td>26</td>
<td>D 4318</td>
<td>D 2216</td>
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<tr>
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<td></td>
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<td>D 2487</td>
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<tr>
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<td>AASHTO Classification System</td>
<td></td>
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<tr>
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<td>1-1/2&quot;</td>
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</tr>
<tr>
<td>25 mm</td>
<td>4&quot;</td>
<td></td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<tr>
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<td>3/8&quot;</td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
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<tr>
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<td>#10</td>
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<tr>
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<td>#40</td>
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<tr>
<td>150 µm</td>
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<tr>
<td>75 µm</td>
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### Log (x)

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<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<tr>
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</tbody>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test Standards are ASTM unless otherwise noted.</th>
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<tbody>
<tr>
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<td>Natural Moisture Content, %</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>4&quot;</td>
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<tr>
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<td>3/4&quot;</td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
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</tr>
<tr>
<td>9.5 mm</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
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<tr>
<td>425 μm</td>
<td>#40</td>
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<tr>
<td>150 μm</td>
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<td></td>
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</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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Test Standard:

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

Below is the graph for the sieve analysis.
# Soil Classification Report

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab #:** 7SG32146

**Project:** St. George Replacement Airport  
**Sampled By:** R. Owens  
**Tested By:** A. Whipple  
**Location:** St. George  
**Sampled Date:** 6/29/2007  
**Tested Date:** 7/2/2007  
**Location of Sample:** ET-3 @ 17”  
**Authorized By:** Client  
**Authorized Date:** 6/29/2007

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<td>5”</td>
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<td>4”</td>
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<td></td>
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<tr>
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</tr>
<tr>
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<td>1”</td>
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</tr>
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<td>19 mm</td>
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<tr>
<td>12.5 mm</td>
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</tr>
<tr>
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<td>3/8”</td>
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<td></td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3”</th>
<th>% Gravel &lt; 3” - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<tr>
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</table>

**Log(x)**

- **Percent Passing:**
  - 0% to 100%
  - 100 mm to 0.1 mm

**Location:** 525 N. 3050 E. Suite 3, St. George, UT 84790  
**Phone:** (435) 986-0566  
**Fax:** (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:

Lab#: 7892150

Project: St. George Replacement Airport  
Project #: 07330

Location: St. George  
Sampled By: R. Owens  
Date: 8/29/2007

Type of Sample: Lean clay  
Tested By: A. Whipple  
Date: 7/2/2007

Location of Sample: ET-4 @ 32.5'  
Authorized By: Client  
Date: 8/29/2007

Sieve Analysis, ASTM C136  
Test Standards are ASTM unless otherwise noted.

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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
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<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
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<tr>
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</tr>
<tr>
<td>2.00 mm</td>
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<tr>
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<tr>
<td>75 μm</td>
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<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 7SO2151

Project #: 07330

Project: St. George Replacement Airport
Location: St. George
Sampled By: R. Owens
Tested By: A. Whipple
Date: 6/29/2007
Date: 7/2/2007

Type of Sample:
Location of Sample: ET-5 @ 2'
Authorized By: Client
Date: 6/29/2007

Sieve Analysis, ASTM C136

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<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
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<tr>
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<td>150 μm</td>
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<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
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<td>&lt; #4 - #200</td>
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</table>

Log(x) - Percent Passing vs Sieve Size

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<td>Natural Moisture Content, %</td>
<td>45</td>
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<tr>
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<td>Liquid Limit</td>
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<tr>
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<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
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<tbody>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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
Tested By: A. Whipple
Date: 7/2/2007
Location of Sample: ET-5 @ 22'
Authorized By: Client
Date: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Slv Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>Liquid Limit</td>
<td>40</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Plasticity Index</td>
<td>15</td>
<td>D 4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Unified Classification System</td>
<td>D 2487</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>% Cobble &gt; 3&quot;</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>% Sand &lt; #4 - #200</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>% Silt-Clay &lt; #200</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Log(x)

100 mm 20 mm 10 mm 6 mm 4 mm 3 mm 2 mm 1 mm 0.8 mm 0.6 mm 0.3 mm 0.1 mm

Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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  
Tested By: A. Whipple  
Date: 7/2/2007  
Authorized By: Client  
Date: 6/29/2007

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

**Test Standards** are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test Standard</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2216</td>
<td>Natural Moisture Content, %</td>
<td>20.1</td>
<td></td>
</tr>
<tr>
<td>D 4318</td>
<td>Liquid Limit</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>D 4318</td>
<td>Plasticity Index</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>D 2487</td>
<td>Unified Classification System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AASHTO M145</td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Log(x)**

100 mm  | 20 mm  | 10 mm  | 6 mm  | 2 mm  | 1 mm  | 0.6 mm | 0.3 mm | 0.1 mm

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 7902204

**Project:** St. George Replacement Airport  
**Project #:** 07330  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Location:** St. George  
**Sampled Date:** 6/29/2007  
**Authorized By:**  
**Date:** 6/29/2007

**Type of Sample:** Fat clay  
**Location of Sample:** ET-6 @ 17'

---

**Sieve Analysis, ASTM C136**  
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Dry Unit Weight, pcf</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>Unified Classification System</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>AASHTO Classification System</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

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

---

**Graph:** Log(x) on a log-log scale with sieve size on the x-axis and percent passing on the y-axis.

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Client: Cremer & Noble Engineers
433 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

Tested By: A. Whipple
Date: 7/2/2007

Authorized By: Client
Date: 6/29/2007

Type of Sample: Fat clay

Location of Sample: ET-6 @ 27'

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>57</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>30</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;3&quot;</td>
<td>&lt;3&quot; - #4</td>
<td>&lt;#4 - #200</td>
<td>&lt;#200</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Log(x)

100 mm  20 mm  10 mm  5 mm  2 mm  1 mm  0.5 mm  0.3 mm  0.1 mm

Sieve Size

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# Soil Classification Report

**Client:** Cremer & 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  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Location:** ET-6 @ 37'  
**Authorized By:** Client  
**Date:** 6/29/2007

## Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>Specification</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>Specification</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>Specification</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>Specification</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>Specification</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>Specification</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Limit</td>
<td>57</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>30</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
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<td>AASHTO M143</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
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<td>0.0</td>
<td>0.0</td>
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</tbody>
</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
**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 #: 07330  
Project: SL George Replacement Airport

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**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>37</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>15</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td>% Silt-Clay &lt; #200</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
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</tr>
<tr>
<td>150 μm</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Diagram**

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## 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  
**Sampled By:** R. Owens  
**Date:** 8/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 8/29/2007

### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
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<td></td>
<td>Natural Moisture Content, %</td>
<td></td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td>30</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>12</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
<td></td>
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<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25</td>
<td>1&quot;</td>
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<td></td>
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<tr>
<td>19</td>
<td>3/4&quot;</td>
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</tr>
<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td></td>
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</tr>
<tr>
<td>4.75</td>
<td>#4</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.00</td>
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<td></td>
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</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
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<tr>
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### Particle Size Distribution

<table>
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<tr>
<th>Particle Size (inches)</th>
<th>% Cobble</th>
<th>% Gravel &lt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<tr>
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<td>0.0</td>
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</tr>
</tbody>
</table>

## Diagram

![Log(x) Plot](image)

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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  
Tested By: A. Whipple  
Location of Sample: ET-9 @ 7"  
Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>33</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td>15</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>15</td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<td>4.75 mm</td>
<td>#4</td>
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<td>2.00 mm</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### Soil Classification Report

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

**Date of Report:** 7/3/2007

**Reviewed By:**  
**Lab #:** 7SG2226

**Project:** St. George Replacement Airport  
**Sampled By:** R. Owens  
**Location:** St. George  
**Tested By:** A. Whipple  
**Location of Sample:** A-4 @ 10'  
**Project #:** 07330

**Sample Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>Liquid Limit</td>
<td>NP</td>
<td>D2216</td>
<td></td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Plastocity Index</td>
<td>NP</td>
<td>D4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Unified Classification System</td>
<td>D2487</td>
<td></td>
<td></td>
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<tr>
<td>50 mm</td>
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<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
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<td></td>
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</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**% Cobble:** 0.0  
**% Gravel:** 0.0  
**% Sand:** 0.0  
**% Silt-Clay:** 0.0

---

**Log(x)**

- **% Passing**
  - 100 mm  
  - 20 mm  
  - 10 mm  
  - 5 mm  
  - 2 mm  
  - 1 mm  
  - 0.6 mm  
  - 0.3 mm  
  - 0.1 mm

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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 #:** 07330

**Sampled By:** R. Owens  
**Date:** 6/29/2007

**Tested By:** A. Whipple  
**Date:** 7/2/2007

**Location:** St. George

**Type of Sample:** Silty

**Location of Sample:** A-4 @ 15'

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
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<td></td>
<td>D2216</td>
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<td>100 mm</td>
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<td>Liquid Limit</td>
<td>NP</td>
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<td>D 4318</td>
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<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>NP</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td>% Silty-Clay &lt; #200</td>
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</tr>
</tbody>
</table>

% Cobble: 0.0  
% Gravel: 0.0  
% Sand: 0.0  
% Silty-Clay: 0.0

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
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<tbody>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
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<tr>
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<td>3&quot;</td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
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</tr>
<tr>
<td>160 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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</tbody>
</table>

### Test Standards

- **Natural Moisture Content, %**
  - Test: D2216
- **Liquid Limit**
  - Result: NP (Not Provided)
  - Specification: D 4318
- **Plasticity Index**
  - Result: NP (Not Provided)
  - Specification: D 4318
- **Unified Classification System**
  - Specification: D 2487
- **AASHTO Classification System**
  - Specification: AASHTO M145

### Petri Chart

- **% Cobble**: 0.0
- **% Gravel**: 0.0
- **% Sand**: 0.0
- **% Silt-Clay**: 0.0

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification Test Standard</th>
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<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
<td>NP</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
<td>NP</td>
<td></td>
<td>D 4318</td>
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<td>3&quot;</td>
<td>Plasticity Index</td>
<td>NP</td>
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<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
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<tr>
<td>37.5 mm</td>
<td>1 1/2&quot;</td>
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</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>425 μm</td>
<td>#40</td>
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<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
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<tr>
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</tbody>
</table>

![Graph](image)
## Soil Classification Report

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab #: 78G2232**

**Project:** St. George Replacement Airport  
**Project #: 07330**

**Location:** St. George  
**Sampled By:** R. Owens  
**Tested By:** A. Whipple  
**Details:** Date: 6/29/2007  
**Authorized By:** Client  
**Details:** Date: 6/29/2007

### Slope Analysis, ASTM C136

<table>
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<th>Slope Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
<td>20.1</td>
<td>D2216</td>
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<tr>
<td>100 mm</td>
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<td>Liquid Limit</td>
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<td>D 4318</td>
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<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td>33</td>
<td>D 4318</td>
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<td></td>
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<td>Dry Unit Weight, pcf</td>
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<td>C 29</td>
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<tr>
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<td></td>
<td>D 2487</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 9/29/2007
Tested By: A. Whipple
Date: 7/2/2007
Authorized By: Client
Date: 6/29/2007

Type of Sample: Lean clay
Location of Sample: A-8 @ 10'

Test Standards are ASTM unless otherwise noted.

<table>
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<th>% Passing Cumulative</th>
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<th>Test</th>
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Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

Date of Report: 7/3/2007

Reviewed By:  
Lab#: TSG2237

**Project:** St. George Replacement Airport  
**Project #:** 07330

**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/29/2007

**Type of Sample:** Lean clay  
**Tested By:** A. Whipple  
**Date:** 7/2/2007

**Location of Sample:** A-7 @ 5'  
**Authorized By:** Client  
**Date:** 8/29/2007

**Sieve Analysis, ASTM C136**

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<td>75 μm</td>
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Test Standards are ASTM unless otherwise noted.

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<td>AASHTO M145</td>
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<th>% Silt-Clay &lt; #200</th>
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Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

Client: Cremer & 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: 7/22/2007

Location of Sample: LS-2 @ 10'
Authorized By: Client
Date: 6/29/2007

Sieve Analysis, ASTM C136

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<tr>
<td>19 mm</td>
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<tr>
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<th>% Silt-Clay &lt; #200</th>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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. Owans  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

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<th>Test</th>
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<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Client: Cremer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By:
Lab#: 7SG2271

Project #: 07330
Type of Sample: Lean clay
Location of Sample: LS-5 @ 15'

Location: St. George
Sampled By: R. Owens
Tested By: A. Whipple
Date: 6/29/2007
Authorized By: Client
Date: 8/29/2007

Sieve Analysis, ASTM C136

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<th>Test</th>
<th>Result</th>
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<td>9.5 mm</td>
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</table>

Log(x)

Percent Passing

Sieve Size

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## 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:** SL George Replacement Airport  
**Project #:** 07330  
**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**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

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
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<tr>
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<tr>
<td>4.75 mm</td>
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### Logarithmic Graph

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<tr>
<td>1 1/2&quot;</td>
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</tr>
<tr>
<td>2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

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525 N. 3050 E. Suite 3, St. George, UT 84790  
Phone: (435) 986-0566  
Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

Client: Cremer & 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: Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<tr>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<tr>
<td>9.5 mm</td>
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<tr>
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<td>75 μm</td>
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</table>

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

![Log(x) graph](image-url)
### 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:** 8/29/2007

**Type of Sample:** Lean clay  
**Tested By:** A. Whipple  
**Date:** 7/1/2007

**Location of Sample:** LS-7 @ 5'  
**Authorized By:** Client  
**Date:** 8/29/2007

#### Sleeve Analysis, ASTM C136

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<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<tr>
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#### Logarithmic Scale

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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
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<td>% Cobble</td>
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<tr>
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<tr>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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
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

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<th>Test</th>
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<th>Specification</th>
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<tr>
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<thead>
<tr>
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<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Project: St. George Replacement Airport
Location: St. George
Type of Sample: 
Location of Sample: WT-1 @ 8'
Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 7SG2193

Test Standards are ASTM unless otherwise noted.

<table>
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<th>% Passing Cumulative</th>
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<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
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<tr>
<td>2.00 mm</td>
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<tr>
<td>425 μm</td>
<td>#40</td>
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<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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Log(x)

<table>
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<tr>
<th>Slave Size</th>
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<tbody>
<tr>
<td>100 mm</td>
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<td>16 mm</td>
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</tr>
<tr>
<td>12 mm</td>
<td>10</td>
</tr>
<tr>
<td>11 mm</td>
<td>10</td>
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</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

**Client:** Cremer & 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  
**Sampled By:** R. Owens  
**Date:** 8/28/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 8/28/2007

**Location:** St. George  
**Location of Sample:** WT-1 @ 5'

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
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<tr>
<td>100 mm</td>
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<td>Liquid Limit</td>
<td>D 4318</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td>D 4318</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
<td>D2487</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
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<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
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</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 8/29/2007  
Tested By: A. Whipple  
Date: 7/2/2007  

Location of Sample: WT-2 @ 5'  
Authorized By: Client  
Date: 8/29/2007  

Sieve Analysis, ASTM C136  
Test Standards are ASTM unless otherwise noted.  

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>8.5</td>
<td></td>
<td>D2218</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Dry Unit Weight, pcf</td>
<td>99.3</td>
<td></td>
<td>C 29</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td>% Silt-Clay &lt; #200</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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  
**Tested By:** A. Whipple  **Date:** 7/2/2007

**Type of Sample:**  
**Location of Sample:** WT-3 @ 2'

**Authorized By:** Client  **Date:** 8/28/2007

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Dry Unit Weight, pcf</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>Unified Classification System</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>AASHTO Classification System</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
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<tr>
<td>Liquid Limit</td>
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<td>D 4316</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4316</td>
</tr>
<tr>
<td>Dry Unit Weight, pcf</td>
<td>108.5</td>
<td></td>
<td>C 29</td>
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<tr>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

| % Cobble > 3"                              | 0.0    |               |               |
| % Gravel < 3" - #4                         | 0.0    |               |               |
| % Sand < #4 - #200                         | 0.0    |               |               |
| % Silt-Clay < #200                         | 0.0    |               |               |
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 73G2285

Project: St. George Replacement Airport
Project #: 07330
Location: St. George
Sampled By: R. Owens
Date: 8/29/2007
Type of Sample: 
Tested By: A. Whipple
Date: 7/2/2007
Location of Sample: WT-4 @ 1'
Authorized By: Client
Date: 8/29/2007

Sieve Analysis, ASTM C136
Test Standards are ASTM unless otherwise noted.

<table>
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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
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<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Liquid Limit</td>
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<td>D4318</td>
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<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
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<tr>
<td>Unified Classification System</td>
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<td>D2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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

---

**Soil Analysis, ASTM C136**  
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
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<tbody>
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<td>Natural Moisture Content, %</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
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<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
<td></td>
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<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
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<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
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</table>

---

[Graph showing log(x) vs. percent passing]

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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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 #: 67330  
Sampled By: R. Owens  
Date: 6/29/2007  
Tested By: A. Whipple  
Date: 7/2/2007  
Authorized By: Client  
Date: 6/29/2007

Location: St. George  
Type of Sample:  
Location of Sample: WT-4 @ 12`

Soil Classification Report

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
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<tr>
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<td>D 4318</td>
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<tr>
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<tr>
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</table>

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

0.0  0.0  0.0  0.0

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## 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:** 8/29/2007  

**Type of Sample:** WT-5 @ 42'  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  

**Location of Sample:**  
**Authorized By:** Client  
**Date:** 8/28/2007  

### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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<tr>
<td>50 mm</td>
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<td>Dry Unit Weight,pcf</td>
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<tr>
<td>25 mm</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
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</tr>
<tr>
<td>12.5 mm</td>
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<td></td>
<td>% Gravel &lt; 3&quot; - #4</td>
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<td></td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<td>% Sand &lt; #4 - #200</td>
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<tr>
<td>4.75 mm</td>
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<td>% Silty-Clay #200</td>
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<tr>
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<td>75 μm</td>
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Logarithmic scale graph showing percent passing versus sieve size.
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 7S02059

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  
Test Standards are ASTM unless otherwise noted.

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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
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<th>Specification</th>
<th>Test Standard</th>
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<td>Plasticity Index</td>
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<td>Unified Classification System</td>
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<td>D 2487</td>
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<td>25 mm</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<tr>
<td>4.75 mm</td>
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<tr>
<td>150 µm</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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Log(x)  

Percent Passing
SOIL CLASSIFICATION REPORT

Client: Cremer & 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-9 @ 2'
Authorized By: Client Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

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<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td></td>
<td>Natural Moisture Content, %</td>
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<tr>
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<td>3&quot;</td>
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<td>Plasticity Index</td>
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<td>50 mm</td>
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<td>Unified Classification System</td>
<td>D 2487</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>AASHTO Classification System</td>
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<tr>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<tr>
<td>12.5 mm</td>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>425 μm</td>
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<td>75 μm</td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
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<tbody>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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
Type of Sample: Clay
Date: 6/29/2007
Location of Sample: RW-4 @ 27'
Tested By: A. Whipple
Date: 7/2/2007
Authorized By: 

Test Standards are ASTM unless otherwise noted.

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<th>Test</th>
<th>Result</th>
<th>Specification</th>
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<tr>
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<td></td>
<td>D 4318</td>
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<td>Dry Unit Weight, pcf</td>
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<td>C 29</td>
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<td>#200</td>
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<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
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<tbody>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab #:** 79G2136

**Project:** St. George Replacement Airport  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/29/2007

**Location:** St. George  
**Location of Sample:** RW-5 @ 7'

---

**Sieve Analysis, ASTM C136**  
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
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<td>D2216</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
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<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</tbody>
</table>

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**Log(k)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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  
**Sampled By:** R. Owens  
**Sample Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Test Date:** 7/2/2007  
**Authorized By:** Client  
**Authorized Date:** 8/29/2007

**Type of Sample:**  
**Location:** St. George  
**Location of Sample:** RW-8 @ surface

### Sieve Analysis, ASTM C136

<table>
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<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
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<table>
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<th>% Gravel &lt; 3&quot; #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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**Log (x)**

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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Project: St. George Replacement Airport

Location: St. George

Sampled By: R. Owens Date: 6/29/2007

Tested By: A. Whipple Date: 7/2/2007

Authorized By: Client Date: 6/29/2007

Sieve Analysis, ASTM C136

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
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<td>Natural Moisture Content, %</td>
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<tr>
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<td></td>
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</tr>
<tr>
<td>75 mm</td>
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<td></td>
<td>D 2487</td>
</tr>
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<td>AASHTO M145</td>
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<td>#200</td>
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</table>
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  
Test Standards are ASTM unless otherwise noted.

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<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tr>
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<td>3/8&quot;</td>
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<td>2.00 mm</td>
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<tr>
<td>75 μm</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
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<tbody>
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<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**Soil Classification Report**

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

Project: SL George Replacement Airport  

Location: St. George  

Type of Sample:  

Location of Sample: ET-6 @ 2'  

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 7SG2201  
**Project #:** 07330  
**Sampled By:** R. Owens  
**Date:** 6/29/2007  
**Tested By:** A. Whipple  
**Date:** 7/2/2007  
**Authorized By:** Client  
**Date:** 6/29/2007

**Sieve Analysis, ASTM C136**

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
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<tr>
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<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
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<td>D 4318</td>
<td></td>
</tr>
<tr>
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<td>Dry Unit Weight, pcf</td>
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<tr>
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<td>3/4&quot;</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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</table>

**Log(x)**

525 N. 3050 E, Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Client: Creamer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 7/3/2007
Reviewed By: _______________________
Lab#: 73G2203

Project: ST George Replacement Airport
Location: ST George
Type of Sample: _______________________
Location of Sample: ET-6 @ 12'
Sampled By: R. Owens Date: 6/29/2007
Tested By: A. Whipple Date: 7/2/2007
Authorized By: Client Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

<table>
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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<td></td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
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<td>D 4318</td>
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<tr>
<td>12.5 mm</td>
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</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
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<td></td>
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</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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<td>75 μm</td>
<td>#200</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Log(x) vs. Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

Client: Cremer & 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  
Sampled By: R. Owens  
Date: 6/29/2007  
Tested By: A. Whipple  
Date: 7/2/2007  
Authorized By: Client  
Date: 6/29/2007

**Sieve Analysis, ASTM C136**

<table>
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<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>% Natural Moisture Content, %</td>
<td>21.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
<td>D4318</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>25 mm</td>
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<td>AASHTO M145</td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
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</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
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</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
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</tr>
<tr>
<td>150 µm</td>
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<td>75 µm</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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</tr>
</tbody>
</table>

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525 N. 3050 E. Suite 3, St. George, UT 84790 ● Phone: (435) 986-0566 ● Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 7832196

**Project:** St. George Replacement Airport  
**Project #:** 07330

**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/29/2007

**Type of Sample:**  
**Tested By:** A. Whipple  
**Date:** 7/2/2007

**Location of Sample:** ET-7 @ surface  
**Authorized By:** Client  
**Date:** 8/29/2007

**Sieve Analysis, ASTM C136**  
**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
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<td></td>
<td>Natural Moisture Content, %</td>
<td>1.0</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td>% Cobble &gt; 3&quot;</td>
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<td></td>
</tr>
<tr>
<td>19 mm</td>
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<td>% Gravel &lt; 3&quot; - #4</td>
<td>0.0</td>
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<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td>% Silt-Clay &lt; #200</td>
<td>0.0</td>
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</tr>
<tr>
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<td>#4</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
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</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td></td>
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</tbody>
</table>

**Log(x)**

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By:
Lab#: TSG2209

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: 7/22/2007

Location of Sample: ET-7 @ 2'
Authorized By: Client  Date: 6/29/2007

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>100</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>100</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>100</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>98</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>83</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>70.8</td>
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<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>15.0</td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>D2487</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<tr>
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<td>0.0</td>
<td>29.1</td>
<td>70.8</td>
</tr>
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</table>

Log(x)

Percent Passing
### Soil Classification Report

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

**Date of Report:** 7/3/2007  
**Reviewed By:**  
**Lab#:** 7802197

**Project:** SL 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

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>4&quot;</td>
<td></td>
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<tr>
<td>75</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>160 µm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

#### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>18.3</td>
<td>D2218</td>
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<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
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<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

#### Size Distribution

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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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: 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

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sluice Analysis, ASTM C136</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>% Passing Cumulative</td>
<td>Natural Moisture Content, %</td>
<td>D2216</td>
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<tr>
<td>125 mm</td>
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<td>Liquid Limit</td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Plasticity Index</td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
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<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# Moisture Content and Unit Weight of Soil

(In General Accordance with ASTM D2937 and D2216)

**Project:** Landmark Testing  
**No:** M00431-008  
**Location:** St. George, UT  
**Date:** 6/29/2007  
**By:** BRR

<table>
<thead>
<tr>
<th>Sample Info.</th>
<th>Boring No.</th>
<th>WT-5</th>
<th>WT-4</th>
<th>WT-3</th>
<th>RW-6</th>
<th>RW-7</th>
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<tbody>
<tr>
<td>Sample</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Depth</td>
<td>37</td>
<td>37</td>
<td>27</td>
<td>21</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Split</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Split sieve</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total sample (g) |            |      |      |      |      |      |
| Moist coarse fraction (g) |            |      |      |      |      |      |
| Moist split fraction (g) |            |      |      |      |      |      |

| Unit Weight Data |            |      |      |      |      |      |
| Sample height, H (in) |            | 0.00 | 5.00 | 5.00 | 4.00 | 4.00 |
| Sample diameter, D (in) |            | 2.416 | 2.416 | 2.416 | 2.416 | 2.416 |
| Wt. rings + wet soil (g) |            | 44.82 | 943.32 | 971.69 | 778.61 | 754.48 |
| Wt. rings/tare (g) |            | 222.35 | 119.8 | 128.4 | 124.8 | 121.6 |
| Moist unit wt., $\gamma_m$ (pcf) |            | 119.8 | 128.4 | 124.8 | 121.6 | 127.3 |

| Moisture Data | Wet soil + tare (g) | 285.76 | 436.23 | 382.92 | 508.30 | 572.69 | 493.93 | 508.28 | 591.32 |
| Dry soil + tare (g) |            | 374.61 | 469.02 | 466.45 | 452.57 | 426.97 | 549.67 |
| Tare (g) |            | 140.54 | 224.09 | 225.15 | 211.23 | 228.84 | 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., $\gamma_d$ (pcf) |            | 90.9 | 94.9 | 108.8 | 107.5 | 119.8 | 103.8 | 102.9 | 115.3 |

Entered by:  
Reviewed:
### Moisture Content and Unit Weight of Soil

*In General Accordance with ASTM D2937 and D2216*

**Project:** Landmark Testing  
**No:** M00431-009  
**Location:** St. George, UT  
**Date:** 7/11/2007  
**By:** BRR

<table>
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<tbody>
<tr>
<td></td>
<td>Sample</td>
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</tr>
<tr>
<td></td>
<td>Depth</td>
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<td>22</td>
<td>7</td>
<td>27</td>
<td>17</td>
<td>32</td>
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<td>5</td>
</tr>
<tr>
<td></td>
<td>Split</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Split sieve</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total sample (g)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Moist coarse fraction (g)</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Moist split fraction (g)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Unit Weight Data | Sample height, H (in) | 5.000 | 5.850 | 5.300 | 5.050 | 4.000 | 3.000 | 5.000 | 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 | 949.61 | 974.40 | 942.45 | 543.97 | 1074.73 | 926.36 |
| Wt. rings/tare (g) | 218.82 | 232.32 | 210.46 | 216.81 | 174.10 | 133.42 | 216.81 | 0.00 |
| Moist unit wt., $\gamma_m$ (pcf) | 1188.6 | 121.9 | 116.3 | 124.7 | 122.2 | 113.7 | 118.1 | 131.4 |
| Wet soil + tare (g) |            |      |      |      |      |      |      |     |     |
| Dry soil + tare (g) |            |      |      |      |      |      |      |     |     |
| Tare (g) |            |      |      |      |      |      |      |     |     |
| Moisture content (%) |            |      |      |      |      |      |      |     |     |

| Moisture Data | Wet soil + tare (g) | 518.55 | 478.95 | 663.46 | 512.02 | 649.02 | 649.92 | 1015.80 | 985.55 |
| Dry soil + tare (g) | 547.55 | 432.92 | 603.26 | 460.40 | 550.65 | 598.57 | 981.41 | 901.24 |
| Tare (g) | 17.96 | 212.10 | 221.63 | 208.49 | 212.41 | 195.59 | 228.50 | 181.32 |
| Moisture content (%) | 18.1 | 20.8 | 16.7 | 20.5 | 16.6 | 12.7 | 8.9 | 11.7 |

| Moisture Content, w (%) | 18.1 | 20.8 | 16.7 | 20.5 | 16.6 | 12.7 | 8.9 | 11.7 |
| Dry Unit Wt., $\gamma_d$ (pcf) | 100.4 | 100.9 | 100.1 | 103.5 | 105.7 | 100.9 | 103.9 | 117.6 |

Entered by:  
Reviewed:
**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:** 27

**Sample Description:** clay

**Engineering Classification:** Not requested

**Sample type:** Undisturbed-trimmed from ring

---

### Specific Gravity, $G_s$

<table>
<thead>
<tr>
<th>Specific Gravity, $G_s$</th>
<th>2.65</th>
<th>Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell (%)</td>
<td>3.84</td>
<td></td>
</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

### Initial (o) Final (f)

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D $e_s$ (%)</th>
<th>$H_e$ (in.)</th>
<th>$e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.0000</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.815</td>
</tr>
<tr>
<td>100</td>
<td>0.0018</td>
<td>0.18</td>
<td>0.9982</td>
<td>0.812</td>
</tr>
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<td>250</td>
<td>0.0038</td>
<td>0.38</td>
<td>0.9962</td>
<td>0.808</td>
</tr>
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<td>250</td>
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<td>1.0346</td>
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<td>500</td>
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<td>-3.16</td>
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<td>-1.41</td>
<td>1.0141</td>
<td>0.841</td>
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<tr>
<td>4000</td>
<td>0.0017</td>
<td>0.17</td>
<td>0.9983</td>
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<tr>
<td>8000</td>
<td>0.0203</td>
<td>2.03</td>
<td>0.9797</td>
<td>0.778</td>
</tr>
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</table>

---

**Graph:**

- **Swell = 3.84 %**

**Effective Consolidation Stress, $\sigma'_{ve}$ (psf)**

---

**Entered:**

**Reviewed:**
Collapse/Swell Potential of Soils  
(ATEM D4546 & 5333)  

Project: Landmark Testing  
No: M00431-008  
Location: St. George Replacement Airport  
Date: 7/2/2007  
By: BRR

### Boring No.: WT-5

**Sample:** clay  
**Depth:** 37  
**Sample Description:** clay  
**Engineering Classification:** Not requested

**Sample type:** Undisturbed-trimmed from ring

<table>
<thead>
<tr>
<th>Stress (psi)</th>
<th>Dial (in.)</th>
<th>1-D $e_s$ (%)</th>
<th>$H_e$ (in.)</th>
<th>$e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0.1204</td>
<td>0.04</td>
<td>0.996</td>
<td>0.757</td>
</tr>
<tr>
<td>200</td>
<td>0.1215</td>
<td>0.15</td>
<td>0.9885</td>
<td>0.755</td>
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<tr>
<td>400</td>
<td>0.1234</td>
<td>0.34</td>
<td>0.9666</td>
<td>0.752</td>
</tr>
<tr>
<td>700</td>
<td>0.1255</td>
<td>0.55</td>
<td>0.9445</td>
<td>0.748</td>
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<tr>
<td>1000</td>
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<td>0.74</td>
<td>0.926</td>
<td>0.745</td>
</tr>
<tr>
<td>10000</td>
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<td>0.818</td>
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<tr>
<td>20000</td>
<td>0.0911</td>
<td>-2.89</td>
<td>1.0289</td>
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<td>40000</td>
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<td>-1.91</td>
<td>1.0191</td>
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</tr>
<tr>
<td>80000</td>
<td>0.1185</td>
<td>-0.15</td>
<td>1.0015</td>
<td>0.760</td>
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</table>

<table>
<thead>
<tr>
<th>Specific gravity, $G_s$</th>
<th>Assumed</th>
<th>Swell (%)</th>
<th>4.16</th>
<th>Swell stress (psi)</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial (o)</td>
<td>Final (f)</td>
<td>Sample height, H (in.)</td>
<td>1.000</td>
<td>1.0015</td>
<td></td>
</tr>
<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
<td>2.416</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>188.24</td>
<td>191.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>45.16</td>
<td>45.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moist unit wt., $y_m$ (pcf)</td>
<td>118.9</td>
<td>121.2</td>
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<td></td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>436.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>374.61</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tare (g)</td>
<td>140.54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture content, w (%)</td>
<td>26.3</td>
<td>29.0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Dry unit wt., $y_d$ (pcf)</td>
<td>94.1</td>
<td>94.0</td>
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<td></td>
</tr>
<tr>
<td>Saturation</td>
<td>0.92</td>
<td>1.00</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Swell = 4.16%**

---

**Effective Consolidation Stress, $\sigma'_w$ (psf)**

**Vertical Strain, $e_v$ (%)**

---

**Entered:**  
**Reviewed:**
Collapse/Swell Potential of Soils

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

<table>
<thead>
<tr>
<th>Specific gravity, G_s</th>
<th>2.65</th>
<th>Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell (%)</td>
<td>9.95</td>
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</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D e_s (%)</th>
<th>H_s (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.2132</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.584</td>
</tr>
<tr>
<td>100</td>
<td>0.2157</td>
<td>0.25</td>
<td>0.9975</td>
<td>0.580</td>
</tr>
<tr>
<td>250</td>
<td>0.2180</td>
<td>0.48</td>
<td>0.9952</td>
<td>0.577</td>
</tr>
<tr>
<td>500</td>
<td>0.1185</td>
<td>-9.47</td>
<td>1.0947</td>
<td>0.734</td>
</tr>
<tr>
<td>1000</td>
<td>0.1190</td>
<td>-9.42</td>
<td>1.0942</td>
<td>0.734</td>
</tr>
<tr>
<td>2000</td>
<td>0.1271</td>
<td>-8.61</td>
<td>1.0861</td>
<td>0.721</td>
</tr>
<tr>
<td>4000</td>
<td>0.1433</td>
<td>-6.99</td>
<td>1.0699</td>
<td>0.695</td>
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<tr>
<td>8000</td>
<td>0.1658</td>
<td>-4.74</td>
<td>1.0474</td>
<td>0.659</td>
</tr>
<tr>
<td>16000</td>
<td>0.2330</td>
<td>-2.31</td>
<td>1.0231</td>
<td>0.621</td>
</tr>
</tbody>
</table>

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 wtr. 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 wtr. γ_d (pcf) 104.4 105.5
Saturation 0.85 1.00

Vertical Strain, ε_s (%)

Effective Consolidation Stress, σ' ve (psf)
Boring No.: WT-6

Sample:

Depth: 27

Sample Description: gray/ tan clay

Engineering Classification: Not requested

Sample type: Undisturbed-trimmed from ring

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D εv (%)</th>
<th>H (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.0000</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.525</td>
</tr>
<tr>
<td>100</td>
<td>0.0014</td>
<td>0.14</td>
<td>0.9986</td>
<td>0.522</td>
</tr>
<tr>
<td>300</td>
<td>0.0033</td>
<td>0.33</td>
<td>0.9967</td>
<td>0.519</td>
</tr>
<tr>
<td>500</td>
<td>0.0069</td>
<td>0.69</td>
<td>0.9931</td>
<td>0.514</td>
</tr>
<tr>
<td>500</td>
<td>-0.0765</td>
<td>-7.65</td>
<td>1.0765</td>
<td>0.641</td>
</tr>
<tr>
<td>1000</td>
<td>-0.0700</td>
<td>-7.00</td>
<td>1.0700</td>
<td>0.631</td>
</tr>
<tr>
<td>2000</td>
<td>-0.0593</td>
<td>-5.93</td>
<td>1.0593</td>
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</tr>
<tr>
<td>4000</td>
<td>-0.0427</td>
<td>-4.27</td>
<td>1.0427</td>
<td>0.590</td>
</tr>
<tr>
<td>8000</td>
<td>-0.0233</td>
<td>-2.33</td>
<td>1.0233</td>
<td>0.560</td>
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<tr>
<td>16000</td>
<td>0.0002</td>
<td>0.02</td>
<td>0.9998</td>
<td>0.524</td>
</tr>
</tbody>
</table>

- Specific gravity, Gs = 2.65 Assumed
- Swell (%) = 8.34
- Swell stress (psf) = 500

<table>
<thead>
<tr>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
</tr>
<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>196.67</td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>45.14</td>
</tr>
<tr>
<td>Moist unit wt., γm (psf)</td>
<td>125.9</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>508.30</td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>469.02</td>
</tr>
<tr>
<td>Tare (g)</td>
<td>224.09</td>
</tr>
<tr>
<td>Moisture content, w (%)</td>
<td>16.0</td>
</tr>
<tr>
<td>Dry unit wt., γd (psf)</td>
<td>108.5</td>
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<tr>
<td>Saturation</td>
<td>0.81</td>
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</table>

Swell = 8.34 %

Effective Consolidation Stress, σ've (psf)
**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-8  
**Sample:**  
**Depth:** 2  
Sample Description: reddish brown clay with gravel  
Engineering Classification: Not requested  
Sample type: Undisturbed-trimmed from ring

<table>
<thead>
<tr>
<th>Specific gravity, (G_s)</th>
<th>2.65</th>
<th>Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell (%)</td>
<td>2.20</td>
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</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D (e_v) (%)</th>
<th>(H_v) (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.0675</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.443</td>
</tr>
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<td>100</td>
<td>0.0680</td>
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<td>0.9995</td>
<td>0.442</td>
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<td>250</td>
<td>0.0708</td>
<td>0.33</td>
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<td>0.438</td>
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<td>250</td>
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<td>1.0187</td>
<td>0.470</td>
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<td>0.0526</td>
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<td>1.0149</td>
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<td>1.0037</td>
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<td>2000</td>
<td>0.0794</td>
<td>1.19</td>
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<td>0.426</td>
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<tr>
<td>4000</td>
<td>0.0998</td>
<td>3.23</td>
<td>0.9677</td>
<td>0.396</td>
</tr>
</tbody>
</table>

| 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., \(y_m\) (pcf) | 122.2 | 136.1 |
| Wet soil + tare (g) | 567.69 |
| Dry soil + tare (g) | 546.45 |
| Tare (g) | 22.515 |
| Moisture content, w (%) | 6.6 | 14.9 |
| Dry unit wt., \(y_d\) (pcf) | 114.7 | 118.5 |
| Saturation | 0.44 | 1.00 |

**Diagram:**
- Vertical Strain, \(e_v\) (§)  
- Effective Consolidation Stress, \(\sigma'_{ve}\) (psf)
**Collapse/Swell Potential of Soils**  
(ASTM D4546 & D5333)  
**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

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>L-D e_s (%)</th>
<th>H_e (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.2217</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.578</td>
</tr>
<tr>
<td>100</td>
<td>0.2227</td>
<td>0.10</td>
<td>0.9990</td>
<td>0.577</td>
</tr>
<tr>
<td>300</td>
<td>0.2246</td>
<td>0.29</td>
<td>0.9971</td>
<td>0.574</td>
</tr>
<tr>
<td>500</td>
<td>0.2263</td>
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<td>0.9954</td>
<td>0.571</td>
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<tr>
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<td>-3.37</td>
<td>1.0337</td>
<td>0.631</td>
</tr>
<tr>
<td>4000</td>
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<td>0.611</td>
</tr>
<tr>
<td>8000</td>
<td>0.2179</td>
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<td>1.0038</td>
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</tr>
<tr>
<td>16000</td>
<td>0.2410</td>
<td>1.93</td>
<td>0.9807</td>
<td>0.548</td>
</tr>
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</table>

**Graph:**  
- **Vertical Strain, e_s (%)**  
- **Effective Consolidation Stress, σ'_w (psf)**

**Table:**  
- Specific gravity, G_s: 2.65 (Assumed)  
- Swell (%): 4.87  
- Swell stress (psf): 500

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
<td>0.9807</td>
</tr>
<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>195.22</td>
<td>198.30</td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>43.22</td>
<td>43.22</td>
</tr>
<tr>
<td>Moist unit wt., γ_m (pcf)</td>
<td>126.3</td>
<td>131.4</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>512.02</td>
<td></td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>460.40</td>
<td></td>
</tr>
<tr>
<td>Tare (g)</td>
<td>208.49</td>
<td></td>
</tr>
<tr>
<td>Moisture content, w (%)</td>
<td>20.5</td>
<td>22.9</td>
</tr>
<tr>
<td>Dry unit wt., γ_d (pcf)</td>
<td>104.8</td>
<td>106.9</td>
</tr>
<tr>
<td>Saturation</td>
<td>0.99</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Graph Notes:**  
- Swell = 4.87 %

**Entered:**  
**Reviewed:**
Collapse/Swell Potential of Soils
( ASTM D4546 & D5333)

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, Gs 2.65 Assumed
Swell (%) 6.32
Swell stress (psf) 500

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in)</th>
<th>1-D e_0 (%)</th>
<th>H_0 (in)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.2355</td>
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<td>0.550</td>
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<tr>
<td>100</td>
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<td>500</td>
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<td>0.71</td>
<td>0.9929</td>
<td>0.539</td>
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<td>0.1794</td>
<td>-5.61</td>
<td>1.0561</td>
<td>0.637</td>
</tr>
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<td>1.0511</td>
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<td>-3.93</td>
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<td>4000</td>
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<td>8000</td>
<td>0.2359</td>
<td>0.04</td>
<td>0.9996</td>
<td>0.550</td>
</tr>
</tbody>
</table>

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. , y_u (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., y_d (pcf) 106.7 106.8
Saturation 0.75 1.00

Vertical Strain, e_v (%) -6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
100 1000 10000
Effective Consolidation Stress, \( \sigma^\prime_{ve} \) (psf)

Swell = 6.32 %

Entered: Reviewed:

Z:\PROJECTS\M00431\Landmark_Testing\009_070907\SWELL_COLLAPSE-1.xls
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-6  
Sample:

Depth: 12  
Sample Description: gray clay w/ mineral deposit  
Engineering Classification: Not requested  
Sample type: Undisturbed-trimmed from ring

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D εv (%)</th>
<th>Hs (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 2167</td>
<td>0 00</td>
<td>1 0000</td>
<td>0 590</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0 2172</td>
<td>0 05</td>
<td>0 9995</td>
<td>0 589</td>
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<td>250</td>
<td>0 2192</td>
<td>0 25</td>
<td>0 9975</td>
<td>0 586</td>
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<td>250</td>
<td>0 1213</td>
<td>-9 54</td>
<td>1 0954</td>
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<td>500</td>
<td>0 1242</td>
<td>-9 25</td>
<td>1 0925</td>
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<td>1000</td>
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<td>-8 30</td>
<td>1 0830</td>
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<td>0 1483</td>
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<td>4000</td>
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<td>-4 73</td>
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<td>8000</td>
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<td>-2 44</td>
<td>1 0244</td>
<td>0 629</td>
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<td>16000</td>
<td>0 2187</td>
<td>0 20</td>
<td>0 9980</td>
<td>0 587</td>
</tr>
</tbody>
</table>

Sample height, H (in.)  
Sample diameter, D (in.)  
Wt. rings + wet soil (g)  
Wt. rings/tare (g)  
Moist unit wt., \( \gamma_m \) (pcf)  
Wet soil + tare (g)  
Dry soil + tare (g)  
Tare (g)  
Moisture content, w (%)  
Dry unit wt., \( \gamma_d \) (pcf)  
Saturation

<table>
<thead>
<tr>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 000</td>
<td>0 9980</td>
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<tr>
<td>2 416</td>
<td>2 416</td>
</tr>
<tr>
<td>188 90</td>
<td>194 47</td>
</tr>
<tr>
<td>42 26</td>
<td>42 26</td>
</tr>
<tr>
<td>121 9</td>
<td>126 7</td>
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<tr>
<td>493 93</td>
<td></td>
</tr>
<tr>
<td>452 57</td>
<td></td>
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<tr>
<td>211 23</td>
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<tr>
<td>17 1</td>
<td>21 6</td>
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<td>104 0</td>
<td>104 2</td>
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<tr>
<td>0 77</td>
<td>0 97</td>
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-12.0
-10.0
-8.0
-6.0
-4.0
-2.0
0.0
2.0
100 1000 10000 100000

Vertical Strain, \( \varepsilon_v \) (%)  
Effective Consolidation Stress, \( \sigma_{ve} \) (psf)

Swell = 9 79 %
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

Specific gravity, Gs  2.65  Assumed
Swell (%)  9.10
Swell stress (psf)  500

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D e', (%)</th>
<th>Hs (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
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<td>0.00</td>
<td>1.0000</td>
<td>0.577</td>
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<tr>
<td>100</td>
<td>0.0020</td>
<td>0.20</td>
<td>0.9980</td>
<td>0.574</td>
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<td>0.0044</td>
<td>0.44</td>
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<td>0.570</td>
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<tr>
<td>500</td>
<td>0.0069</td>
<td>0.69</td>
<td>0.9931</td>
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<tr>
<td>1000</td>
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<td>-8.41</td>
<td>1.0841</td>
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<td>2000</td>
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<td>-5.40</td>
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<td>1.0293</td>
<td>0.623</td>
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<td>-0.40</td>
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<tr>
<td>32000</td>
<td>0.0274</td>
<td>2.74</td>
<td>0.9726</td>
<td>0.534</td>
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Boring No.: RW-6
Sample:
Depth: 17
Sample Description: clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from ring

<table>
<thead>
<tr>
<th>Initial (o)</th>
<th>Final (f)</th>
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</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
</tr>
<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>188.28</td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>42.33</td>
</tr>
<tr>
<td>Moist unit wt., γm (pcf)</td>
<td>121.3</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>458.28</td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>426.97</td>
</tr>
<tr>
<td>Tare (g)</td>
<td>226.36</td>
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<tr>
<td>Moisture content, w (%)</td>
<td>15.6</td>
</tr>
<tr>
<td>Dry unit wt., γd (pcf)</td>
<td>104.9</td>
</tr>
<tr>
<td>Saturation</td>
<td>0.77</td>
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</table>

Swell = 9.1%
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

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D εv (%)</th>
<th>Ht (in.)</th>
<th>e</th>
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</thead>
<tbody>
<tr>
<td>Seating</td>
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<td>0.440</td>
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<td>0.1032</td>
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<tr>
<td>500</td>
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<tr>
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<tr>
<td>8000</td>
<td>0.1092</td>
<td>0.64</td>
<td>0.9936</td>
<td>0.430</td>
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</tbody>
</table>

- Specific gravity, Gs = 2.65 Assumed
- Swell (%) = 4.01
- Swell stress (psf) = 1000

<table>
<thead>
<tr>
<th>Sample Height, H (in.)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
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</thead>
<tbody>
<tr>
<td>1.000</td>
<td>0.9936</td>
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</table>

<table>
<thead>
<tr>
<th>Sample Diameter, D (in.)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.416</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wt. Ring + Wet Soil (g)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
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</thead>
<tbody>
<tr>
<td>196.16</td>
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</table>

<table>
<thead>
<tr>
<th>Wt. Rings/tare (g)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
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<tr>
<td>43.40</td>
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<table>
<thead>
<tr>
<th>Moist Unit Wt. γm (psf)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
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<tr>
<td>126.9</td>
<td>135.9</td>
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</table>

<table>
<thead>
<tr>
<th>Wet Soil + Tare (g)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
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<tbody>
<tr>
<td>591.32</td>
<td>639.32</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry Soil + Tare (g)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>549.67</td>
<td>608.67</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tare (g)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>151.54</td>
<td>151.54</td>
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<table>
<thead>
<tr>
<th>Moisture Content, w (%)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
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<tbody>
<tr>
<td>10.5</td>
<td>17.5</td>
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</table>

<table>
<thead>
<tr>
<th>Dry Unit Wt. γd (psf)</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
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<td>114.9</td>
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<table>
<thead>
<tr>
<th>Saturation</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.64</td>
<td>1.00</td>
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</table>

- Swell = 4.01 %

Graph showing relationship between effective consolidation stress and vertical strain.
Boring No.: ET-6
Sample:
Depth: 22
Sample Description: tan/gray clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D $e_s$ (%)</th>
<th>$H_o$ (in.)</th>
<th>$e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
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<td>0.00</td>
<td>1.0000</td>
<td>0.616</td>
</tr>
<tr>
<td>100</td>
<td>0.2459</td>
<td>0.05</td>
<td>0.9995</td>
<td>0.615</td>
</tr>
<tr>
<td>250</td>
<td>0.2473</td>
<td>0.19</td>
<td>0.9981</td>
<td>0.613</td>
</tr>
<tr>
<td>250</td>
<td>0.1510</td>
<td>-9.44</td>
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<td>0.1539</td>
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<td>1.0915</td>
<td>0.764</td>
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<tr>
<td>1000</td>
<td>0.1610</td>
<td>-8.44</td>
<td>1.0844</td>
<td>0.752</td>
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<tr>
<td>8000</td>
<td>0.2210</td>
<td>-2.44</td>
<td>1.0244</td>
<td>0.655</td>
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<tr>
<td>16000</td>
<td>0.2474</td>
<td>0.20</td>
<td>0.9980</td>
<td>0.613</td>
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</table>

Specific gravity, $G_s$: 2.65
Swell (%): 9.63
Swell stress (psf): 250

Sample height, $H$ (in.): 1.000
Sample diameter, $D$ (in.): 2.416
Wt. rings + wet soil (g): 191.19
Wt. rings/tare (g): 42.30
Moist unit wt., $\gamma_m$ (pcf): 123.7
Wet soil + tare (g): 478.95
Dry soil + tare (g): 432.92
Tare (g): 212.10
Moisture content, $w$ (%): 20.8
Dry unit wt., $\gamma_d$ (pcf): 102.4
Saturation: 0.90

Swell = 9.63 %
Collapse/Swell Potential of Soils
(ASME D4546 & D5333)

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

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D εs (%)</th>
<th>Hc (in.)</th>
<th>ε</th>
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<td>1.000</td>
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<td>100</td>
<td>0.1659</td>
<td>0.17</td>
<td>0.9983</td>
<td>0.539</td>
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<td>200</td>
<td>0.1672</td>
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<td>0.9970</td>
<td>0.537</td>
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<tr>
<td>400</td>
<td>0.1694</td>
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<tr>
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<td>0.9976</td>
<td>0.538</td>
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</tbody>
</table>

Specific gravity, Gs = 2.65 Assumed
Swell (%) = 1.29
Swell stress (psf) = 2000

---

**Graphic:**

- **Vertical Strain, εs (%)** vs. **Effective Consolidation Stress, σ'we (psf)**
- **Swell = 1.29 %**

Entered: BRR
Reviewed: AS
**Collapse/Swell Potential of Soils**  
**ASTM D4546 & D5333**

**Project: Landmark Testing**
**No: M00431-009**
**Location: St. George, UT**
**Date: 7/19/2007**
**By: BRR**

Compaction specifications:

<table>
<thead>
<tr>
<th></th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity, $G_s$</td>
<td>2.65</td>
<td>2.65</td>
</tr>
<tr>
<td>Swell (%)</td>
<td>5.94</td>
<td>5.94</td>
</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
<td>250</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D $e_s$ (%)</th>
<th>$H_c$ (in.)</th>
<th>$e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.2175</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.613</td>
</tr>
<tr>
<td>100</td>
<td>0.2185</td>
<td>0.10</td>
<td>0.9990</td>
<td>0.611</td>
</tr>
<tr>
<td>250</td>
<td>0.2206</td>
<td>0.31</td>
<td>0.9969</td>
<td>0.608</td>
</tr>
<tr>
<td>500</td>
<td>0.1612</td>
<td>-5.63</td>
<td>1.0563</td>
<td>0.703</td>
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<tr>
<td>1000</td>
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<td>1.0517</td>
<td>0.696</td>
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<tr>
<td>2000</td>
<td>0.2002</td>
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<td>1.0173</td>
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<tr>
<td>4000</td>
<td>0.2312</td>
<td>1.37</td>
<td>0.9863</td>
<td>0.591</td>
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</table>

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

<table>
<thead>
<tr>
<th>Wet samples</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
<td>0.9863</td>
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<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>183.85</td>
<td>194.70</td>
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<tr>
<td>Wt, rings/tare (g)</td>
<td>43.57</td>
<td>43.57</td>
</tr>
<tr>
<td>Moist unit wt., $\gamma_m$ (pcf)</td>
<td>116.6</td>
<td>127.3</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>252.06</td>
<td></td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>248.71</td>
<td></td>
</tr>
<tr>
<td>Tare (g)</td>
<td>224.14</td>
<td></td>
</tr>
<tr>
<td>Moisture content, w (%)</td>
<td>13.6</td>
<td>22.4</td>
</tr>
<tr>
<td>Dry unit wt., $\gamma_d$ (pcf)</td>
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<td>104.0</td>
</tr>
<tr>
<td>Saturation</td>
<td>0.61</td>
<td>1.00</td>
</tr>
</tbody>
</table>

**Boring No.: TP ET-7**

**Effective Consolidation Stress, $\sigma'_{ve}$ (psf)**

Vertical Strain, $\varepsilon$ (\%)

Swell = 5.94 %

Entered:  
Reviewed:

Z:\PROJECTS\M00431_Landmark_Testing\009_070507\SF\WILL_COLLAPSVv1.xlsb
Collapse/Swell Potential of Soils  
(ASTM D4546 & D5333)  

Project: Landmark Testing  
No: M00431-009  
Location: St. George, UT  
Date: 7/19/2007  
By: BRR

Compaction specifications:

<table>
<thead>
<tr>
<th>Specific gravity, ( G_s )</th>
<th>2.65</th>
<th>Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell (%)</td>
<td>4.91</td>
<td></td>
</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
</tr>
<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>186.11</td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>43.28</td>
</tr>
<tr>
<td>Moist unit wt., ( \gamma_m ) (pcf)</td>
<td>118.7</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>181.20</td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>177.40</td>
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<tr>
<td>Tare (g)</td>
<td>152.94</td>
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<tr>
<td>Moisture content, ( w ) (%)</td>
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<tr>
<td>Dry unit wt., ( \gamma_d ) (pcf)</td>
<td>102.7</td>
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<tr>
<td>Saturation</td>
<td>0.69</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D e, (%)</th>
<th>H_c (in.)</th>
<th>e</th>
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<tbody>
<tr>
<td>Seating</td>
<td>0.2177</td>
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<td>1.0000</td>
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<tr>
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<td>0.609</td>
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<td>250</td>
<td>0.2208</td>
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<tr>
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<td>0.2276</td>
<td>0.99</td>
<td>0.9901</td>
<td>0.594</td>
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</table>

Sample Description: reddish clay with gypsum

Engineering Classification: Not requested

Sample type: Laboratory compacted

Dry unit weight: 103 psf

Swell = 4.91%
**Collapse/Swell Potential of Soils**  
(QUOTE D4546 & D5333)

**Project: Landmark Testing**  
No: M00431-009  
Location: St. George, UT  
Date: 7/19/2007  
By: BRR

Compaction specifications:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Specific gravity, $G_s$</td>
<td>2.65</td>
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<tr>
<td>Swell (%)</td>
<td>3.11</td>
</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
</tr>
<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>188.50</td>
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<td>Wet, rings/tare (g)</td>
<td>43.38</td>
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<tr>
<td>Moist unit wt., $\gamma_m$ (pcf)</td>
<td>120.6</td>
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<tr>
<td>Wet soil + tare (g)</td>
<td>182.82</td>
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<td>Dry soil + tare (g)</td>
<td>178.60</td>
</tr>
<tr>
<td>Tare (g)</td>
<td>154.03</td>
</tr>
<tr>
<td>Moisture content, w (%)</td>
<td>17.2</td>
</tr>
<tr>
<td>Dry unit wt., $\gamma_d$ (pcf)</td>
<td>102.9</td>
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<tr>
<td>Saturation</td>
<td>0.79</td>
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**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

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>I-D $e_i$ (%)</th>
<th>Hc (in.)</th>
<th>$e$</th>
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<tbody>
<tr>
<td>Seating</td>
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<td>1.0000</td>
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<td>0.9990</td>
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<td>0.1892</td>
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<td>2000</td>
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<td>1.0041</td>
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<td>4000</td>
<td>0.2048</td>
<td>1.84</td>
<td>0.9816</td>
<td>0.578</td>
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</table>

**Effective Consolidation Stress, $\sigma^\prime_{ve}$ (psf)**

![Graph showing vertical strain vs. effective consolidation stress](image_url)
Collapse/Swell Potential of Soils
(ASTM D4546 & D5333)

Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/19/2007
By: BRR

Compaction specifications:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific gravity, $G_s$</td>
<td>2.65</td>
</tr>
<tr>
<td>Swell (%)</td>
<td>1.69</td>
</tr>
<tr>
<td>Swell stress (psf)</td>
<td>250</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Dry unit weight (pcf)</th>
<th>103</th>
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<tbody>
<tr>
<td>Stress (psf)</td>
<td></td>
</tr>
<tr>
<td>Dial (in.)</td>
<td></td>
</tr>
<tr>
<td>1-D $e_i$ (%)</td>
<td></td>
</tr>
<tr>
<td>$H_o$ (in.)</td>
<td></td>
</tr>
<tr>
<td>$e$</td>
<td></td>
</tr>
<tr>
<td>Seating</td>
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<tr>
<td>100</td>
<td>0.2232</td>
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<tr>
<td>250</td>
<td>0.2251</td>
</tr>
<tr>
<td>250</td>
<td>0.2082</td>
</tr>
<tr>
<td>500</td>
<td>0.2109</td>
</tr>
<tr>
<td>1000</td>
<td>0.2175</td>
</tr>
<tr>
<td>2000</td>
<td>0.2275</td>
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</table>

Stress (psf): Initial (i) 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., $\gamma_m$ (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., $\gamma_d$ (pcf): 102.9 | 103.4
- Saturation: 0.85 | 0.99

\[ \text{Swell} = 1.69\% \]

Effective Consolidation Stress, $\sigma'_{ve}$ (psf)
Laboratory Compaction Characteristics of Soil

Project: Landmark Testing & Engineering
No: M00431-009
Location: St. Gerse 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 (in³): 0.0333

Optimum moisture content (%): 15.2
Maximum dry unit weight (pcf): 114.4

<table>
<thead>
<tr>
<th>Point Number</th>
<th>As Is</th>
<th>+2%</th>
<th>+4%</th>
<th>+6%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wt. Sample + Mold (g)</td>
<td>6194.3</td>
<td>6239.1</td>
<td>6214.5</td>
<td>6166.9</td>
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<tr>
<td>Wt. of Mold (g)</td>
<td>4255.3</td>
<td>4255.3</td>
<td>4255.3</td>
<td>4255.3</td>
</tr>
<tr>
<td>Wet Unit Wt., ( \gamma_m ) (pcf)</td>
<td>128.2</td>
<td>131.2</td>
<td>129.6</td>
<td>126.4</td>
</tr>
<tr>
<td>Wet Soil + Tare (g)</td>
<td>623.5</td>
<td>761.8</td>
<td>649.3</td>
<td>773</td>
</tr>
<tr>
<td>Dry Soil + Tare (g)</td>
<td>574.43</td>
<td>691.04</td>
<td>575.4</td>
<td>685.1</td>
</tr>
<tr>
<td>Tare (g)</td>
<td>185</td>
<td>211.3</td>
<td>141.2</td>
<td>219.8</td>
</tr>
</tbody>
</table>

| Moisture Content, \( w \) (%) | 12.6 | 14.7 | 17.0 | 18.9 |
| Moisture Unit Wt., \( \gamma_d \) (pcf) | 113.9 | 114.3 | 110.7 | 106.3 |

Comments:
Sample was dried in a 140°F oven due to gypsum present in the soil.

![Graph showing compaction characteristics](image)

Maximum dry unit weight and optimum moisture content

Maximum dry unit weight = 114.4 (pcf)

ZAVL G1 = 2.7
ZAVL G2 = 2.6

Entered by: DKS
Reviewed: AOG
Collapse/Swell Potential of Soils
(AS TM D4546 & D5333)

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

<table>
<thead>
<tr>
<th>Specific gravity, $G_s$</th>
<th>2.65</th>
<th>Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell (%)</td>
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<td></td>
</tr>
<tr>
<td>Swell stress (psi)</td>
<td>2000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D $e_c$ (%)</th>
<th>$H_c$ (in.)</th>
<th>$e$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.1832</td>
<td>0.00</td>
<td>1.0000</td>
<td>0.658</td>
</tr>
<tr>
<td>100</td>
<td>0.1843</td>
<td>0.11</td>
<td>0.9989</td>
<td>0.656</td>
</tr>
<tr>
<td>200</td>
<td>0.1858</td>
<td>0.26</td>
<td>0.9974</td>
<td>0.654</td>
</tr>
<tr>
<td>400</td>
<td>0.1884</td>
<td>0.52</td>
<td>0.9948</td>
<td>0.649</td>
</tr>
<tr>
<td>1000</td>
<td>0.1934</td>
<td>1.02</td>
<td>0.9898</td>
<td>0.641</td>
</tr>
<tr>
<td>2000</td>
<td>0.1969</td>
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<td>0.1769</td>
<td>-0.63</td>
<td>1.0063</td>
<td>0.668</td>
</tr>
<tr>
<td>4000</td>
<td>0.1889</td>
<td>0.57</td>
<td>0.9943</td>
<td>0.648</td>
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</table>

<table>
<thead>
<tr>
<th>Initial (i)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, $H$ (in.)</td>
<td>1.000</td>
</tr>
<tr>
<td>Sample diameter, $D$ (in.)</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>183.48</td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>41.63</td>
</tr>
<tr>
<td>Moist unit wt., $\gamma_m$ (pcf)</td>
<td>117.9</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>614.53</td>
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<tr>
<td>Dry soil + tare (g)</td>
<td>547.55</td>
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<tr>
<td>Tare (g)</td>
<td>177.96</td>
</tr>
<tr>
<td>Moisture content, $w$ (%)</td>
<td>18.1</td>
</tr>
<tr>
<td>Dry unit wt., $\gamma_d$ (pcf)</td>
<td>99.8</td>
</tr>
<tr>
<td>Saturation</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Vertical Strain, $\varepsilon_v$ (g)

Effective Consolidation Stress, $\sigma'_{ve}$ (psf)

Swell = 2.27 %

Entered:  
Reviewed:  

Z/PROJECTS/M00431_Landmark_Testing/09/070507/SWELL_COLLAPSDe1.log}
Collapse/Swell Potential of Soils
(ASME D4546 & D5333)

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

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D e_s (%)</th>
<th>H_p (in.)</th>
<th>e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating</td>
<td>0.2583</td>
<td>0.00</td>
<td>1.6000</td>
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</tr>
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<td>0.2639</td>
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<td>2.66</td>
<td>0.9734</td>
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</tr>
<tr>
<td>2000</td>
<td>0.2997</td>
<td>4.12</td>
<td>0.9588</td>
<td>0.664</td>
</tr>
<tr>
<td>2000</td>
<td>0.3174</td>
<td>5.89</td>
<td>0.9411</td>
<td>0.633</td>
</tr>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Initial (o)</th>
<th>Final (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample height, H (in.)</td>
<td>1.000</td>
<td>0.9411</td>
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<tr>
<td>Sample diameter, D (in.)</td>
<td>2.416</td>
<td>2.416</td>
</tr>
<tr>
<td>Wt. rings + wet soil (g)</td>
<td>175.72</td>
<td>187.68</td>
</tr>
<tr>
<td>Wt. rings/tare (g)</td>
<td>46.36</td>
<td>46.36</td>
</tr>
<tr>
<td>Moist unit wt., γ_m (pcf)</td>
<td>107.5</td>
<td>124.8</td>
</tr>
<tr>
<td>Wet soil + tare (g)</td>
<td>649.92</td>
<td></td>
</tr>
<tr>
<td>Dry soil + tare (g)</td>
<td>598.57</td>
<td></td>
</tr>
<tr>
<td>Tare (g)</td>
<td>195.59</td>
<td></td>
</tr>
<tr>
<td>Moisture content, w (%)</td>
<td>12.7</td>
<td>23.2</td>
</tr>
<tr>
<td>Dry unit wt., γ_d (pcf)</td>
<td>95.3</td>
<td>101.3</td>
</tr>
<tr>
<td>Saturation</td>
<td>0.53</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Collapse = 1.77 %

Effective Consolidation Stress, σ'_ve (psf)
**BEARING RATIO TEST REPORT**

**ASTM D 1883-99**

### Penetration Resistance vs. Depth

![Graph showing penetration resistance vs. depth](image)

### Swell vs. Elapsed Time

![Graph showing swell vs. elapsed time](image)

<table>
<thead>
<tr>
<th>Depth (in.)</th>
<th>Density (pcf)</th>
<th>Percent of Max. Dens. (%)</th>
<th>Moisture (%)</th>
<th>Density (pcf)</th>
<th>Percent of Max. Dens. (%)</th>
<th>Moisture (%)</th>
<th>GBR (%)</th>
<th>Linear Correction (in.)</th>
<th>Surcharge (lbs.)</th>
<th>Max. Swell (%)</th>
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<tbody>
<tr>
<td>0</td>
<td>112.2</td>
<td>95.1</td>
<td>11.0</td>
<td>108.8</td>
<td>92.2</td>
<td>19.3</td>
<td>4.8</td>
<td>7.4</td>
<td>0.014</td>
<td>10</td>
</tr>
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<td>0.10</td>
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<td></td>
<td></td>
<td>3.2</td>
<td></td>
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</tr>
<tr>
<td>0.20</td>
<td></td>
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</tbody>
</table>

### Material Description

Silty / clayey sand with gravel

### Test Description/Remarks:

- **Project No:** 07330
- **Project:** St. George Replacement Airport
- **Location:** WT-1 @ 2'
- **Sample Number:** 78G2301
- **Date:** 6/29/07

---

**BEARING RATIO TEST REPORT**

**LANDMARK**

Figure
SOIL CLASSIFICATION REPORT

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

Date of Report: 7/3/2007
Reviewed By: ____________________________
Lab#: 75G2301

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: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing (Cumulative)</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>3.7</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTOM148</td>
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<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td>96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td>38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td>24.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mm</td>
<td>0.0</td>
<td>21.5</td>
<td>54.3</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Project: St. George Replacement Airport
Location: St. George
Type of Sample: Silty / clayey sand with gravel
Sample Location: WT-1 @ 2'

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.: N/A
- Performed on Material Passing: 3/4 in. Sieve

<table>
<thead>
<tr>
<th>Point</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Moisture</td>
<td>8.2</td>
<td>10.4</td>
<td>12.8</td>
<td>14.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Density</td>
<td>113.7</td>
<td>117.6</td>
<td>118.4</td>
<td>111.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Results

- Maximum Dry Density: 118.0
- Optimum Moisture: 11.0
- Test Standard: ASTM D 1557
- Method: C
Poorly-graded sand with gravel

<table>
<thead>
<tr>
<th>Project No: 07330</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project: St. George Replacement Airport</td>
</tr>
<tr>
<td>Location: WT-3 @ 15'</td>
</tr>
<tr>
<td>Sample Number: 7SG2302</td>
</tr>
<tr>
<td>Date: 6/29/07</td>
</tr>
</tbody>
</table>

Material Description | USCS | Max. Dens. (pcf) | Optimum Moisture (%) | LL | PI |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 118.8 95 8.0</td>
<td>125.0</td>
<td>8.5</td>
<td></td>
<td></td>
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<tr>
<td>2 116.8 93.4 15.0</td>
<td>21.8</td>
<td>0.042</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 19.0 21.8</td>
<td>10</td>
<td>1.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Description/Remarks:
SOIL CLASSIFICATION REPORT

Client: Greener & 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

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test Standard</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2216</td>
<td>Natural Moisture Content, %</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>D 4318</td>
<td>Liquid Limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D 4318</td>
<td>Plasticity Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D 2487</td>
<td>Unified Classification System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AASHTO M145</td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>27.9</td>
<td>61.0</td>
<td>11.2</td>
</tr>
</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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
Location: St. George
Project #: 07330

Type of Sample: Poorly-graded sand with gravel
Sample Location: WT-3 @ 15'
Sampled By: R. Owens
Date: 7/1/2007
Tested By: B. Jansen
Date: 7/6/2007
Approved By: Client
Date: 7/1/2007

Moisture Density Relationship

<table>
<thead>
<tr>
<th>Proctor Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammer Weight: 10 pounds</td>
<td></td>
</tr>
<tr>
<td>Hammer Drop: 18 inches</td>
<td></td>
</tr>
<tr>
<td>Number of Layers: 5 layers</td>
<td></td>
</tr>
<tr>
<td>Blows per Layer: 56 blows</td>
<td></td>
</tr>
<tr>
<td>Mold Size (cu. Ft.): 0.0750</td>
<td></td>
</tr>
<tr>
<td>% Oversized: N/A</td>
<td></td>
</tr>
<tr>
<td>Oversize Sp. G.: N/A</td>
<td></td>
</tr>
<tr>
<td>ZAV Sp. G.:</td>
<td></td>
</tr>
<tr>
<td>Performed on Material Passing: 3/4 in. Sieve</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Point</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Moisture</td>
<td>6.3</td>
<td>7.8</td>
<td>10.3</td>
<td>12.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Density</td>
<td>119.6</td>
<td>124.8</td>
<td>122.2</td>
<td>117.6</td>
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</tr>
</tbody>
</table>

Test Results

<table>
<thead>
<tr>
<th>Maximum Dry Density</th>
<th>125.0</th>
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<tbody>
<tr>
<td>Optimum Moisture</td>
<td>8.5</td>
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<tr>
<td>Test Standard</td>
<td>ASTM D 1557</td>
</tr>
<tr>
<td>Method</td>
<td>C</td>
</tr>
</tbody>
</table>

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BEARING RATIO TEST REPORT
ASTM D 1883-99

Penetration Resistance (psi)

Penetration Depth (in.)

Swell (%)

Elapsed Time (hrs)

<table>
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<tr>
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<th></th>
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<th></th>
<th></th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>127.2</td>
<td>94.9</td>
<td>7.0</td>
<td>121.6</td>
<td>90.8</td>
<td>13.9</td>
<td>2.4</td>
<td>2.7</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>△</td>
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<tr>
<td>3</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Material Description
Clay with sand

Test Description/Remarks:

Project No: 07330
Project: St. George Replacement Airport
Location: W1-5 @ 3'
Sample Number: 7SG2303
Date: 6/29/07
SOIL CLASSIFICATION REPORT

Client: Cremer & 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 #: 97330
Location: St. George  
Sampled By: R. Owens  
Date: 6/29/2007
Type of Sample: Clay with sand  
Tested By: A. Whipple  
Date: 7/1/2007
Location of Sample: WT-8 @ 3'  
Authorized By: Client  
Date: 6/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>4.6</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
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<td></td>
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<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>100</td>
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<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>99</td>
<td></td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>96</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>75.6</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.7</td>
<td>23.6</td>
<td>75.6</td>
</tr>
</tbody>
</table>

Log(c)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
MOISTURE-DENSITY RELATIONSHIP REPORT

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

Date of Report: 7/9/2007
Reviewed By: 7SG2303

Project: St. George Replacement Airport
Location: St. George
Type of Sample: Clay with sand
Sample Location: WT-8 @ 3'

Sampled By: R. Owens Date: 7/1/2007
Tested By: B. Jansen Date: 7/6/2007
Approved By: Client Date: 7/1/2007

Project #: 07330

Moisture Density Relationship

<table>
<thead>
<tr>
<th>Proctor Data</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammer Weight:</td>
<td>10 lbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hammer Drop:</td>
<td>18 inches</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Layers:</td>
<td>5</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Blows per Layer:</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mold Size (cu. Ft.):</td>
<td>0.075</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Oversized:</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oversize Sp. G.:</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZAV Sp. G.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performed on Material Passing:</td>
<td>3/4 in. Slope</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Point</th>
<th>% Moisture</th>
<th>Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.9</td>
<td>124.0</td>
</tr>
<tr>
<td>2</td>
<td>6.7</td>
<td>133.6</td>
</tr>
<tr>
<td>3</td>
<td>8.4</td>
<td>132.7</td>
</tr>
<tr>
<td>4</td>
<td>10.3</td>
<td>127.9</td>
</tr>
</tbody>
</table>

Test Results

<table>
<thead>
<tr>
<th>Test Standard</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM D 1557</td>
<td>C</td>
</tr>
</tbody>
</table>

Maximum Dry Density: 134.0
Optimum Moisture: 7.0

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BEARING RATIO TEST REPORT
ASTM D 1883-99

Penetration Resistance (psi)

Penetration Depth (in.)

<table>
<thead>
<tr>
<th>Density (pcf)</th>
<th>Molded Percent of Max. Dens.</th>
<th>Moisture (%)</th>
<th>Density (pcf)</th>
<th>Soaked Percent of Max. Dens.</th>
<th>Moisture (%)</th>
<th>CBR (%) 0.10 in.</th>
<th>CBR (%) 0.20 in.</th>
<th>Linearity Correction (in.)</th>
<th>Surcharge (lbs.)</th>
<th>Max. Swell (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  ○ 125.2</td>
<td>95.9</td>
<td>7.5</td>
<td>125.2</td>
<td>95.9</td>
<td>9.6</td>
<td>65.1</td>
<td>65.1</td>
<td>0.000</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2  △</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3  □</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Material Description
Silty / clayey sand with gravel

Project No: 07330
Project: St. George Replacement Airport
Location: RW-2 @ 2'
Sample Number: 7SG2304
Date: 6/29/07

Test Description/Remarks:
SOIL CLASSIFICATION REPORT

Date of Report: 7/3/2007
Reviewed By: 
Lab#: 7SG2304

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

Project:  St. George Replacement Airport  
Project #: 07330

Location: St. George

Type of Sample: Silty / clayey sand with gravel

Location of Sample: RW-2 @ 2'

Sampled By: R. Owens  Date: 8/29/2007
Tested By: A. Whipple  Date: 7/2/2007

Authorized By: Client  Date: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>7.1</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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


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MOISTURE-DENSITY RELATIONSHIP REPORT

Project: St. George Replacement Airport
Location: St. George
Type of Sample: Silty / clayey sand with gravel
Sample Location: RW-2 @ 2'

Moisture Density Relationship

<table>
<thead>
<tr>
<th>Proctor Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammer Weight: 10 pounds</td>
</tr>
<tr>
<td>Hammer Drop: 18 inches</td>
</tr>
<tr>
<td>Number of Layers: 5 layers</td>
</tr>
<tr>
<td>Blows per Layer: 56 blows</td>
</tr>
<tr>
<td>Mold Size (cu. Ft.): 0.0750</td>
</tr>
<tr>
<td>% Oversized: 19.6</td>
</tr>
<tr>
<td>Oversize Sp. G.: 2.3</td>
</tr>
<tr>
<td>ZAV Sp. G.:</td>
</tr>
<tr>
<td>Performed on Material Passing: 3/4 in. Sieve</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Dry Density: 130.5</td>
</tr>
<tr>
<td>Optimum Moisture: 7.5</td>
</tr>
<tr>
<td>Test Standard: ASTM D 1557</td>
</tr>
<tr>
<td>Method: C</td>
</tr>
</tbody>
</table>

Correction applied to each point in accordance with ASTM D 4718

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BEARING RATIO TEST REPORT
ASTM D 1883-99

![Penetration Depth vs. Penetration Resistance](image)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 × 102.1</td>
<td>91.2</td>
<td>16.0</td>
<td>90.8</td>
<td>81.1</td>
<td>22.3</td>
<td>1.5</td>
<td>1.5</td>
<td>0.000</td>
<td>10</td>
</tr>
<tr>
<td>2 △</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 □</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Material Description

25% Sand 75% Clay

Project No: 07330
Project: St. George Replacement Airport
Location: RW-6 @ 10.5'
Sample Number: 7SG2305
Date: 6/29/07

Test Description/Remarks:

![Diagram](image)
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
Location: St. George
Type of Sample: 25% Sand 75% clay
Sample Location: RW - 6 @ 10.5'

Moisture Density Relationship

<table>
<thead>
<tr>
<th>Point</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Moisture</td>
<td>13.2</td>
<td>16.2</td>
<td>17.9</td>
<td>19.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Density</td>
<td>110.9</td>
<td>111.9</td>
<td>110.9</td>
<td>107.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 |

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

A&M D 1883-99

<table>
<thead>
<tr>
<th>Penetration Resistance (psi)</th>
<th>Penetration Depth (in.)</th>
<th>Swell (%)</th>
<th>Elapsed Time (hrs)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Density (pcf)</th>
<th>Molded Percent of Max. Dens. (%)</th>
<th>Moisture (%)</th>
<th>Density (pcf)</th>
<th>Soaked Percent of Max. Dens. (%)</th>
<th>Moisture (%)</th>
<th>CBR (%)</th>
<th>Linearity Correction (in.)</th>
<th>Surcharge (lbs.)</th>
<th>Max. Swell (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 112.2</td>
<td>95.1</td>
<td>14.0</td>
<td>105.3</td>
<td>89.2</td>
<td>17.1</td>
<td>2.2</td>
<td>2.4</td>
<td>0.000</td>
<td>10</td>
</tr>
</tbody>
</table>

| 2 2 | 3 3 |

### Material Description

- **50% Sand 50% Clay**

<table>
<thead>
<tr>
<th>USCS</th>
<th>Max. Dens. (pcf)</th>
<th>Optimum Moisture (%)</th>
<th>LL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>118.0</td>
<td>14.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Project Details

- **Project No:** 07330
- **Project:** St. George Replacement Airport
- **Location:** RW-6 @ 10.5'
- **Sample Number:** 7SG2305
- **Date:** 6/29/07

---

**Test Description/Remarks:**

- BEARING RATIO TEST REPORT
- LANDMARK
**Moisture-Density Relationship Report**

**Client:** Creamer & Noble Engineers  
435 East Tabernacle  
St. George, Utah 64770

**Project:** St. George Replacement Airport  
**Location:** St. George  
**Type of Sample:** 50% Sand 50% clay  
**Sample Location:** RW - 8 @ 10.5'

**Date of Report:** 7/9/2007  
**Reviewed By:**  
**Lab #:** 78G2305

**Sampled By:** R. Owens  
**Tested By:** B. Janeen  
**Approved By:** Client

**Project #:** 07330  
**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 |

---

**Moisture Density Relationship**

---

**Test Results**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Dry Density</td>
<td>118.0</td>
</tr>
<tr>
<td>Optimum Moisture</td>
<td>14.0</td>
</tr>
<tr>
<td>Test Standard</td>
<td>ASTM D 1557</td>
</tr>
<tr>
<td>Method</td>
<td>C</td>
</tr>
</tbody>
</table>

---

**Graph**

---

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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 #: 7SG2305

Project: St. George Replacement Airport
Location: St. George
Type of Sample: 75% Sand 25% clay
Sample Location: RW - 6 @ 10.5' 

Proctor Data

| Hammer Weight: | 10 pounds |
| Hammer Drop: | 18 inches |
| Number of Layers: | 5 layers |
| Blows per Layer: | 58 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 |

Moisture Density Relationship

![Graph of moisture density relationship]

<table>
<thead>
<tr>
<th>Point</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Moisture</td>
<td>7.3</td>
<td>9.4</td>
<td>11.4</td>
<td>13.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Density</td>
<td>113.6</td>
<td>122.0</td>
<td>122.5</td>
<td>118.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Results

<table>
<thead>
<tr>
<th>Test Results</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Dry Density</td>
<td>123.0</td>
</tr>
<tr>
<td>Optimum Moisture</td>
<td>10.5</td>
</tr>
<tr>
<td>Test Standard</td>
<td>ASTM D 1557</td>
</tr>
<tr>
<td>Method</td>
<td>C</td>
</tr>
</tbody>
</table>

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# BEARING RATIO TEST REPORT

**ASTM D 1883-99**

![Graph showing penetration resistance vs. penetration depth]

<table>
<thead>
<tr>
<th>Penetration Resistance (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration Depth (in.)</td>
</tr>
</tbody>
</table>

### Test Results

<table>
<thead>
<tr>
<th>Molded</th>
<th>Soaked</th>
<th>CBR (%)</th>
<th>Linearity Correction (in)</th>
<th>Surcharge (lbs)</th>
<th>Max. Swell (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (pcf)</td>
<td>Percent of Max. Dens.</td>
<td>Moisture (%)</td>
<td>Density (pcf)</td>
<td>Percent of Max. Dens.</td>
<td>Moisture (%)</td>
</tr>
<tr>
<td>1 O</td>
<td>123.3</td>
<td>96</td>
<td>7.5</td>
<td>123.3</td>
<td>96</td>
</tr>
<tr>
<td>2 △</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 □</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material Description</th>
<th>USCS</th>
<th>Max. Dens. (pcf)</th>
<th>Optimum Moisture (%)</th>
<th>LL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty / clayey sand with gravel</td>
<td>128.5</td>
<td>7.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Test Description/Remarks:

- **Project No:** 07330
- **Project:** St. George Replacement Airport
- **Location:** ET-2 @ 5'
- **Sample Number:** 7SG2306
- **Date:** 6/29/07

**BEARING RATIO TEST REPORT**

**LANDMARK**
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: 8/29/2007

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: 8/29/2007

Sieve Analysis, ASTM C136
Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>4.1</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>89</td>
<td></td>
<td></td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>83</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>71</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>56</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>35</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>76 μm</td>
<td>#200</td>
<td>28.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>28.7</td>
<td>45.0</td>
<td>26.3</td>
</tr>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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 #: 07330
Project: St. George Replacement Airport
Location: St. George
Sampled By: R. Owens
Sampled Date: 7/6/2007
Tested By: B. Jansen
Tested Date: 7/6/2007
Approved By: Client
Approved Date: 7/1/2007

Sample Location: ET-2 @ 5

Moisture Density Relationship

<table>
<thead>
<tr>
<th>Point</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Moisture</td>
<td>5.0</td>
<td>7.4</td>
<td>9.4</td>
<td>11.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dry Density</td>
<td>117</td>
<td>128.3</td>
<td>124.8</td>
<td>120.5</td>
<td></td>
<td></td>
</tr>
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Proctor Data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Hammer Weight</td>
<td>10 pounds</td>
</tr>
<tr>
<td>Hammer Drop</td>
<td>18 inches</td>
</tr>
<tr>
<td>Number of Layers</td>
<td>5 layers</td>
</tr>
<tr>
<td>Blows per Layer</td>
<td>56 blows</td>
</tr>
<tr>
<td>Moid Size (cu. Ft.)</td>
<td>0.0750</td>
</tr>
<tr>
<td>% Oversized</td>
<td>N/A</td>
</tr>
<tr>
<td>Oversize Sp. G.:</td>
<td>N/A</td>
</tr>
<tr>
<td>ZAV Sp. G.:</td>
<td></td>
</tr>
<tr>
<td>Performed on Material Passing:</td>
<td>3/4 in. Sieve</td>
</tr>
</tbody>
</table>

Test Results

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Dry Density</td>
<td>128.5</td>
</tr>
<tr>
<td>Optimum Moisture</td>
<td>7.5</td>
</tr>
<tr>
<td>Test Standard</td>
<td>ASTM D 1557</td>
</tr>
<tr>
<td>Method</td>
<td>C</td>
</tr>
</tbody>
</table>

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BEARING RATIO TEST REPORT
ASTM D 1883-99

Penetration Resistance (psi)

Penetration Depth (in.)

Swell (%)

Elapsed Time (hrs)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>98.6</td>
<td>90.5</td>
<td>19.0</td>
<td>89.4</td>
<td>82</td>
<td>24.2</td>
<td>1.5</td>
<td>1.6</td>
<td>0.000</td>
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</table>

<table>
<thead>
<tr>
<th>Material Description</th>
<th>USCS</th>
<th>Max. Dens. (pcf)</th>
<th>Optimum Moisture (%)</th>
<th>LL</th>
<th>PI</th>
</tr>
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<tbody>
<tr>
<td>Sandy clay</td>
<td></td>
<td>109.0</td>
<td>19.0</td>
<td></td>
<td></td>
</tr>
</tbody>
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Project No: 07330
Project: St. George Replacement Airport
Location: ET-5 @ 7'
Sample Number: 7SG2307
Date: 6/29/07

Test Description/Remarks:

LANDMARK
Client: Cremer & 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 #: G7330

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

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>96</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>97</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>94</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>67</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>70</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>57.5</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>6.2</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2498</td>
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</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

% Cobble
- > 3"
- < 3" - #4

% Gravel
- #4 - #200
- < #200

% Sand
- < #200

% Silt-Clay
- 0.0

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
MOISTURE-DENSITY RELATIONSHIP REPORT

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

Project: St. George Replacement Airport
Location: St. George
Type of Sample: Sandy clay
Sample Location: TP ET-5 @ 7'

Date of Report: 7/9/2007
Reviewed By: _____________________
Lab #: 7SG2307

Sampled By: R. Owens Date: 7/1/2007
Tested By: B. Jansen Date: 7/6/2007
Approved By: Client Date: 7/1/2007

Project #: 07330

Moisture Density Relationship

Proctor Data

| Hammer Weight: | 10 pounds       |
| Hammer Drop:   | 18 inches       |
| Number of Layers: | 5 layers      |
| Blows per Layer: | 55 blows       |
| Mold Size (cu. Ft.): | 0.0750         |
| % Oversized: | N/A             |
| Oversize Sp. G.: | N/A             |
| ZAV Sp. G.: | N/A             |
| Performed on Material Passing: | 3/4 in. Slove |

<table>
<thead>
<tr>
<th>Point</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Moisture</td>
<td>14.2</td>
<td>16.1</td>
<td>18.2</td>
<td>20.1</td>
<td>22.3</td>
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<tr>
<td>Dry Density</td>
<td>100.2</td>
<td>104.3</td>
<td>108.9</td>
<td>107.4</td>
<td>103.0</td>
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</table>

Test Results

<table>
<thead>
<tr>
<th>Maximum Dry Density</th>
<th>109.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimum Moisture</td>
<td>19.0</td>
</tr>
<tr>
<td>Test Standard</td>
<td>ASTM D 1557</td>
</tr>
<tr>
<td>Method</td>
<td>C</td>
</tr>
</tbody>
</table>

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BEARING RATIO TEST REPORT
ASTM D 1883-99

Penetration Resistance (psi)

Penetration Depth (in.)

Swell (%)

Elapsed Time (hrs)

<table>
<thead>
<tr>
<th></th>
<th>Molded</th>
<th>Soaked</th>
<th>CBR (%)</th>
<th>Linearity Correction (in.)</th>
<th>Surcharge (lbs.)</th>
<th>Max. Swell (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Density (pcf)</td>
<td>Percent of Max. Dens.</td>
<td>Moisture (%)</td>
<td>Density (pcf)</td>
<td>Percent of Max. Dens.</td>
<td>Moisture (%)</td>
</tr>
<tr>
<td>1</td>
<td>117.6</td>
<td>94.8</td>
<td>10.5</td>
<td>117.5</td>
<td>94.7</td>
<td>12.6</td>
</tr>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

Material Description
Silty / clayey sand with gravel

Project No: 07330
Project: St. George Replacement Airport
Location: A-3 @ 5'
Sample Number: 7SG2309
Date: 6/29/07

Test Description/Remarks:
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: 8/29/2007

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: 8/29/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm 5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>1.8</td>
<td></td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm 4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td></td>
<td>D4318</td>
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<tr>
<td>75 mm 3&quot;</td>
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<td>Plasticity Index</td>
<td></td>
<td></td>
<td>D4318</td>
<td></td>
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<tr>
<td>50 mm 2&quot;</td>
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<td>Unified Classification System</td>
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<tr>
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<td>AASHTO M145</td>
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<tr>
<td>25 mm 1&quot;</td>
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</tr>
<tr>
<td>19 mm 3/4&quot;</td>
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<td></td>
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</tr>
<tr>
<td>12.5 mm 1/2&quot;</td>
<td>83</td>
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</tr>
<tr>
<td>9.5 mm 3/8&quot;</td>
<td>77</td>
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</tr>
<tr>
<td>4.75 mm #4</td>
<td>66</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2.00 mm #10</td>
<td>56</td>
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</tr>
<tr>
<td>425 µm #40</td>
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<tr>
<td>150 µm #100</td>
<td>27</td>
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<tr>
<td>75 µm #200</td>
<td>19.5</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<tr>
<td>0.0</td>
<td>34.1</td>
<td>46.4</td>
<td>19.5</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils
(AYST D2850)

Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/10/2007
By: BRR

Sample height, H (in.): 6.000
Sample diameter, D (in.): 2.416
Sample volume, V (ft³): 0.0159
Wt. rings + wet soil (g): 1027.73
Wt. rings/tare (g): 210.83
Moist soil, Ws (g): 816.90
Moist unit wt., γₘ (pcf): 113.1
Dry unit wt., γ₀ (pcf): 103.9

<table>
<thead>
<tr>
<th>Axial Strain (%)</th>
<th>σ₀</th>
<th>Q</th>
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</thead>
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<tr>
<td>0.00</td>
<td>0.0</td>
<td>0.0</td>
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<tr>
<td>0.05</td>
<td>887.0</td>
<td>443.5</td>
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<td>0.10</td>
<td>1843.2</td>
<td>921.6</td>
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<td>0.15</td>
<td>2559.1</td>
<td>1279.6</td>
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<tr>
<td>0.20</td>
<td>3106.4</td>
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</tr>
<tr>
<td>0.25</td>
<td>3515.5</td>
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<td>0.30</td>
<td>3945.7</td>
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<td>0.35</td>
<td>4395.9</td>
<td>2197.9</td>
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<td>0.45</td>
<td>5204.6</td>
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<td>0.50</td>
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<td>0.55</td>
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<tr>
<td>0.60</td>
<td>6453.9</td>
<td>3164.6</td>
</tr>
<tr>
<td>0.65</td>
<td>6881.7</td>
<td>3311.8</td>
</tr>
<tr>
<td>0.70</td>
<td>7211.3</td>
<td>3455.6</td>
</tr>
</tbody>
</table>

Boring No.: A-5
Sample: 2
Sample Description: top- red clay / bottom- gray silt w/ gravel
Sample type: Undisturbed

Wet soil + tare (g): 1015.50
Dry soil + tare (g): 951.15
Tare (g): 226.36
Moisture content, w (%): 8.9
Confining stress, σ₃ (psf): 245
Strain rate (in/min): 0.0180
Strain at failure, εₙ (%): 1.20
Deviator stress at failure, (σ₀-σ₃)ₙ (psf): 10308
Shear stress at failure, qₑ = (σ₀+σ₃)/2 (psf): 5134

Entered by: [Signature]
Reviewed: [Signature]
Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

( ASTM D2850)

Project: Landmark Testing
No: M00431-009
Location: St. George, UT
Date: 7/1/2007
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., $\gamma_w$ (pcf) | 131.4 |
| Dry unit wt., $\gamma_d$ (pcf) | 117.6 |

Axial Strain $\sigma_1 - \sigma_3$ (1/2 $\sigma$) (psf)

| 0.00 | 0.0 |
| 0.05 | 317.7 |
| 0.10 | 676.3 |
| 0.15 | 1386.0 |
| 0.20 | 2131.9 |
| 0.25 | 3076.8 |
| 0.30 | 4202.6 |
| 0.35 | 5262.0 |
| 0.40 | 6443.8 |
| 0.45 | 7500.2 |
| 0.50 | 8759.5 |
| 0.55 | 9640.5 |
| 0.60 | 9356.0 |

Deviator stress at failure, $(\sigma_1 - \sigma_3)_f$ (psf) 18450
Shear stress at failure, $q_f = (\sigma_1 - \sigma_3)/2$ (psf) 9225

Strain rate (in/min) 0.0176
Strain at failure, $\varepsilon_f$ (%) 1.20

Wet soil + tare (g) 985.55
Dry soil + tare (g) 901.24
Tare (g) 181.32
Moisture content, w (%) 11.7
Confining stress, $\sigma_3$ (psf) 605

Graph showing deviator stress vs. axial strain.
## Unconfined Compressive Strength

**Project:** St. George Replacement Airport  
**Project #:** 07330

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Location</th>
<th>Length</th>
<th>Diameter</th>
<th>Area</th>
<th>Load</th>
<th>PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7SG2070</td>
<td>WT-9 @ 6'</td>
<td>4.02</td>
<td>2.04</td>
<td>3.27</td>
<td>24020</td>
<td>7350</td>
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<tr>
<td>7SG2071</td>
<td>WT-9 @ 14'</td>
<td>4.00</td>
<td>2.04</td>
<td>3.27</td>
<td>23260</td>
<td>7120</td>
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<tr>
<td>7SG2072</td>
<td>WT-9 @ 22'</td>
<td>3.96</td>
<td>2.02</td>
<td>3.20</td>
<td>22830</td>
<td>7120</td>
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<tr>
<td>7SG2073</td>
<td>WT-9 @ 35'</td>
<td>4.01</td>
<td>1.98</td>
<td>3.08</td>
<td>17980</td>
<td>5840</td>
</tr>
<tr>
<td>7SG2253</td>
<td>RW-10 @ 12'</td>
<td>4.01</td>
<td>2.05</td>
<td>3.30</td>
<td>28460</td>
<td>8620</td>
</tr>
<tr>
<td>7SG2254</td>
<td>RW-10 @ 20'</td>
<td>4.07</td>
<td>2.04</td>
<td>3.27</td>
<td>23080</td>
<td>7060</td>
</tr>
<tr>
<td>7SG2255</td>
<td>RW-11 @ 11'</td>
<td>4.05</td>
<td>2.05</td>
<td>3.30</td>
<td>22280</td>
<td>6750</td>
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<tr>
<td>7SG2256</td>
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<td>3.99</td>
<td>2.05</td>
<td>3.30</td>
<td>19080</td>
<td>5780</td>
</tr>
<tr>
<td>7SG2257</td>
<td>RW-11 @ 23'</td>
<td>4.07</td>
<td>2.05</td>
<td>3.30</td>
<td>27440</td>
<td>8310</td>
</tr>
<tr>
<td>7SG2258</td>
<td>RW-12 @ 9'</td>
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<td>2.02</td>
<td>3.20</td>
<td>28710</td>
<td>8770</td>
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<tr>
<td>7SG2259</td>
<td>RW-12 @ 23'</td>
<td>4.02</td>
<td>2.03</td>
<td>3.24</td>
<td>26710</td>
<td>8840</td>
</tr>
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</table>
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

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Location</th>
<th>Depth (feet)</th>
<th>Sodium (Percent)</th>
<th>Water Soluble Sulfate (SO₄) (Percent)</th>
<th>Total Available Water Soluble Sodium Sulfate (Na₂SO₄) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td></td>
<td>5.0</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>ET-2</td>
<td></td>
<td>2.0</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>ET-3</td>
<td></td>
<td>2.0</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>ET-8</td>
<td></td>
<td>2.0</td>
<td>&lt;0.01</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>RW-2</td>
<td></td>
<td>2.0</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>RW-4</td>
<td></td>
<td>7.0</td>
<td>0.01</td>
<td>0.03</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Solubility = 0.24%
Solubility = 0.04%
Solubility = 0.10%
Solubility = 0.25%
Solubility = 0.06%
Solubility = 0.44%

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.
### 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**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Location</th>
<th>Depth (feet)</th>
<th>Sodium (Percent)</th>
<th>Water Soluble Sulfate (SO₄) (Percent)</th>
<th>Total Available Water Soluble Sodium Sulfate (Na₂SO₄) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT-1</td>
<td>2.0</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WT-3</td>
<td>17.0</td>
<td>0.01</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WT-5</td>
<td>7.0</td>
<td>0.03</td>
<td>0.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS-6</td>
<td>10.0</td>
<td>0.02</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS-8</td>
<td>5.0</td>
<td>0.03</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solubility:
- WT-1: 0.12%
- WT-3: 0.14%
- WT-5: 0.36%
- LS-6: 0.20%
- LS-8: 0.30%

**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.
# 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

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Location</th>
<th>Depth (feet)</th>
<th>Sodium (Percent)</th>
<th>Water Soluble Sulfate (SO₄) (Percent)</th>
<th>Total Available Water Soluble Sodium Sulfate (Na₂SO₄) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75G3017</td>
<td>WD-1</td>
<td>7</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
</tr>
</tbody>
</table>

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.
**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

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Location</th>
<th>Depth (feet)</th>
<th>Sodium (Percent)</th>
<th>Water Soluble Sulfate (SO₄) (Percent)</th>
<th>Total Available Water Soluble Sodium Sulfate (Na₂SO₄) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75G3027</td>
<td>WD-2</td>
<td>4</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Solubility 0.32%

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.
# Atlas Consultants, Inc.

6000 S. Eastern Avenue, Suite 10J • Las Vegas, Nevada 89119  
(702) 383-1199 • Fax (702) 383-4983

**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**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Location</th>
<th>Depth (feet)</th>
<th>Sodium (Percent)</th>
<th>Water Soluble Sulfate (SO₄) (Percent)</th>
<th>Total Available Sodium Sulfate (Na₂SO₄) (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75G3030</td>
<td>WD-X4</td>
<td>X2</td>
<td>&lt;0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Solubility 0.03%

---

**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.
SOIL CLASSIFICATION REPORT

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

Date of Report: 10/2/2007
Reviewed By: _______________________
Lab#: 7803017

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

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>97</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>91</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>78</td>
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<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>67</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>54</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>35</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>23.4</td>
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</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>6.7</td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

\[
\begin{array}{|c|c|c|c|c|}
\hline
\% Cobble & \% Gravel & \% Sand & \% Silt-Clay \\
\hline
0.0 & 22.3 & 54.3 & 23.4 \\
\hline
\end{array}
\]
# 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  
**Sampled By:** R. Owens  
**Date:** 8/25/2007

**Location:** St. George  
**Tested By:** M. Clements  
**Date:** 8/25/2007

**Type of Sample:**  
**Location of Sample:** WD 1 @ 12'

**Authorized By:** Client  
**Date:** 8/25/2007

---

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>2.7</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
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<td></td>
<td>Dry Unit Weight, paf</td>
<td>104.5</td>
<td>C 29</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>Unified Classification System</td>
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<td>D 2487</td>
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</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
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<td>AASHTO Classification System</td>
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<td>AASHTO M145</td>
<td></td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
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</tr>
<tr>
<td>9.5 mm</td>
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<td></td>
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<td></td>
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<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>89</td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>75</td>
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</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td>41</td>
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</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>11.6</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>10.6</td>
<td>77.8</td>
<td>11.6</td>
</tr>
</tbody>
</table>

---

**Logarithmic Plot:**

- Log(x) vs. Percent Passing
- Sieve Size vs. Test Results
**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**

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td></td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>D2216</td>
</tr>
<tr>
<td>100 mm</td>
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<td></td>
<td></td>
<td></td>
<td>Liquid Limit</td>
<td>D 4318</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td></td>
<td></td>
<td>Plasticity Index</td>
<td>D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td></td>
<td></td>
<td>Unified Classification System</td>
<td>D 2487</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
<td></td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

---

**Log(v)**

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### 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 #:** 97330

**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/25/2007  
**Tested By:** M. Clements  
**Date:** 8/25/2007  
**Authorized By:** Client  
**Date:** 3/25/2007

#### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>18 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
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- **Natural Moisture Content,** %  
  - **Result:** 1.2  
  - **Specification:** D2216
- **Liquid Limit**  
  - **Specification:** D 4318
- **Plasticity Index**  
  - **Specification:** D 4318
- **Unified Classification System**  
  - **Specification:** D 2487
- **AASHTO Classification System**  
  - **Specification:** AASHTO M145

<table>
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<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<td>35.9</td>
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525 N. 3050 E. Suite 3, St. George, UT 84790 ● Phone: (435) 986-0566 ● Fax: (435) 986-0568
**SOIL CLASSIFICATION REPORT**

Client: Cremer & 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  
Tested By: S. Wells  
Date: 8/25/2007  
Authorized By: Client  
Date: 3/3/2007

**Slieve Analysis, ASTM C136**  
Test Standards are ASTM unless otherwise noted.

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<tr>
<th>Slieve Size</th>
<th>% Passing Cumulative</th>
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<th>Test</th>
<th>Result</th>
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<th>Test Standard</th>
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<tr>
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<td>33</td>
<td>D 4318</td>
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<tr>
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<td>3&quot;</td>
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<td>Plasticity Index</td>
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</tr>
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<td>1&quot;</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
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</table>

% Cobble:
- > 3"
- < 3" - #4

% Gravel:
- < #4 - #200

% Sand:
- < #200

% Silt-Clay:
- < #200

Log(x) vs.Percent Passing

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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  
**Tested By:** S. Wells  
**Date:** 8/25/2007  
**Authorized By:** Client  
**Date:** 8/25/2007

**Location of Sample:** WD-2 @ 17'

**Type of Sample:**

---

### Sieve Analysis, ASTM C136

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<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125</td>
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<td>Natural Moisture Content, %</td>
<td>24</td>
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<tr>
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<td>0</td>
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<tr>
<td>75</td>
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<td></td>
<td>Plasticity index</td>
<td>0</td>
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<td>D 4316</td>
</tr>
<tr>
<td>50</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td>D2487</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
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<td>AASHTO Classification System</td>
<td>AASHTO M145</td>
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<tr>
<td>25</td>
<td>1&quot;</td>
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<tr>
<td>12.5</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
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<td></td>
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<tr>
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</tbody>
</table>

### Log(x) Graph

- Log(x) Graph showing percent passing against sieve size.

---

*525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568*
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
Tested By: M. Clements
Date: 8/25/2007
Authorized By: Client
Date: 8/25/2007

Location of Sample: WD-3 @ 7'

Sieve Analysis, ASTM C136

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<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>100</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>83</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>67</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
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</tr>
<tr>
<td>2.00 mm</td>
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<td>48</td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td>39</td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td>24</td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td>15.0</td>
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</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>3.1</td>
<td>D2216</td>
<td></td>
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<tr>
<td>Liquid Limit</td>
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<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
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<td>D2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
<tbody>
<tr>
<td>0.0</td>
<td>45.2</td>
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<td>15.0</td>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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:** SL George Replacement Airport  
**Project #:** 07330  
**Location:** St. George  
**Sampled By:** R. Owens  
**Date:** 8/25/2007  
**Tested By:** M. Clements  
**Date:** 8/25/2007  
**Authorized By:** Client  
**Date:** 8/25/2007

**Type of Sample:**  
**Location of Sample:** WD-3 @ 12'

---

**Sieve Analysis, ASTM C136**  
Test Standards are ASTM unless otherwise noted.

<table>
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<th>Sieve Size</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>75 mm</td>
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<td></td>
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<tr>
<td>50 mm</td>
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<td>Dry Unit Weight, pcf</td>
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<tr>
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<td>D2487</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>AASHTO Classification System</td>
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<td>AASHTO M149</td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
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<tr>
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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 10/2/2007
Reviewed By: ___________________________
Lab#: 78G3025

Project: St. George Replacement Airport
Project #: 07330

Location: St. George
Sampled By: R. Owens
Date: 8/25/2007
Tested By: S. Wells
Date: 8/25/2007
Authorized By: Client
Date: 8/25/2007

Type of Sample: ___________________________
Location of Sample: WD-3 @ 22°

Sieve Analysis, ASTM C136

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<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
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<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125</td>
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<td>Natural Moisture Content, %</td>
<td>52</td>
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<tr>
<td>75</td>
<td>3&quot;</td>
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<td>27</td>
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<td>50</td>
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<td>D 2497</td>
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<td>AASHTO M149</td>
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<td>3/4&quot;</td>
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</tr>
<tr>
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<td>1/2&quot;</td>
<td>% Sand &lt; #4 - #200</td>
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<td>9.5</td>
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</tr>
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<tr>
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<tr>
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<td>#200</td>
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525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Client: Cremer & Noble Engineers
435 East Tabernacle
St. George, Utah 84770

Date of Report: 10/2/2007
Reviewed By: 
Lab#: 79G3026

Project: St. George Replacement Airport
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

SOIL CLASSIFICATION REPORT

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<th>Specification</th>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
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<td>26</td>
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<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>25</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>23</td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td>20</td>
</tr>
<tr>
<td>425 μm</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test Standards</th>
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<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>3.1</td>
<td>D2216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td></td>
<td>D4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td></td>
<td>D4318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>76.8</td>
<td>14.8</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
Client: Creamer & Noble Engineers  
435 East Tabernacle  
St. George, Utah 84770  

Date of Report: 10/2/2007  
Reviewed By:  
Lab #: 7SG30027  

Project #: 07330  
Sampled By: R. Owens Date: 8/25/2007  
Tested By: M. Clements Date: 8/25/2007  
Authorized By: Client Date: 8/25/2007  

Type of Sample:  
Location of Sample: WD 4 @ 7'  

**SOIL CLASSIFICATION REPORT**

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

**Project:** St. George Replacement Airport  
**Location:** St. George  

**Sampled By:** R. Owens **Date:** 8/25/2007  
**Tested By:** M. Clements **Date:** 8/25/2007  
**Authorized By:** Client **Date:** 8/25/2007  

**Test Standards are ASTM unless otherwise noted.**

### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>6.8</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td></td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
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<tr>
<td>9.5 mm</td>
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<tr>
<td>4.75 mm</td>
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<td>76</td>
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<tr>
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</tr>
<tr>
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<td></td>
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<td>54</td>
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</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
<td></td>
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<td>#200</td>
<td></td>
<td></td>
<td>16.2</td>
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</table>

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot; - #4</td>
<td>&lt; #4 - #200</td>
<td>&lt; #200</td>
</tr>
<tr>
<td>0.0</td>
<td>24.0</td>
<td>59.8</td>
<td>16.2</td>
</tr>
</tbody>
</table>

**Diagram:** Log (x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## Soil Classification Report

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

**Date of Report:** 10/2/2007

**Reviewed By:**  
Lab#: 78G3028

**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

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>27</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
<td>Liquid Limit</td>
<td></td>
<td>4318</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>5</td>
<td>4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>2487</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
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</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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<td></td>
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<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Grading Curve

**% Cobble:** 0.0  
**% Gravel:** 0.0  
**% Sand:** 0.0  
**% Silt-Clay:** 0.0

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### 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  
**Sampled By:** R. Owens  
**Sampled Date:** 8/25/2007  
**Tested By:** M. Clements  
**Tested Date:** 8/25/2007  
**Authorized By:** Client  
**Authorized Date:** 8/25/2007

**Location:** St. George  
**Type of Sample:** WD-4 @ 22'

---

**Sieve Analysis, ASTM C136**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
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</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td>93</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td>93</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td>80</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td>72</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td>60</td>
</tr>
<tr>
<td>2.0 mm</td>
<td>#10</td>
<td>44</td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td>31</td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td>25</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>21.4</td>
</tr>
</tbody>
</table>

**Test Standards are ASTM unless otherwise noted.**

<table>
<thead>
<tr>
<th>Test Standard</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td>5.8</td>
<td>D2216</td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>27</td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>10</td>
<td>D4318</td>
<td></td>
</tr>
<tr>
<td>Unified Classification System</td>
<td></td>
<td>D2487</td>
<td></td>
</tr>
<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>40.5</td>
<td>38.1</td>
<td>21.4</td>
</tr>
</tbody>
</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 10/2/2007
Reviewed By: ____________________
Lab#: 78G3030

Project: St George Replacement Airport
Project #: 97330

Location: St George
Sampled By: R. Owens
Date: 8/25/2007
Tested By: S. Wells
Date: 8/25/2007
Location of Sample: WD-4 @ 27'
Authorized By: Client
Date: 8/25/2007

Sieve Analysis, ASTM C138

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td>Natural Moisture Content, %</td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td>Liquid Limit</td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td>Plasticity Index</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td>Unified Classification System</td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td>AASHTO Classification System</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td></td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content, %</td>
<td></td>
<td>D2216</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>22</td>
<td>D 4318</td>
</tr>
<tr>
<td>Plasticity Index</td>
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<td>D 2487</td>
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<tr>
<td>AASHTO Classification System</td>
<td></td>
<td>AASHTO M145</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5”</td>
<td></td>
<td></td>
<td></td>
<td>Natural Moisture Content, %</td>
<td>4.7</td>
</tr>
<tr>
<td>100 mm</td>
<td>4”</td>
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<td></td>
<td></td>
<td>Liquid Limit</td>
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</tr>
<tr>
<td>75 mm</td>
<td>3”</td>
<td></td>
<td></td>
<td></td>
<td>Plasticity Index</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2”</td>
<td></td>
<td></td>
<td></td>
<td>Dry Unit Weight,pcf</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2”</td>
<td>Unified Classification System</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>25 mm</td>
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<td></td>
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<tr>
<td>19 mm</td>
<td>3/4”</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2”</td>
<td>96</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9.5 mm</td>
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<tr>
<td>4.75 mm</td>
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<tr>
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<tr>
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<td></td>
</tr>
</tbody>
</table>

Test Standards are ASTM unless otherwise noted.

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0568 • Fax: (435) 986-0568
Collapse/Swell Potential of Soils
(AGT D4546 & D5333)

Project: Landmark Testing & Engineering
No: M00431-011

Location:
Date: 9/10/2007
By: BRR

Boring No.: WD-5
Sample: 17
Depth: 17
Sample Description: purplish brown clay
Engineering Classification: Not requested
Sample type: Undisturbed-trimmed from thin-wall

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D ε_u (%)</th>
<th>H_c (in.)</th>
<th>ε</th>
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<tbody>
<tr>
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<td>0.00</td>
<td>1.0000</td>
<td>0.529</td>
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<td>0.1682</td>
<td>0.05</td>
<td>0.9995</td>
<td>0.528</td>
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<tr>
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<td>0.1698</td>
<td>0.21</td>
<td>0.9979</td>
<td>0.526</td>
</tr>
<tr>
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<td>0.663</td>
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<td>16000</td>
<td>0.1784</td>
<td>1.07</td>
<td>0.9893</td>
<td>0.512</td>
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</table>

Specific gravity, G_s = 2.65 Assumed
Swell (%) = 8.99
Swell stress (psf) = 250

Sample height, H (in.) = 1.000 Initial 0.9893 Final
Sample diameter, D (in.) = 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

Vertical Strain, ε_v (%) = 8.99 %

Effective Consolidation Stress, σ'_v (psf)
# 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  
**Sample Date:** 8/25/2007

**Type of Sample:**  
**Tested By:** M. Clements  
**Test Date:** 8/25/2007

**Location of Sample:** WD-6 @ 7  
**Authorized By:** Client  
**Date:** 8/25/2007

## Sleeve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test Standards are ASTM unless otherwise noted.</th>
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</thead>
<tbody>
<tr>
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<td>Natural Moisture Content, % 4.6 D2216</td>
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<tr>
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<td>Liquid Limit D 4318</td>
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<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index D 4318</td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
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<td>Unified Classification System D 2487</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
<td>AASHTO Classification System AASHTO M145</td>
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<tr>
<td>25 mm</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
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</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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<td></td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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<tr>
<td>0.0</td>
<td>23.5</td>
<td>64.6</td>
<td>11.9</td>
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**Log(x)**

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### 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:**  
**Date:** 8/25/2007

#### Sieve Analysis, ASTM C136

<table>
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<tr>
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<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
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<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
<td></td>
</tr>
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</table>

#### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test Standards</th>
<th>Test</th>
<th>Specification</th>
<th>Result</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
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<td>D2216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>D4318</td>
<td></td>
<td></td>
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<tr>
<td>Plasticity Index</td>
<td>17</td>
<td>D4318</td>
<td></td>
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</tr>
<tr>
<td>Unified Classification System</td>
<td>D2487</td>
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<td></td>
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<tr>
<td>AASHTO Classification System</td>
<td>AASHTO M146</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### Collapse/Swell Potential of Soils

*(ASTM D4546 & D5333)*

**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

<table>
<thead>
<tr>
<th>Specific gravity, $G_s$</th>
<th>2.65</th>
<th>Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swell (%)</td>
<td>4.82</td>
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</tr>
<tr>
<td>Swell stress (psf)</td>
<td>1000</td>
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<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D $e_0$ (%)</th>
<th>$H_c$ (in.)</th>
<th>$e$</th>
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<tbody>
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<td>0.00</td>
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<tr>
<td>8000</td>
<td>0.1958</td>
<td>1.54</td>
<td>0.9846</td>
<td>0.568</td>
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</table>

| 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., $\gamma_m$ (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., $\gamma_d$ (pcf) | 103.8 | 105.5 |
| Saturation | 0.65 | 1.00 |

**Diagram:**  
- **Swell = 4.82 %**

**Effective Consolidation Stress, $\sigma_{ve}'$ (psf)**

**Entered:**  
**Reviewed:**
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 #: 07330

Project: St. George Replacement Airport
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: 3/25/2007

Sieve Analysis, ASTM C136
Test Standards are ASTM unless otherwise noted.

<table>
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<tr>
<th>Sieve Size (mm)</th>
<th>% Passing</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<td>Natural Moisture Content, %</td>
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<tr>
<td>100</td>
<td>4&quot;</td>
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<td>Liquid Limit</td>
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<td></td>
<td>D4318</td>
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<tr>
<td>75</td>
<td>3&quot;</td>
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<td>D4318</td>
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<tr>
<td>50</td>
<td>2&quot;</td>
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<td>Unified Classification System</td>
<td></td>
<td></td>
<td>D2487</td>
</tr>
<tr>
<td>37.5</td>
<td>1-1/2&quot;</td>
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<td></td>
<td>AASHTO M145</td>
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<tr>
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</tr>
<tr>
<td>19</td>
<td>3/4&quot;</td>
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<td></td>
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</tr>
<tr>
<td>12.5</td>
<td>1/2&quot;</td>
<td></td>
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<tr>
<td>9.5</td>
<td>3/8&quot;</td>
<td></td>
<td></td>
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<tr>
<td>4.75</td>
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</tr>
<tr>
<td>2.00</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150 µm</td>
<td>#100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>75 µm</td>
<td>#200</td>
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<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
<tbody>
<tr>
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<td>0.0</td>
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</table>

Log(k)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
## Soil Classification Report

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

**Date of Report:** 10/2/2007

**Reviewed By:**  
**Lab #:** 78G3039

**Project:** St. George Replacement Airport  
**Sampled By:** R. Owens  
**Date:** 8/25/2007

**Location:** St. George  
**Tested By:** M. Clements  
**Date:** 8/25/2007

**Location of Sample:** WD-7 @ 7'  
**Authorized By:** Client  
**Date:** 8/25/2007

**Project #:** 07330

---

### Sleeve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
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<tbody>
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<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
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<td>50 mm</td>
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</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>100</td>
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<td>34</td>
</tr>
<tr>
<td>75 μm</td>
<td>#200</td>
<td>17.6</td>
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</table>

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
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<tbody>
<tr>
<td>Natural Moisture Content, %</td>
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<td>D2216</td>
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<td>Liquid Limit</td>
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<td></td>
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<tr>
<td>Plasticity Index</td>
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<td>Dry Unit Weight, pcf</td>
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<td>AASHTO M145</td>
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</tr>
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### Particle Size Distribution

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
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</thead>
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<tr>
<td>0.0</td>
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<td>70.1</td>
<td>17.6</td>
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</table>

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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: 3/25/2007

Type of Sample:  
Tested By: S. Wells  
Date: 3/25/2007

Location of Sample: WD-7 @ 12’  
Authorized By: Client  
Date: 3/25/2007

---

### Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>100 mm</td>
<td>100 mm</td>
<td>75 mm</td>
<td>50 mm</td>
<td>37.5 mm</td>
<td>25 mm</td>
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<tr>
<td>5&quot;</td>
<td>4&quot;</td>
<td>3&quot;</td>
<td>2&quot;</td>
<td>1-1/2&quot;</td>
<td>1&quot;</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

### Logarithmic Chart

![Logarithmic Chart](chart.png)

### Summary

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

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 10/2/2007
Reviewed By: 
Lab#: 78G3041

Project: St. George Replacement Airport
Project #: 07330

Location: St. George
Sampled By: R. Owens
Date: 8/25/2007
Tested By: S. Wells
Date: 8/25/2007
Authorized By: Client
Date: 8/25/2007

Type of Sample: 
Location of Sample: WD-7 @ 21'

Sieve Analysis, ASTM C136

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<th>Sieve Size</th>
<th>% Passing</th>
<th>Specification</th>
</tr>
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<td>125 mm</td>
<td>6&quot;</td>
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<tr>
<td>100 mm</td>
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<tr>
<td>50 mm</td>
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<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 µm</td>
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<tr>
<td>75 µm</td>
<td>#200</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test Standard</th>
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<tr>
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<tr>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
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<tbody>
<tr>
<td></td>
<td></td>
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<td>0.0</td>
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</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### Soil Classification Report

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

**Date of Report:** 10/2/2007  
**Reviewed By:**  
**Lab#:** 7SG3043

**Project:** SL George Replacement Airport  
**Project #:** 07330  
**Sampled By:** R. Owens  
**Date:** 8/25/2007  
**Tested By:** S. Wells  
**Date:** 8/25/2007  
**Authorized By:** Client  
**Date:** 9/25/2007

**SOIL CLASSIFICATION REPORT**

**Location:** SL George  
**Location of Sample:** WD-7 @ 42'

### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
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<td>Natural Moisture Content, %</td>
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<tr>
<td>75 mm</td>
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<td>D 2497</td>
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<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
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</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
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</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
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</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
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<td>75 μm</td>
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<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
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<tbody>
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<td>&lt; 3&quot; - #4</td>
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### Log(k)

![Log(k) Diagram](attachment:logk_graph.png)

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
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
Tested By: S. Wells
Date: 8/25/2007
Authorized By: Client
Date: 8/25/2007

Sampled By: R. Owens
Type of Sample: WD-8 @ 7'
Date: 8/25/2007

Location of Sample: WD-8 @ 7'

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sleeve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
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<tr>
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<tr>
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<td>% Cobble &gt; 3&quot;</td>
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</tr>
<tr>
<td>19 mm</td>
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<td>% Gravel &lt; 3&quot; - #4</td>
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<td>% Sand &lt; #4 - #200</td>
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<tr>
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<td>3/8&quot;</td>
<td></td>
<td>% Slit-Clay &lt; #200</td>
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</tr>
<tr>
<td>4.75 mm</td>
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</tr>
<tr>
<td>2.00 mm</td>
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<tr>
<td>425 µm</td>
<td>#40</td>
<td></td>
<td>% Sand &lt; #4 - #200</td>
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<tr>
<td>150 µm</td>
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<td>% Slit-Clay &lt; #200</td>
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<td></td>
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</table>

Log(x):

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**Collapse/Swell Potential of Soils**  
(ASME D4546 & D5333)  
**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

<table>
<thead>
<tr>
<th>Specific gravity, Gs</th>
<th>2.65</th>
<th>Assumed</th>
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<tbody>
<tr>
<td>Swell (%)</td>
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<td>Swell stress (psf)</td>
<td>250</td>
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</table>

<table>
<thead>
<tr>
<th>Stress (psf)</th>
<th>Dial (in.)</th>
<th>1-D εv (%)</th>
<th>H (in.)</th>
<th>ε</th>
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<tr>
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<td>0.2661</td>
<td>1.89</td>
<td>0.9811</td>
<td>0.448</td>
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</table>

| 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., γm (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., γd (pcf) | 112.1 | 114.2 |
| Saturation | 0.79 | 1.00 |

**Swell = 7.41 %**

**Effective Consolidation Stress, σ' ve (psf)**

**Plot:**

- Vertical Strain, εv (%) vs Effective Consolidation Stress, σ' ve (psf)
## Soil Classification Report

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

**Date of Report:** 10/2/2007  
**Reviewed By:**  
**Lab #:** 793049

**Project:** St. George Replacement Airport  
**Project #:** 07330  
**Sampled By:** R. Owens  
**Date:** 8/25/2007  
**Tested By:** S. Wells  
**Date:** 8/25/2007  
**Authorized By:** Client  
**Date:** 8/25/2007

**Location:** St. George  
**Location of Sample:** WD-8 @ 27'

---

### Sieve Analysis, ASTM C136

<table>
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<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
<td>125 mm</td>
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<td>Natural Moisture Content, %</td>
<td></td>
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<td>D2216</td>
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<tr>
<td>19 mm</td>
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</tr>
<tr>
<td>9.5 mm</td>
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<td>4.75 mm</td>
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</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
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</tr>
<tr>
<td>150 μm</td>
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<td>#200</td>
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</table>

### Percentage Passing

<table>
<thead>
<tr>
<th>% Cobble &gt; 3&quot;</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0.0</td>
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</tbody>
</table>

---

**Log(x)**

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
### Soil Classification Report

**Client:** Cremer & 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  
**Sampled By:** R. Owens  
**Date:** 8/25/2007  
**Tested By:** S. Wells  
**Date:** 8/25/2007  
**Authorized By:** Client  
**Date:** 9/25/2007

**Location:** St. George  
**Location of Sample:** WD-8 @ 32'

---

### Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
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<td>425 µm</td>
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</tr>
<tr>
<td>75 µm</td>
<td>#200</td>
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</tbody>
</table>

### Logarithmic Log(x) Chart

- X-axis: Sieve Size (mm)  
- Y-axis: Project Passing

---

**525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568**
SOIL CLASSIFICATION REPORT

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

Date of Report: 10/2/2007
Reviewed By: 
Lab#: 7S3G3048

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

Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
</tr>
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<tbody>
<tr>
<td>125 mm</td>
<td>6&quot;</td>
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<td>Natural Moisture Content, %</td>
<td>25</td>
<td>D 4318</td>
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<tr>
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<td>Liquid Limit</td>
<td></td>
<td></td>
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<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
<td>Plasticity Index</td>
<td>5</td>
<td>D 4318</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
<td>Unified Classification System</td>
<td></td>
<td>D 2487</td>
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</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
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<td>AASHTO Classification System</td>
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<td>AASHTO M145</td>
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<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel &lt; 3&quot; - #4</th>
<th>% Sand &lt; #4 - #200</th>
<th>% Silt-Clay &lt; #200</th>
</tr>
</thead>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
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</tbody>
</table>

Log(x)

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
**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

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
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<th>Specification</th>
<th>Test Standard</th>
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<td></td>
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<tr>
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<td>4.75</td>
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<tr>
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<tr>
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<td>150 µm</td>
<td>#100</td>
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<td>75 µm</td>
<td>#200</td>
<td>39.8</td>
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</tbody>
</table>

### Graph

**Log(x)**

- 0.1 mm to 100 mm
- 0.3 mm to 1 mm
- 0.5 mm to 0.3 mm
- 1 mm to 0.1 mm
- 2 mm to 10 mm
- 5 mm to 20 mm
- 10 mm to 100 mm

---

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0568 • Fax: (435) 986-0568
SOIL CLASSIFICATION REPORT

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

Date of Report: 10/2/2007

Reviewed By: ____________________________
Lab#: 79G3055

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: ____________________________
Date: 8/25/2007

Sieve Analysis, ASTM C136

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing Cumulative</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 mm</td>
<td>5&quot;</td>
<td></td>
</tr>
<tr>
<td>100 mm</td>
<td>4&quot;</td>
<td></td>
</tr>
<tr>
<td>75 mm</td>
<td>3&quot;</td>
<td></td>
</tr>
<tr>
<td>50 mm</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>37.5 mm</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
<td></td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>9.5 mm</td>
<td>3/8&quot;</td>
<td></td>
</tr>
<tr>
<td>4.75 mm</td>
<td>#4</td>
<td></td>
</tr>
<tr>
<td>2.00 mm</td>
<td>#10</td>
<td></td>
</tr>
<tr>
<td>425 μm</td>
<td>#40</td>
<td></td>
</tr>
<tr>
<td>150 μm</td>
<td>#100</td>
<td></td>
</tr>
<tr>
<td>75 μm</td>
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Test Standards are ASTM unless otherwise noted.

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Specification</th>
<th>Test Standard</th>
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<tbody>
<tr>
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<td>Liquid Limit</td>
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<tr>
<td>Unified Classification System</td>
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<td>D2487</td>
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<tr>
<td>AASHTO Classification System</td>
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<td>AASHTO M145</td>
<td></td>
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</table>

Cobbler Grading:

<table>
<thead>
<tr>
<th>% Cobble</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Silt-Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3&quot;</td>
<td>&lt; 3&quot;-#4</td>
<td>&lt; #4-#200</td>
<td>&lt; #200</td>
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<td>0.0</td>
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</table>

Logarithmic Plot

525 N. 3050 E. Suite 3, St. George, UT 84790 • Phone: (435) 986-0566 • Fax: (435) 986-0568
# Unconfined Compressive Strength

**Project:** St. George Replacement Airport  
**Project #:** 07330

<table>
<thead>
<tr>
<th>Lab #</th>
<th>Location</th>
<th>Length</th>
<th>Diameter</th>
<th>Area</th>
<th>Load</th>
<th>PSI</th>
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<tbody>
<tr>
<td>7SG3049</td>
<td>ET-11 @ 5'</td>
<td>4.00</td>
<td>2.04</td>
<td>3.27</td>
<td>13,340</td>
<td>4,080</td>
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<tr>
<td>7SG3050</td>
<td>ET-12 @ 10'</td>
<td>4.07</td>
<td>2.06</td>
<td>3.33</td>
<td>52,400</td>
<td>15,720</td>
</tr>
<tr>
<td>7SG3051</td>
<td>WT-10 @ 6'</td>
<td>4.02</td>
<td>2.02</td>
<td>3.20</td>
<td>29,310</td>
<td>9,150</td>
</tr>
<tr>
<td>7SG3052</td>
<td>RW-14 @ 6'</td>
<td>4.18</td>
<td>2.02</td>
<td>3.20</td>
<td>30,000</td>
<td>9,360</td>
</tr>
<tr>
<td>7SG3053</td>
<td>WT-13 @ 7'</td>
<td>4.03</td>
<td>2.05</td>
<td>3.30</td>
<td>24,510</td>
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