GEOTECHNICAL EVALUATION
NEW CHARTER SCHOOL BUILDING
201 NEEL STREET
SOCORRO, NEW MEXICO
JOB NO. 3227.JJ291

Western Technologies Inc.
The Quality People
Since 1965

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Prepared for:
COTTONWOOD CHARTER SCHOOL
January 10, 2008

 Carlton Pine
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ARIZONA
Casa Grande
Cottonwood
Flagstaff

FORT MOHAVE
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PAGOSA SPRINGS

NEVADA
LAS VEGAS

NEW MEXICO
ALBUQUERQUE
FARMINGTON

UTAH
SALT LAKE CITY
January 10, 2008

Cottonwood Charter School
429 School of Mines Road
Socorro, New Mexico 87801

Attn: Mr. Russell Wrenn, Project Manager

Re: Geotechnical Evaluation
New Charter School Building
201 Neel Street
Socorro, New Mexico

Job No. 3227JJ291

Western Technologies, Inc. (WT) has completed the geotechnical evaluation for the proposed school building to be located at 201 Neel Street in Socorro, New Mexico. This study was performed in general accordance with our proposal number 3227PJ158, dated December 04, 2007. The results of our evaluation, including the boring location diagram, boring logs, laboratory test results, and geotechnical recommendations are attached.

We appreciate being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. If design conditions change, or if you have any questions concerning this report or any of our materials testing, special inspection, or consulting services, please do not hesitate to contact us. We look forward to working with you on future projects.

Sincerely,

WESTERN TECHNOLOGIES, INC.
Geotechnical Engineering Services

Jeff M. Boyd, P.E.
Senior Geotechnical Engineer

Copies to: Addressee (5)
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GEOTECHNICAL EVALUATION

NEW CHARTER SCHOOL BUILDING
201 NEEL STREET
SOCORRO, NEW MEXICO

JOB NO. 3227JJ291

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed school building to be located at 201 Neel Street in Socorro, New Mexico. The purpose of these services is to provide information and recommendations regarding:

- Foundation design parameters
- Seismic considerations
- Drainage
- Earthwork
- Lateral earth pressures
- Slabs-on-grade
- Pavement sections
- Excavation conditions

Results of the field exploration, field-tests, and laboratory tests are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Project information supplied by Mr. Russell Wrenn on December 04, 2007 indicates that the project will consist of an 8,000 square foot, single-story, slab-on-grade multi-purpose building using wood/steel frame or masonry construction. Additionally, several modular buildings will also be installed at the site. The maximum wall and column loads are assumed to be two kips per linear foot and 75 kips, respectively. We anticipate that the ground floor level will be at or slightly above existing site grade and that no extraordinary slab criteria are required. On-site asphalt paved areas for parking and driveways and rigid pavement sections for loading and dumpster areas will be constructed. Final site grading plans were not available at the time of this report. Should our assumptions not be correct, we should be notified immediately.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Five borings were drilled to a depth of 21.5 feet below existing grade in the proposed building areas. The borings were at the approximate locations shown on the attached Boring Location Diagram. A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation
of the subsurface conditions between samples. Final logs included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, and the locations where samples were obtained.

The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria.

3.2 Laboratory Analysis

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable ASTM test methods. The following tests were performed and the results are presented in Appendix B.

- Water Content
- Minus #200 Sieve
- Compression
- Dry Density
- Plasticity

3.3 Analyses and Report

Analyses were performed and this report was prepared for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as required to satisfy the purpose previously described.

4.0 SITE CONDITIONS

4.1 Surface

At the time of our exploration, the site was a developed lot that contained the Cottonwood Charter School Facility. There are seven one-story steel-sided modular buildings to the west and southwest. The ground surface surrounding the existing modular buildings consisted of sidewalks, and a six inch gravel playground. There is a
sparse growth of weeds, grass, and cedar trees. Site drainage trended to the south as surface sheet flow along a gradual slope. Other site features included an existing concrete basketball court located on the northwest corner of the site, a 15' x 15' concrete slab with a wood-sided storage shed approximately five feet to the north of modular buildings, and covered patio approximately ten-feet north of main office building.

4.2 Subsurface

As presented on Logs of Borings, surface soils to depths of six to 19.5 feet consist of silty sand in boring number two, four, and five. In boring number one silty sand/clayey sand was encountered in the upper six feet, and clayey sand with moderate plasticity was encountered in the upper ten an half feet of boring number three. Near surface soils are of non-plasticity to moderate plasticity. The materials underlying the surface soils and extending to the full depth of exploration consisted of silty sand and sand.

Groundwater was not encountered in any of the borings at the time of exploration.

4.3 Geology

The site is located in the Rio Grande Rift, which is located near the southern confluence of the Colorado Plateau and Basin and Range Geologic Provinces. The general geology of the surrounding area includes Recent Age Alluvial deposits and the Upper Santa Fe Group Formation. Based upon the materials encountered in our borings, it is our opinion that the materials encountered were likely the Recent Age Alluvial deposits and/or the Upper Santa Fe Group formation.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

5.1 Laboratory Tests

Laboratory test results (see Appendix B) indicate that native subsoils near shallow foundation level exhibit moderate compressibility at existing water content. A moderate amount of additional compression occurs when the water content is increased.

Near-surface soils are of non-plastic to low plasticity. These soils will not exhibit a significant expansion potential upon moisture content changes.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0, Project Description, and the assumption that the soil and subsurface conditions are those disclosed by the borings. Others may change the
plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing.

6.2 Foundations

Conventional spread-type footings may be used to support the proposed buildings. Since the native soils exhibit substantial settlement potentials, the footings should bear on engineered fills achieved by removal and recompaction of the soils below footings. The depth and lateral extent of the engineered fills is presented in the Earthwork section of this report. Alternative footing depths and allowable bearing capacities are presented in the following tabulation:

<table>
<thead>
<tr>
<th>Footing Depth Below Finished Grade (ft)</th>
<th>Allowable Bearing Capacity (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5(^3)</td>
<td>2000</td>
</tr>
<tr>
<td>2.0</td>
<td>2500</td>
</tr>
</tbody>
</table>

Note 1: Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

Note 2: Allowable bearing capacities assume fulfillment of Earthwork recommendations.

Note 3: Minimum-footing depth based on anticipated frost penetration.

The allowable bearing capacities apply to dead loads plus design live load conditions. The allowable bearing capacity may be increased by one-third when considering total loads that include wind or seismic. Recommended minimum widths of column and wall footings are 24 inches and 16 inches, respectively.

Thickened slab sections can be used to support interior partitions, provided that:

- loads do not exceed 900 psf,
- thickened sections have a minimum width of 12 inches, and
- thickness and reinforcement are consistent with structural requirements.

We anticipate that differential movement of the proposed buildings, supported as recommended, should be three-quarters of one inch or less. Additional foundation movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage should be provided in the final design and during construction.
All footings, stem walls, and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before reinforcing steel and concrete are placed. This observation is to assess whether the soils exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable soils should be undercut to suitable materials and backfilled with approved fill materials or lean concrete. Soil backfill should be properly compacted.

6.3 Lateral Design Criteria

Earth retaining structures less than six feet in height, above any free water surface, with level backfill and no surcharge loads may be designed using the equivalent fluid pressure method. Recommended equivalent fluid pressures and coefficients of base friction for unrestrained elements are:

- **Active:**
  - Undisturbed subsoil ................................................................. 35 psf/ft
  - Compacted granular backfill .................................................... 30 psf/ft

- **Passive:**
  - Shallow wall footings ............................................................. 250 psf/ft
  - Shallow column footings .......................................................... 400 psf/ft

- **Coefficient of base friction** .................................................. 0.40*

  *The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

The equivalent fluid pressures presented herein do not include the lateral pressures arising from the presence of:

- hydrostatic conditions, submergence or partial submergence
- sloping backfill, positively or negatively
- surcharge loading, permanent or temporary
- seismic or dynamic conditions

We recommend a free-draining soil layer or manufactured geosynthetic material, be constructed adjacent to the back of any retaining walls. A filter may be required between the soil backfill and drainage layer. This drainage zone should help prevent development of hydrostatic pressure on the wall. This vertical drainage zone should be
tied into a gravity drainage system at the base of the wall. It is important that all backfill be properly placed and compacted. Backfill should be mechanically compacted in layers. Flooding or jetting should not be permitted. Care should be taken not to damage the walls when placing the backfill. Backfills should be observed and tested during placement.

Fill against footings, stem walls, basement walls and retaining walls should be compacted to densities specified in Earthwork. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures that could result in wall movements.

6.4 Seismic Considerations

For structural designs based upon the International Building Code 2000 or 2003 Editions, the following criteria will apply. The site class is D. $S_n$, the spectral acceleration for short periods, is 0.7g. $S_1$, the spectral acceleration for a one-second period is 0.2g. $F_a$ and $F_v$, in accordance with Table 1615.1.2 (1) and 1615.1.2 (2), are 1.3 and 2.0, respectively.

6.5 Conventional Slab-on-Grade Support

Floor slabs can be supported on properly placed and compacted fill or approved natural soils. The slab subgrade should be prepared by the procedures outlined in this report. A minimum four-inch layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab.

The use of vapor retarders is desirable for any slab-on-grade where the floor will be covered by products using water based adhesives, wood, vinyl backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or product. When used, the design and installation should be in accordance with the recommendation given in ACI 302.1R-04. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.6 Drainage

The major cause of soil problems in this vicinity is moisture increase in soils below structures. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the proposed development. Infiltration
of water into utility or foundation excavations must be prevented during construction. No planters, retention basins, or other surface features that could retain water adjacent to the building should be constructed.

In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with an outfall of about five-percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration.

If retention basins, planters and/or landscaping are adjacent to or near the structure, we recommend the following:

- Such features should be sealed.
- Grades should slope away from the structure(s).
- Only shallow rooted landscaping should be used.
- Watering should be kept to a minimum.

6.7 Pavements

The on-site soils are considered as fair quality materials for support of pavements. The types of traffic anticipated to use the facility include passenger vehicles and small to medium size trucks. On this basis, a daily traffic value of two Equivalent 18-kip Single Axle Loads (ESAL) was estimated for passenger car parking and drives (light duty) and a daily traffic value of five ESALS were used for major access drives. A resilient modulus (M_r) of 8,000 pounds per square inch was assigned to the on-site soil. A reliability value of 70 percent was assigned to the facility that corresponds to occasional interruption of traffic for pavement repairs. Based upon these parameters, the resulting pavement sections according to the AASHTO procedure for a 20-year design life are:

<table>
<thead>
<tr>
<th>Traffic Area</th>
<th>Asphalitic Concrete Pavement (inches)</th>
<th>Base Course (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Duty</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Major access drives</td>
<td>3.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

Due to the high static loads imposed by parking trucks in loading and unloading areas and at dumpster locations, we recommend that a rigid pavement section be considered for these areas. A minimum six-inch thick Portland cement concrete pavement is recommended.
Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course, portland cement, and asphalt concrete should conform with New Mexico Department of Transportation (NMDOT) or City of Socorro specifications.

Material and compaction requirements should conform to recommendations presented under Earthwork. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted, and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities or backfilling occurs.

Although fills or underground facilities such as septic tanks, cesspools, basements, utilities, and dry wells were not observed, such features might be encountered during construction. These features should be demolished in accordance with the recommendations of the geotechnical engineer. Any loose or disturbed soils resulting from demolition should be removed or recompacted as engineered fill and any excavations should be backfilled in accordance with recommendations presented herein.

7.2 Site Clearing

Strip and remove any existing vegetation, organic topsoils, debris, and any other deleterious materials from the building and pavement areas. The building area is defined as that area within the building footprint plus five feet beyond the perimeter of the footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Excavation

We anticipate that excavations for shallow foundations and utility trenches for the proposed construction can be accomplished with conventional equipment.

7.4 Foundation Preparation

In footing areas, remove existing soils to a minimum depth of three feet below the bottom of the footing. Removal should extend a minimum of two feet beyond the footing edges. Replace with engineered fill material.
After any overexcavation has been accomplished, the exposed soils should be scarified, moistened or dried as required, and compacted to a minimum depth of 10 inches.

7.5 Conventional Interior Slab Preparation

Prior to the placement of fill or aggregate base course, the exposed soil should be scarified a minimum depth of 10 inches, moisture conditioned and recompacted as recommended herein.

7.6 Pavement Preparation

The subgrade should be scarified, moistened as required, and recompacted for a minimum depth of 10 inches prior to placement of fill and pavement materials.

7.7 Materials

Clean on-site native soils with low-expansive potentials or imported materials may be used as fill material for the following:

- foundation areas
- interior slab areas
- pavement areas
- backfill

Imported soils should conform to the following:

- Gradation (ASTM C136):
  - 6" ................................................................. 100
  - 4" ................................................................. 85-100
  - 3/4" ............................................................ 70-100
  - No. 4 Sieve .................................................. 50-100
  - No. 200 Sieve..............................................40 (max)

- Maximum expansive potential (%) ........................................ 1.5
- Maximum soluble sulfates (%) ........................................ 0.10

*Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about three percent below optimum water content. The sample is confined under a 100-psf surcharge and submerged.

Base course should conform to the City of Socorro or NMDOT specifications.
7.8 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted fill lifts should not exceed 10 inches.

c. No fill should be placed over frozen ground.

d. Materials should be compacted to the following:

<table>
<thead>
<tr>
<th>Minimum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Compaction (ASTM D1557)</td>
</tr>
<tr>
<td>On-site soil, reworked and fill .................................................. 95</td>
</tr>
<tr>
<td>Imported soil ................................................................................. 95</td>
</tr>
<tr>
<td>Aggregate base course below slabs-on-grade .................................. 95</td>
</tr>
<tr>
<td>Aggregate base below pavement .................................................... 100</td>
</tr>
<tr>
<td>Nonstructural backfill .................................................................. 90</td>
</tr>
</tbody>
</table>

On-site and imported soils should be compacted within a water content range of three percent below to three percent above optimum.

7.9 Compliance

Recommendations for slabs-on-grade, foundation, and pavement elements supported on compacted fills or prepared subgrade depend upon compliance with Earthwork recommendations. To assess compliance, observation and testing should be performed under the direction of a geotechnical engineer.

8.0 LIMITATIONS

This report has been prepared based on our understanding of the project criteria as described in Section 2.0. Others may make changes in the project criteria during design or construction, and substantially different subsurface conditions may be encountered or become known. The conclusions and recommendations presented herein shall not continue to be valid unless all variations are brought to our attention in writing, and we have had an opportunity to assess the effect such variations may have on our conclusions and recommendations and respond in writing.

The recommendations presented are based upon data derived from a limited number of samples obtained from widely spaced borings. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. The geotechnical engineer necessarily makes assumptions as to the uniformity of the geology and soil structure between borings/test pits,
but variations can exist. Accordingly, whenever any deviation or change is encountered or become known during design or construction, WT shall be notified in writing. WT shall review the matter, and issue a written response regarding the validity of the conclusions and recommendations presented herein.

This report does not provide information relative to construction methods or sequences. Any person reviewing this report must draw his/her own conclusions regarding site conditions as they relate to the employment or development of construction techniques. This report is valid for one year after the date of issuance unless there is a change in circumstances or discovered variations justifying an earlier expiration of validity. After expiration, no person or entity has any right to rely on this report without further review and reporting by WT under a separate contract.

The recommendations contained herein may be based upon government regulations in effect at the time of this report. Future changes or modifications to these regulations may require modification of this report.

9.0 OTHER SERVICES

The geotechnical engineer should be retained for a general review of final plans and specifications to evaluate compliance with our recommendations.

The geotechnical engineer should also be retained to provide observation and testing services during excavation, earthwork operations, foundation, and construction phases of the project. Observation of footing excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present.

10.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon conditions at the location of specific tests, observations and data developed to satisfy the scope of services defined by the contract documents. Work on your project was performed in accordance with generally accepted industry standards and practices by other professionals providing similar services in this locality. No other warranty, express or implied, is made.
Allowable Soil Bearing Capacity: The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.

Backfill: A specified material placed and compacted in a confined area.

Base Course: A layer of specified material placed on a subgrade or subbase.

Base Course Grade: Top of base course.

Bench: A horizontal surface in a sloped deposit.

Caisson: A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.

Concrete Slabs-On-Grade: A concrete surface layer cast directly upon a base, subbase or subgrade.

Crushed Rock Base Course: A base course composed of crushed rock of a specified gradation.

Differential Settlement: Unequal settlement between or within foundation elements of a structure.

Engineered Fill: Specified material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.

Existing Fill: Materials deposited through the action of man prior to exploration of the site.

Existing Grade: The ground surface at the time of field exploration.

Expansive Potential: The potential of a soil to expand (increase in volume) due to absorption of moisture.

Fill: Materials deposited by the actions of man.

Finished Grade: The final grade created as a part of the project.

Gravel Base Course: A base course composed of naturally occurring gravel with a specified gradation.

Heave: Upward movement.

Native Grade: The naturally occurring ground surface.

Native Soil: Naturally occurring on-site soil.

Rock: A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.

Sand and Gravel Base: A base course of sand and gravel of a specified gradation.

Sand Base Course: A base course composed primarily of sand of a specified gradation.

Scarify: To mechanically loosen soil or break down existing soil structure.

Settlement: Downward movement.

Soil: Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.

Strip: To remove from present location.

Subbase: A layer of specified material placed to form a layer between the subgrade and base course.

Subbase Grade: Top of subbase.

Subgrade: Prepared native soil surface.
### Coarse-Grained Soils

<table>
<thead>
<tr>
<th>GROUP SYMBOL</th>
<th>DESCRIPTION</th>
<th>MAJOR DIVISIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GW</td>
<td>Well-Graded Gravels or Gravel-Sand Mixtures, Less than 5% Fines</td>
<td>Gravels</td>
</tr>
<tr>
<td>GP</td>
<td>Poorly-Graded Gravels or Gravel-Sand Mixtures, Less than 5% Fines</td>
<td>Gravels</td>
</tr>
<tr>
<td>GM</td>
<td>Silty Gravels, Gravel-Sand-Silt Mixtures, More than 12% Fines</td>
<td>Silt</td>
</tr>
<tr>
<td>GC</td>
<td>Clayey Gravels, Gravel-Sand-Clay Mixtures, More than 12% Fines</td>
<td>Clay</td>
</tr>
<tr>
<td>SW</td>
<td>Well-Graded Sands or Gravelly Sands, Less than 5% Fines</td>
<td>Sands</td>
</tr>
<tr>
<td>SP</td>
<td>Poorly-Graded Sands or Gravelly Sands, Less than 5% Fines</td>
<td>Sands</td>
</tr>
<tr>
<td>SM</td>
<td>Silty Sands, Sand-Silt Mixtures, More than 12% Fines</td>
<td>Silt</td>
</tr>
<tr>
<td>SC</td>
<td>Clayey Sands, Sand-Clay Mixtures, More than 12% Fines</td>
<td>Clay</td>
</tr>
</tbody>
</table>

**Note:** Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

### Fine-Grained Soils

<table>
<thead>
<tr>
<th>GROUP SYMBOL</th>
<th>DESCRIPTION</th>
<th>MAJOR DIVISIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML</td>
<td>Inorganic Silts, Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands</td>
<td>Silts and Clays</td>
</tr>
<tr>
<td>CL</td>
<td>Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays</td>
<td>Silts and Clays</td>
</tr>
<tr>
<td>OL</td>
<td>Organic Silts or Organic Silt-Clays of Low Plasticity</td>
<td>Organic Clays</td>
</tr>
<tr>
<td>MH</td>
<td>Inorganic Silts, Micaceous or DIATOMACEOUS Fine Sands or Silts, ELASTIC SILTS</td>
<td>Organic Clays</td>
</tr>
<tr>
<td>CH</td>
<td>Inorganic Clays of High Plasticity, Fat Clays</td>
<td>Organic Clays</td>
</tr>
<tr>
<td>OH</td>
<td>Organic Clays of Medium to High Plasticity</td>
<td>Organic Clays</td>
</tr>
<tr>
<td>PT</td>
<td>Peat, Muck and Other Highly Organic Soils</td>
<td>Organic Clays</td>
</tr>
</tbody>
</table>

**Note:** Fine-grained soils may receive dual classification based upon plasticity characteristics.

### Soil Sizes

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>SIZE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulders</td>
<td>Above 12 in.</td>
</tr>
<tr>
<td>Cobbles</td>
<td>3 in. – 12 in.</td>
</tr>
<tr>
<td>Gravel</td>
<td>No. 4 – 3 in.</td>
</tr>
<tr>
<td></td>
<td>3/4 in. – 3 in.</td>
</tr>
<tr>
<td></td>
<td>No. 4 – 3/4 in.</td>
</tr>
<tr>
<td>Sand</td>
<td>No. 200 – No. 4</td>
</tr>
<tr>
<td></td>
<td>No. 10 – No. 4</td>
</tr>
<tr>
<td></td>
<td>No. 40 – No. 10</td>
</tr>
<tr>
<td></td>
<td>No. 200 – No. 40</td>
</tr>
</tbody>
</table>

\*Fines (Silt or Clay) Below No. 200

**Note:** Only sizes smaller than three inches are used to classify soils.

### Consistency

<table>
<thead>
<tr>
<th>CLAYS &amp; SILTS</th>
<th>BLOWS PER FOOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Soft</td>
<td>0 – 2</td>
</tr>
<tr>
<td>Soft</td>
<td>2 – 4</td>
</tr>
<tr>
<td>Firm</td>
<td>4 – 8</td>
</tr>
<tr>
<td>Stiff</td>
<td>8 – 16</td>
</tr>
<tr>
<td>Very Stiff</td>
<td>16 – 30</td>
</tr>
<tr>
<td>Hard</td>
<td>Over 30</td>
</tr>
</tbody>
</table>

### Relative Density

<table>
<thead>
<tr>
<th>SANDS &amp; GRAVELS</th>
<th>BLOWS PER FOOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>0 – 4</td>
</tr>
<tr>
<td>Loose</td>
<td>4 – 10</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10 – 30</td>
</tr>
<tr>
<td>Dense</td>
<td>30 – 50</td>
</tr>
<tr>
<td>Very Dense</td>
<td>Over 50</td>
</tr>
</tbody>
</table>

1 Number of blows of 146 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8" I.D.) split spoon (ASTM D1556).

### Plasticity of Fine Grained Soils

<table>
<thead>
<tr>
<th>PLASTICITY INDEX</th>
<th>TERM</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Non-Plastic</td>
</tr>
<tr>
<td>1 - 7</td>
<td>Low</td>
</tr>
<tr>
<td>8 - 25</td>
<td>Medium</td>
</tr>
<tr>
<td>Over 25</td>
<td>High</td>
</tr>
</tbody>
</table>

### Definition of Moisture Content

- **Damp**: Slightly damp
- **Moist**: Moist
- **Wet**: Wet
- **Saturated**: Saturated

---

NEW CHARTER SCHOOL BUILDING
Method of Soil Classification
Western Technologies Inc.
Job No.: 3227JJ291
Plate: A-2
The number shown in "BORING NO." refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing from property lines and/or existing features.

"AUGER TYPE/SIZE" refers to the exploratory equipment used in the boring wherein HSA = hollow stem auger, SSA = solid-stem auger, RW = rotary wash, RA = rotary air, RAF = rotary air with foam, CNX = NX-size diamond core, CBX = BX-size diamond core, CHQ = HQ-size diamond core.

"N" in Blows/Foot refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a two-inch-outside-diameter split-barrel sampler a distance of 1 foot, Standard Penetration Test (ASTM D1586). Refusal to penetration is defined as more than 100 blows per foot.

"'PN' in Blows/Foot" refers to the number of blows of a 50-pound weight, dropped 24 inches, required to advance a two-inch-outside-diameter split-barrel sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per foot.

"R" in Blows/Foot refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a 2.12-inch-inside-diameter ring sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per foot.

"PR" in Blows/Foot refers to the number of blows of a 50-pound weight, dropped 24 inches, required to advance a 2.42-inch-inside-diameter ring sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per foot.

"Sample Type" refers to the form of sample recovery, in which N = Split-barrel sample, R = Ring sample, G = Grab Sample, B = Block Sample, T = Thin-walled tube sample, CR = Core Run.

"Dry Density,pcf" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol "NR" indicates that no sample was recovered. The symbol "DU" indicates that determination of dry density was not possible.

"Water Content, %" refers to the laboratory-determined moisture content in percent ASTM D2216.

"Unified Classification" refers to the soil type as defined by "Method of Soil Classification". The soils were classified visually in the field and, where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the dates noted. Variations in subsurface conditions and soil characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil types based upon visual field classification. The transition between materials is approximate and may be far more or less gradual than indicated.
**BORING NO. 1**

**DATE DRILLED:** 12-26-2007  
**DRILL RIG TYPE:** CME-75  
**BORING TYPE/SIZE:** 8"/HSA  
**LOCATION:** See Boring Location Diagram  
**ELEVATION:** Not Determined  
**FIELD ENGR:** C. Pine

### Water Content (%)

<table>
<thead>
<tr>
<th>Depth (Ft.)</th>
<th>Dry Density (Lbs/Cu.Ft.)</th>
<th>Sample Type</th>
<th>Blows/ft.</th>
<th>R</th>
<th>K</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>112</td>
<td>G</td>
<td></td>
<td>R</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>8.7</td>
<td>112</td>
<td>R</td>
<td></td>
<td>R</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>4.8</td>
<td>103</td>
<td>N</td>
<td></td>
<td>N</td>
<td></td>
<td>33</td>
</tr>
</tbody>
</table>

### Soil Description

- **SM-SC:** Silty Sand/Clayey Sand; with gravel, brown, medium dense, moist
- **CL:** Clayey Sand; trace gravel, brown, medium dense, moist
- **SM:** Silty Sand; yellowish brown, medium dense, damp
- **SP:** Sand; with gravel, light brown, dense, damp

**Stopped At 21.5 Feet**

---

**NEW CHARTER SCHOOL BUILDING**

**Boring Log**

**Western Technologies Inc.**

**Job No.:** 3227JJ291  
**Plate:** A-4
**BORING NO. 2**

<table>
<thead>
<tr>
<th>R</th>
<th>Z</th>
<th>C</th>
<th>USGS</th>
<th>GRAPHIC</th>
<th>SOIL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>R</td>
<td>50/12&quot;</td>
<td>SM</td>
<td>SILTY SAND; with gravel, gray, dense, slightly moist</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>15</td>
<td></td>
<td>medium dense</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>16</td>
<td></td>
<td>color change yellowish brown, medium dense</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>30</td>
<td>SP</td>
<td>SAND; with gravel, gray, dense, slightly moist</td>
<td></td>
</tr>
</tbody>
</table>

**LOCATION:** See Boring Location Diagram

**ELEVATION:** Not Determined

**FIELD ENGR:** C. Pine

**NEW CHARTER SCHOOL BUILDING**

**Boring Log**

**Western Technologies Inc.**

**Job No.: 3227JJ291**

**Plate:** A-5
**BORING NO. 3**

<table>
<thead>
<tr>
<th>WATER CONTENT (%)</th>
<th>DRY DENSITY (LBS/CU.FT)</th>
<th>SAMPLE TYPE</th>
<th>BLOWS/FT</th>
<th>USCS</th>
<th>GRAPHIC</th>
<th>SOIL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.9</td>
<td>94</td>
<td>R</td>
<td>11</td>
<td>CL</td>
<td></td>
<td>SANDY CLAY; brown, stiff, moist</td>
</tr>
<tr>
<td>13.4</td>
<td>94</td>
<td>R</td>
<td>20</td>
<td></td>
<td></td>
<td>trace sand lens</td>
</tr>
<tr>
<td>24.2</td>
<td>97</td>
<td>N</td>
<td>33</td>
<td>SM</td>
<td></td>
<td>SILTY SAND; yellowish brown, medium dense, moist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>42</td>
<td>SP</td>
<td></td>
<td>SAND; light brown, dense, moist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>with gravel</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stopped At 21.5 Feet</td>
</tr>
</tbody>
</table>

**GROUNDWATER ENCOUNTERED**

NO: X  YES:  DEPTH:  DATE: 12-26-2007

**NOTES**

**NEW CHARTER SCHOOL BUILDING**

Boring Log

Western Technologies Inc.

Job No.: 3227JJ291  Plate: A-6
### BORING NO. 4

**DATE DRILLED:** 12-26-2007  
**LOCATION:** See Boring Location Diagram  
**DRILL RIG TYPE:** CME-75  
**ELEVATION:** Not Determined  
**BORING TYPE/SIZE:** 8"/HSA  
**FIELD ENGR:** C. Pine

<table>
<thead>
<tr>
<th>WATER CONTENT (%)</th>
<th>DRY DENSITY (LBS/CU FT)</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE</th>
<th>BLOWS/FT.</th>
<th>R</th>
<th>R</th>
<th>C</th>
<th>SOIL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.6</td>
<td>100</td>
<td>G</td>
<td>R</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>SILTY SAND; with gravel, brown, medium dense, moist</td>
</tr>
<tr>
<td>8.3</td>
<td>104</td>
<td>R</td>
<td>G</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td>SANDY CLAY; trace gravel, brown, medium dense, moist</td>
</tr>
<tr>
<td>20.7</td>
<td>97</td>
<td>R</td>
<td>N</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td>SILTY SAND; yellowish brown, medium dense, moist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td>SAND; trace gravel, light brown, medium dense, moist</td>
</tr>
</tbody>
</table>

Stopped At 21.5 Feet

**NEW CHARTER SCHOOL BUILDING**

Boring Log

Western Technologies Inc.

**Job No.:** 3227JJ291  
**Plate:** A-7
**DATE DRILLED:** 12-26-2007  
**LOCATION:** See Boring Location Diagram  
**DRILL RIG TYPE:** CME-75  
**BORING TYPE/SIZE:** 8'/HSA  
**ELEVATION:** Not Determined  
**FIELD ENGR:** C. Pine

<table>
<thead>
<tr>
<th>WATER CONTENT (%)</th>
<th>DRY DENSITY (LBS/CU.FT)</th>
<th>SAMPLE TYPE</th>
<th>SAMPLE</th>
<th>BLOWS/FT.</th>
<th>R X Z</th>
<th>C</th>
<th>DEPTH (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>102</td>
<td>G</td>
<td></td>
<td></td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>109</td>
<td>R</td>
<td></td>
<td></td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.0</td>
<td>103</td>
<td>R</td>
<td></td>
<td></td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td>26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOIL DESCRIPTION**

SILTY SAND; with gravel, brown, dense, moist

color change yellowish brown

color change brown

with gravel

SAND; light brown, dense, damp

**Stopped At 21.5 Feet**

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**NEW CHARTER SCHOOL BUILDING**

Boring Log

Western Technologies Inc.

**Job No.:** 3227JJ291  
**Plate:** A-8
<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Depth (ft.)</th>
<th>Soil Class</th>
<th>Initial Dry Density (pcf)</th>
<th>Initial Water Content (%)</th>
<th>Compression Properties</th>
<th>Expansion Properties</th>
<th>Plasticity</th>
<th>Percent Passing #200</th>
<th>Soluble Sulfates (ppm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0-5</td>
<td>SM-SC</td>
<td>115</td>
<td>6.1</td>
<td>0.5 0.5</td>
<td>1.0 2.0</td>
<td>4.2</td>
<td>22</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>1</td>
<td>2-3</td>
<td>SM-SC</td>
<td>115</td>
<td>6.1</td>
<td>1.0 1.0</td>
<td>2.0 2.1</td>
<td>4.2</td>
<td>22</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>1</td>
<td>6-9</td>
<td>CL</td>
<td>88</td>
<td>13.9</td>
<td>2.0 2.1</td>
<td>4.2 6.1</td>
<td>34</td>
<td>17</td>
<td>63</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>0-5</td>
<td>CL</td>
<td>88</td>
<td>13.9</td>
<td>2.0 2.1</td>
<td>4.2 6.1</td>
<td>34</td>
<td>17</td>
<td>63</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2-3</td>
<td>CL</td>
<td>88</td>
<td>13.9</td>
<td>2.0 2.1</td>
<td>4.2 6.1</td>
<td>34</td>
<td>17</td>
<td>63</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>0-5</td>
<td>SM</td>
<td>115</td>
<td>6.1</td>
<td>0.5 0.5</td>
<td>1.0 1.5</td>
<td>2.0 1.6 6.3</td>
<td>22</td>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>

Note: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.
NV = Will not roll; NP = Non-Plastic

Remarks:
1. Compacted density (approx. 95% of ASTM D698 max. density at moisture content slightly below optimum).
2. Submerged to approximate saturation.
4. Sample disturbance observed.