SALEM Engineering Group, Inc.

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED NEW CLASSROOM BUILDING AT
RD WHITE ELEMENTARY SCHOOL
744 EAST DORAN STREET
GLENDALE, CALIFORNIA

PREPARED FOR:

MR. RICHARD BRAND
GLENDALE UNIFIED SCHOOL DISTRICT
349 WEST MAGNOLIA AVENUE
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Prepared by:

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Job No. 3-211-0979
December 12, 2011

SALEM Engineering Group, Inc.

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Mr. Richard Brand
Planning, Development, & Facilities
Glendale Unified School District
349 West Magnolia Avenue
Glendale, CA 91204

RE: Geotechnical Engineering Investigation
Proposed New Classroom Building at
RD White Elementary School
744 East Doran Street
Glendale, California

Dear Mr. Brand:

At your request and authorization, SALEM Engineering Group, Inc. (SALEM) has prepared this Geotechnical Engineering Investigation for the site of the proposed New Classroom Building at RD White Elementary School located in Glendale, California.

We appreciate the opportunity to assist you with this project. Should you have questions regarding this report or need additional information, please contact the undersigned at (909) 908-6455.

Respectfully submitted,

SALEM Engineering Group, Inc.

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GLENDALE, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the site of the Proposed New Classroom Building at RD White Elementary School located in Glendale, California.

The investigation included a field exploration program of drilling a total of five (5) test borings to depths ranging from 25 to 41½ feet below existing ground surface, the collection of intact and bulk soil samples, and a variety of laboratory tests to supplement the field data. In addition, two (2) percolation tests were performed at depths of approximately 6 to 8 feet for determination of percolation rate for the proposed stormwater infiltration system. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil liquefaction, seismic-induced settlement, and soil cement reactivity. The approximate test boring and percolation test locations are shown on the Site Plan.

The results of the field exploration and laboratory test data are included in Appendix "A". Earthwork / Pavement Specifications are presented in Appendix "B". If conflicts in the text of the report occur with the specifications in the appendices, the recommendations in the text of the report have precedence.

2.0 PROJECT DESCRIPTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structure are unavailable. On a preliminary basis, it's anticipated that development of the site will include demolition of existing buildings and construction of a new 8-classroom building. The proposed classroom building will be a two-story structure with concrete slab-on-grade. The building footprint will measure approximately 16,428 square feet. Maximum wall load is expected to be on the order of 3 kips per linear foot. Maximum interior column load is expected to be on the order of 50 kips, and maximum exterior column load is expected to be on the order of 50 kips. Floor slab soil bearing pressure is expected to be on the order of 150 psf.

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A site grading plan was not available at the time of preparation of this report. As the existing project area is essentially level, we anticipate that cuts and fills during earthwork will be minimal and limited to providing a level building pad and positive site drainage. In the event that changes occur in the nature or design of the project, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions of our report are modified.

3.0 SITE LOCATIONS AND DESCRIPTION

The existing school is located on the southwest corner of E. Doran Street and N. Everett Street in Glendale, California. At the time of our field investigation, the site of the proposed classroom building was occupied by several portable classroom buildings with paved asphaltic concrete (AC). The school is predominately surrounded by residential and commercial developments. The site is relatively level with no major changes in grade. The average elevation of the site is approximately 615 feet above mean sea level.

4.0 GEOLOGIC/SEISMIC CONDITIONS

The site is underlain by Holocene and Pleistocene alluvium deposited in the San Fernando Valley, a structural basin surrounded by mountains on all four sides. The alluvium is estimated to be several hundred feet thick. These deposits are generally fine grained, consisting of mixtures of sands and silts. Deposits encountered on the subject site during exploratory drilling are discussed in detail in this report.

Southern California is seismically active and will experience future earthquakes that will affect the project site. The earthquakes are predominately generated by periodic slip along the northwesterly trending faults associated with the San Andreas Fault system and the east-west trending faults along the northern margin of the Los Angeles Basin. In addition to these probable earthquake sources, recent earthquakes in the region have occurred on previously unknown faults having no surface expression (1987 Whittier Narrows and the 1994 Northridge earthquakes). The Hollywood Fault Zone is the nearest active fault within the site.

Because of the proximity to the subject site and the maximum probable events for these faults, it appears that a maximum probable event along these fault zones could produce a peak horizontal acceleration of approximately 0.61g (10% probability of being exceeded in 50 years). With respect to this hazard, the site is comparable to others in this general area within similar geologic settings. The area in consideration shows no mapped faults on-site according to maps prepared by the California Division of Mines and Geology (now known as the California Geologic Survey) and published by the International Conference of Building Officials (ICBO). No evidence of surface faulting was observed on the property during our reconnaissance. Soils on site are classified as Site Class C in accordance with Chapter 16 of the International Building Code (IBC). The proposed structures are determined to be in Seismic Design Category **E**.

5.0 PURPOSE AND SCOPE

The purpose of this investigation is to evaluate the subsurface conditions encountered during field exploration and to provide geotechnical engineering recommendations for site preparation, earthwork procedures, percolation rates, and foundation and slab system design parameters. The scope of our investigation included a program of field exploration, laboratory testing, engineering analysis and preparation of this report.

6.0 FIELD EXPLORATION

Our field exploration consisted of site surface reconnaissance and subsurface exploration. The exploratory test borings (B-1 through B-5, P-1 and P-2) were drilled on December 3, 2011 at the approximate locations shown on the Site Plan, Figure 1. The test borings were advanced with a 6½-inch diameter auger rotated by a truck-mounted CME 45C drill rig. The test borings were extended to depths ranging from 25 to 41 ½ feet below the existing grade. The depth of our exploration was limited due to auger refusal on dense gravel and cobbles. The percolation test borings were extended to depths of approximately 6 to 8 feet below the existing grade.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a Professional Engineer at that time. Visual classification of the materials encountered in the test borings was generally made in accordance with the Unified Soil Classification System (ASTM D2487). A soil classification chart and key to sampling is presented on the Unified Soil Classification Chart, in Appendix "A". The logs of the test borings are presented in Appendix "A".

Subsurface soil samples were obtained by driving a Modified California sampler or a Standard Penetration Test (SPT) sampler. Penetration resistance blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall to drive the sampler to a maximum depth of 18 inches. The number of blows required to drive the last 12 inches is recorded as Penetration Resistance (blows/foot) on the logs of borings. Soil samples were obtained from the test borings at the depths shown on the logs of borings. The samples were recovered and capped at both ends to preserve the samples at their natural moisture content. At the completion of drilling and sampling, the test borings were backfilled with drill cuttings.

7.0 LABORATORY TESTING

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, shear strength, consolidation and expansion potential, gradation and maximum dry density of the materials encountered.

In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and the results of laboratory test are summarized in Appendix "A". This information, along with the field observations, was used to prepare the final boring logs in Appendix "A".

8.0 SOIL AND GROUNDWATER CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the soils within the depth of exploration consisted of loose to very dense silty sand and silty sand/sand with gravel and cobbles. Fill materials may be present onsite between our test boring locations. Verification of the extent of fill should be determined during site grading.

Field and laboratory tests suggest that the deeper native soils are moderately strong and slightly compressible. These soils extended to the termination depth of our borings. For a more detailed description of the materials encountered, the Boring Logs in Appendix "A" should be consulted.

The soils were classified in the field during the drilling and sampling operations. The stratification lines were approximated by the field engineer on the basis of observations made at the time of drilling. The actual boundaries between different soil types may be gradual and soil conditions may vary. For a more detailed description of the materials encountered, the Boring Logs (Figures A-1 through A-5, in Appendix "A") should be consulted. The Boring Logs include the soil type, color, moisture content, dry density, and the applicable Unified Soil Classification System symbol. The locations of the test borings were determined by measuring from features shown on the Site Plan, provided to us. Hence, accuracy can be implied only to the degree that this method warrants.

Test boring locations were checked for the presence of groundwater during and after the drilling operations. Free groundwater was not encountered in our borings. It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

9.0 SOIL LIQUEFACTION AND SEISMIC SETTLEMENT

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events. To evaluate the liquefaction potential of the site, the following items were evaluated:

- ❑ Soil type
- ❑ Groundwater depth
- ❑ Relative density
- ❑ Initial confining pressure
- ❑ Intensity and duration of groundshaking

The soils encountered in our borings on the project site consisted predominately of loose to very dense silty sand and silty sand/sand with gravel and cobbles. Low to very low cohesion strength is associated with the sandy soil. Based on the Sate of California Seismic Open-File Report 98-05, the historically highest groundwater depth is more than 55 feet below existing ground. The liquefaction potential of the site is considered to be low based on the absence of shallow groundwater and the relatively dense subsurface materials. In accordance with the State of California, Seismic Hazard Zones Map, Pasadena Quadrangle, March 25, 1999, the site is not located within the zone of potential liquefaction. Therefore, no mitigation measures are warranted.

One of the most common phenomena during seismic shaking accompanying any earthquake is the induced settlement of loose unconsolidated soils. Based on site subsurface conditions and the moderate to high seismicity of the region, any loose fill materials at the site could be vulnerable to this potential hazard. However, this hazard can be mitigated by following the design and construction recommendations of our Geotechnical Engineering Investigation (over-excavation and rework of the loose soils and/or fill). Based on the moderate penetration resistance measured, the native deposits underlying the surface materials do not appear to be subject to significant seismic settlement.

10.0 PERCOLATION TESTING

Two percolation tests (P-1 and P-2) were performed at the site and were conducted in accordance with the criteria set in the Uniform Plumbing Code. The percolation test locations are shown on Figure 1, Site Plan. Results of the falling head tests are presented in Appendix "A". The data, which is presented in tabular format, indicates varied percolation rates with changing pressure head and within the varying soil strata at the site. The soil absorption or percolation rates are based on tests conducted with clear water. The percolation rates may vary with time as a result of soil clogging from water impurities. The percolation rates will deteriorate over time due to the soil conditions and a minimum factor of safety (FS) of 3 should be applied. In addition, periodic maintenance consisting of clearing the bottom of the stormwater infiltration areas of clogged soils should be expected. The stormwater infiltration areas may become impermeable if the filter is clogged or the soil is compacted.

Based on the test results, a percolation rate of 12 minutes per inch may be used for preliminary design of the stormwater infiltration areas. The percolation rate may become slower if the surrounding soil is wet or saturated due to prolonged rainfalls. The owner or civil engineer may elect to use a lower factor of safety for the design; however, more frequent maintenance consisting of clearing the bottom of the stormwater infiltration areas of clogged soils will be expected. Additional percolation tests may be conducted at bottom of the stormwater infiltration areas during construction to determine the actual percolation rate.

11.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site is suitable for the proposed construction. Any proposed buildings or structures may be supported on shallow reinforced concrete foundations provided that the recommendations presented herein are incorporated in the design and construction of the project.

Presently, the site is occupied with buildings, paved driveways and underground utility lines. Buried structures encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill. It is suspected that possible demolition activities of the existing structures and trees may disturb the upper soils. After demolition activities, it is recommended that disturbed soils within building pad and exterior flatwork areas be removed and/or recompacted.

No significant fill was encountered in our borings. However, fill soils are anticipated to be present onsite between our test boring locations since the site has been graded for the current development. Any uncompacted fill materials will not be suitable to support any future structures and should be replaced with Engineered Fill. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify no additional excavation will be required.

The near-surface onsite soils are moisture-sensitive and are moderately compressible (collapsible soil) under saturated conditions. Structures within the project vicinity have experienced excessive post-construction settlement, when the foundation soils become near saturated. As recommended in the site preparation section of this report, the collapsible or weak soils should be removed and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM D1557-07 Test Method.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Detailed geotechnical engineering recommendations are presented in the remaining portions of the text. The recommendations are based on the properties of the materials identified during our investigation.

11.1 Groundwater Influence on Structures/Construction

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques.

Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

11.2 Site Preparation

General site clearing should include removal of vegetation, organic materials, and existing utilities, structures, trees and associated root systems, rubble, rubbish, and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for reuse as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas with the approval of the owner and landscaper.

Any excavations that result from clearing operations should be backfilled with Engineered Fill. Our field staff should be present during site clearing operations to enable us to locate areas where depressions or disturb soils are present and to allow our staff to observe and test the backfill as it is placed.

If site clearing and backfilling operations occur without appropriate observation and testing by a qualified geotechnical consultant, there may be the need to over-excavate the building area to identify uncontrolled fills prior to mass grading of the building pad.

As with site clearing operations, any buried structures encountered during construction should be properly removed and backfilled. The resulting excavations should be backfilled with Engineered Fill.

11.3 Wet Soil Treatment for Earthwork Construction

The upper soils, during wet winter months or due to prolonged watering, may become very moist due to the absorption characteristics of the soil. Earthwork operations may encounter very moist unstable soils which may require removal to a stable bottom. The wet soils may become non conducive to site grading as the upper soils yield under the weight of the construction equipment. Therefore, mitigation measures should be performed for stabilization.

The most common remedial measure of stabilizing the bottom of the excavation due to wet soil condition is to reduce the moisture of the soil to near the optimum moisture content by having the subgrade soils scarified and aerated or mixed with drier soils prior to compacting. However, the drying process may require an extended period of time and delay the construction operation. To expedite the stabilizing process, crushed rock may be utilized for stabilization provided this method is approved by the owner for the cost purpose.

If the use of crushed rock is considered, it is recommended that the upper soft and wet soils be replaced by 6 to 24 inches of ¾-inch to 1-inch crushed rocks. The thickness of the rock layer depends on the severity of the soil instability. The recommended 6 to 24 inches of crushed rock material will provide a stable platform. It is further recommended that lighter compaction equipments be utilized for compacting the crushed rock. A layer of geofabric is recommended to be placed on top of the compacted crushed rock to minimize migration of soil particles into the voids of the crushed rock, resulting in soil movement. Although it is not required, the use of geogrid (e.g. Tensar BX 1100 or TX 140) below the crushed rock will enhance stability and reduce the required thickness of crushed rock necessary for stabilization.

11.4 Overexcavation and Recompaction

To minimize post-construction soil movement and provide uniform support for the proposed building, overexcavation and recompaction within the proposed building area should be performed to a minimum depth of four (4) feet below existing grade or three (3) feet below bottom of the proposed footing, whichever is deeper. The overexcavation and recompaction should also extend laterally to a minimum of 5 feet beyond the outer edges of the proposed footings.

Within the pavement areas, it is recommended that overexcavation and recompaction be performed to at least 12 inches below existing grade or finish grade, whichever is deeper. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Any fill materials encountered during grading should be removed and replaced with engineered fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction.

11.5 Fill Placement and Compaction

The upper organic-free, on-site, native soils are predominately silty sand with gravel. These soils will be suitable for reuse as non-expansive Engineered Fill, provided they are cleansed of excessive organics, debris and rocks over 3 inches in size.

The preferred materials specified for engineered fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site. Imported non-expansive non-corrosive fill should consist of a well-graded, slightly cohesive silty fine sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Engineer prior to use and should typically possess the following characteristics:

Maximum Percent Passing No. 200 Sieve	50
Minimum Percent Passing No. 200 Sieve	10
Maximum Particle Size	3 inches
Maximum Plasticity Index	10
Maximum UBC Standard 29-2 Expansion Index	15

Prior to placement of fill soils, the upper 8 inches of native subgrade soils should be scarified, moisture-conditioned to no less than the optimum moisture content and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM D1557-07 Test Method.

Fill soils should be placed in lifts approximately 6 to 8 inches thick, moisture-conditioned to near the optimum moisture content (±2%) and compacted to achieve at least 95 percent of the maximum dry density as determined by ASTM D1557-07. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

11.6 Surface Drainage Control

The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces within 10 feet of the building foundation shall be sloped a minimum of 2 percent away from the building and drainage gradients maintained to carry all surface water to collection facilities and off site. These grades should be maintained for the life of the project. Roof drains should be installed with appropriate downspout extensions out-falling on splash blocks so as to direct water a minimum of 5 feet away from the structures or be connected to the storm drain system for the development.

11.7 Temporary Excavation Stability

Temporary excavations planned for the construction of the proposed building and other associated underground structures may be excavated, according to the accepted engineering practice following Occupational Safety and Health Administration (OSHA) standards by a contractor experienced in such work. Open, unbraced excavations in undisturbed soils should be made according to the table below.

Recommended Excavation Slopes	
Depth of Excavation (ft)	**Slope (Horizontal:Vertical)**
0-5	1:1
5-10	2:1

If, due to space limitation, excavations near existing structures are performed in a vertical position, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavations and installation.

A Specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction. Braced shorings should be designed for a maximum pressure distribution of 30H, *(where H is the depth of the excavation in feet)*. The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given herein. Equipment traffic should concurrently be limited to an area at least 3 feet from the shoring face or edge of the slope.

The excavation and shoring recommendations provided herein are based on soil characteristics derived from the test borings within the area. Variations in soil conditions will likely be encountered during the excavations. SALEM Engineering Group, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation. Slope height, slope inclination, or excavation depth should in no case exceed those specified in local, state, or federal safety regulation, (e.g. OSHA) standards for excavations, 29 CFR part 1926, or Assessor's regulations.

11.8 Foundations

Bearing wall footings considered for the structure should be continuous with a minimum width of 15 inches and extend to a minimum depth of 18 inches below the lowest adjacent grade. Isolated column footings should have a minimum width of 24 inches and extend a minimum depth of 18 inches below the lowest adjacent grade. Footing concrete should be placed into neat excavation. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footings constructed as recommended herein may be designed for the maximum bearing capacity shown below.

Load	Allowable Loading
Dead Load Only	1,800 psf
Dead-Plus-Live Load	2,200 psf
Total Load, Including Wind or Seismic Loads	2,930 psf

For design purposes, total settlement due to static loading on the order of 1 inch may be assumed for shallow foundations. Differential settlement due to static loading, along a 20-foot exterior wall footing or between adjoining column footings, should be ¼ to ½ inch, producing an angular distortion of 0.002. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated. The footing excavations should not be allowed to dry out any time prior to pouring concrete.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.40 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 400 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance.

11.9 Concrete Slabs-on-Grade

We recommend that non-structural non-traffic slabs-on-grade be a minimum of 4 inches thick. The maximum water-cementitious ratio of the concrete should be 0.45 and the ultimate shrinkage of the concrete should be less than 0.05% as tested per ASTM C-157. In areas where it is desired to reduce floor dampness where moisture-sensitive coverings are anticipated, construction should have a suitable waterproof vapor retarder (a minimum of 15 mils thick polyethylene vapor retarder sheeting, Raven Industries "VaporBlock 15, Stego Industries 15 mil "Stego Wrap™" or W.R. Meadows Sealtight 15 mil "Perminator®") incorporated into the floor slab design. The water vapor retarder should be decay resistant material complying with ASTM E96 not exceeding 0.04 perms, ASTM E154 and ASTM E1745 Class A.

The water vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-94. Because of the importance of the membrane, joints and perforations should be properly sealed. The vapor barrier should be underlain by four (4) inches of compacted granular clean aggregate base material conforming to ASTM D-2940-03 with at least 95 percent passing a 1½-inch sieve and not more than 8% passing a No. 200 sieve to prevent capillary moisture rise. The aggregate base should be moisture-conditioned as necessary, and compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557-07. The subgrade should be kept in a moist condition until time of slab placement. The concrete maybe placed directly on vapor retarder. The vapor retarder should be inspected prior to concrete placement. Cut or punctured retarder should be repaired using vapor retarder material lapped 6 inches beyond damaged areas and taped.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that good construction practices be performed to create a vapor membrane.

It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure is recommended to reduce the accumulation of interior moisture.

It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. The concrete slab should be reinforced using No. 3 reinforcing rebars, placed 24 inches on centers at mid-height. The exterior floors should be poured separately in order to act independently of the walls and foundation system. Exterior finish grades should be sloped at a minimum of 1 to 1½ percent away from all interior slab areas to preclude ponding of water adjacent to the structures. All fills required to bring the building pads to grade should be Engineered Fills.

Slabs subject to structural loading may be designed utilizing a modulus of subgrade reaction K of 200 pounds per square inch per inch. The K value was approximated based on inter-relationship of soil classification and bearing values (Portland Cement Association, Rocky Mountain Northwest).

In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs. Control joints should have a minimum depth of one-quarter of the slab thickness.

11.10 Lateral Earth Pressures and Frictional Resistance

Active, at-rest and passive unit lateral earth pressures against footings and walls are presented below:

Lateral Pressure Conditions	Equivalent Fluid Pressure, pcf
Active Pressure, Drained	35
At-Rest Pressure, Drained	55
Passive Pressure	400

Active pressure applies to walls, which are free to rotate. At-rest pressure applies to walls, which are restrained against rotation. The preceding lateral earth pressures assume sufficient drainage behind retaining walls to prevent the build-up of hydrostatic pressure. The top one-foot of adjacent subgrade should be deleted from the passive pressure computation. A coefficient of friction of 0.40 may be used between soil subgrade and footings or slabs.

The foregoing values of lateral earth pressures and frictional coefficients represent ultimate soil values and a safety factor consistent with the design conditions should be included in their usage. For stability against lateral sliding, which is resisted solely by the passive pressure, we recommend a minimum safety factor of 1.5. For stability against lateral sliding, which is resisted by the combined passive and frictional resistance, a minimum safety factor of 2.0 is recommended. For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

11.11 Retaining Walls

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage into the wall drain system.

The aggregate should be washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, and should conform to ASTM D448, Size 57, with 100 percent passing a 1½-inch sieve and not more than 5 percent passing a No. 4 sieve. Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturers' recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The top of the perforated pipe should be placed at or below the bottom of the adjacent floor slab or pavements. The pipe should be placed in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Slots should be no wider than 1/8-inch in diameter, while perforations should be no more than ¼-inch in diameter.

If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and placed no higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to Section 88-1.03 of the CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

11.12 Soil Corrosivity Protection

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and UBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

A soil sample was obtained from the project site and was tested for the evaluation of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts. The water-soluble sulfate concentration in the saturation extract from the soil sample was detected to be 89 mg/kg. This concentration is indicative of negligible corrosion potential. Type I/II cement with a minimum strength of 3,000 psi with water-cement ratio of 0.5 has been shown to adequately resist the soil sulfate concentration.

The water-soluble chloride concentration detected in saturation extract from the soil sample was 36 mg/kg. This level of chloride concentration is considered mildly corrosive. Based on the corrosive nature of the site soils, SALEM recommends that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, that manufacturer's recommendations for corrosion protection be closely followed. A concrete cover of 3 inches is considered adequate to provide protection for reinforcing steel.

11.13 Utility Pipe Bedding and Backfilling

Utility trenches should be excavated according to accepted engineering practice following OSHA (Occupational Safety and Health Administration) standards by a contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the contractor. Traffic and vibration adjacent to trench walls should be minimized; cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced; especially during or following periods of precipitation.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Utility trench backfill should be compacted to at least 95 percent of maximum density based on ASTM D1557-07 Test Method. Pipe bedding should be in accordance with pipe manufacturer recommendations. The contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

11.14 Pavement Design

Based on the site soil condition, an R-value of 40 was used for the preliminary flexible asphaltic concrete pavement design. The R-value may be verified during grading of the pavement areas. The following table shows the recommended pavement sections for various traffic indices.

The pavement design recommendations provided herein are based on the State of California Department of Transportation (CALTRANS) design manual. The asphaltic concrete (flexible pavement) is based on a 20-year pavement life utilizing 1200 passenger vehicles, 10 single unit trucks, and 2 multi-unit trucks.

(Parking Area)

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade*
4.5	2.5"	4.0"	12.0"

(Vehicle Drive Area)

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade*
5.5	3.0"	4.5"	12.0"

(Heavy Truck Area)

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade*
6.5	3.5"	6.0"	12.0"

**95% compaction based on ASTM D1557-07 Test Method*

The following recommendations are for light-duty and heavy-duty Portland Cement Concrete pavement sections.

PORTLAND CEMENT PAVEMENT

(Light Duty)

Traffic Index	Portland Cement Concrete**	Class II Aggregate Base*	Compacted Subgrade*
4.5	5.0"	5.0"	12.0"

(Heavy Duty)

Traffic Index	Portland Cement Concrete**	Class II Aggregate Base*	Compacted Subgrade*
6.5	6.0"	6.0"	12.0"

**95% compaction based on ASTM D1557-07 Test Method*
*** Minimum concrete strength = 4,000 psi*

11.15 Site Coefficient

For seismic design of the structures, and in accordance with the seismic provisions of the 2009 IBC and 2010 CBC, our recommended parameters are shown below. These parameters are based on Probabilistic Ground Motion of 2% Probability of Exceedance in 50 years. The Site Class was determined based on the results of field exploration as documented in the above-referenced geotechnical report.

Seismic Item	Symbol	Value	2009 IBC/2010 CBC Reference
Site Coordinates (Datum = NAD 83)		34.1533 Lat -118.2454 Lon	
Site Class	SC	C	Table 1615.5.2
Soil Profile Name	SP	Very Dense Soil	Table 1615.5.2
Mapped Spectral Acceleration (Short period - 0.2 sec)	S_S	2.483 g	Figure 1613.5*
Mapped Spectral Acceleration (1.0 sec. period)	S_1	0.817 g	Figure 1613.5*
Site Class Modified Site Coefficient	F_a	1.0	Table 1613.5.3(1)
Site Class Modified Site Coefficient	F_v	1.3	Table 1613.5.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a S_S$	S_{MS}	2.483 g	Equation 16-36
MCE Spectral Response Acceleration (1.0 sec. period) $S_{M1} = F_v S_1$	S_{M1}	1.063 g	Equation 16-37
Design Spectral Response Acceleration S_{DS}=2/3 S_{MS} (short period - 0.2 sec)	S_{DS}	1.655 g	Equation 16-38
Design Spectral Response Acceleration S_{D1}=2/3 S_{M1} (1.0 sec. period)	S_{D1}	0.708 g	Equation 16-39

* Also used USGS National Seismic Hazard Mapping Program Java applet tool to determine site-specific accelerations (available at http://earthquake.usgs.gov/research/hazmaps/design/).

12.0 PLAN REVIEW, CONSTRUCTION OBSERVATIONS AND TESTING

We recommend that a review of plans and specifications with regard to foundations, and earthwork be completed by SALEM Engineering Group, Inc. (SALEM) prior to construction bidding. SALEM should be present at the site during site preparation to observe site clearing, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material. SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of the building pad (footings and slab subgrade) should be tested immediately prior to concrete placement.

SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report. SALEM should also observe placement of foundation and slab concrete.

13.0 CHANGED CONDITIONS

The analyses and recommendations submitted in this report are based upon the data obtained from the test borings drilled at the approximate locations shown on the Site Plan, Figure 1. The report does not reflect variations which may occur between borings. The nature and extent of such variations may not become evident until construction is initiated. If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of such variations.

The findings and recommendations presented in this report are valid as of the present and for the proposed construction. If site conditions change due to natural processes or human intervention on the property or adjacent to the site, or changes occur in the nature or design of the project, or if there is a substantial time lapse between the submission of this report and the start of the work at the site, the conclusions and recommendations contained in our report will not be considered valid unless the changes are reviewed by SALEM and the conclusions of our report are modified or verified in writing. The validity of the recommendations contained in this report is also dependent upon an adequate testing and observations program during the construction phase. Our firm assumes no responsibility for construction compliance with the design concepts or recommendations unless we have been retained to perform the on-site testing and review during construction.

SALEM has prepared this report for the exclusive use of the owner and project design consultants. The report has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No other warranties, either expressed or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (909) 908-6455.

Respectfully submitted,
SALEM Engineering Group, Inc.

Clarence Jiang, GE
Senior Geotechnical Engineer
RGE 2477

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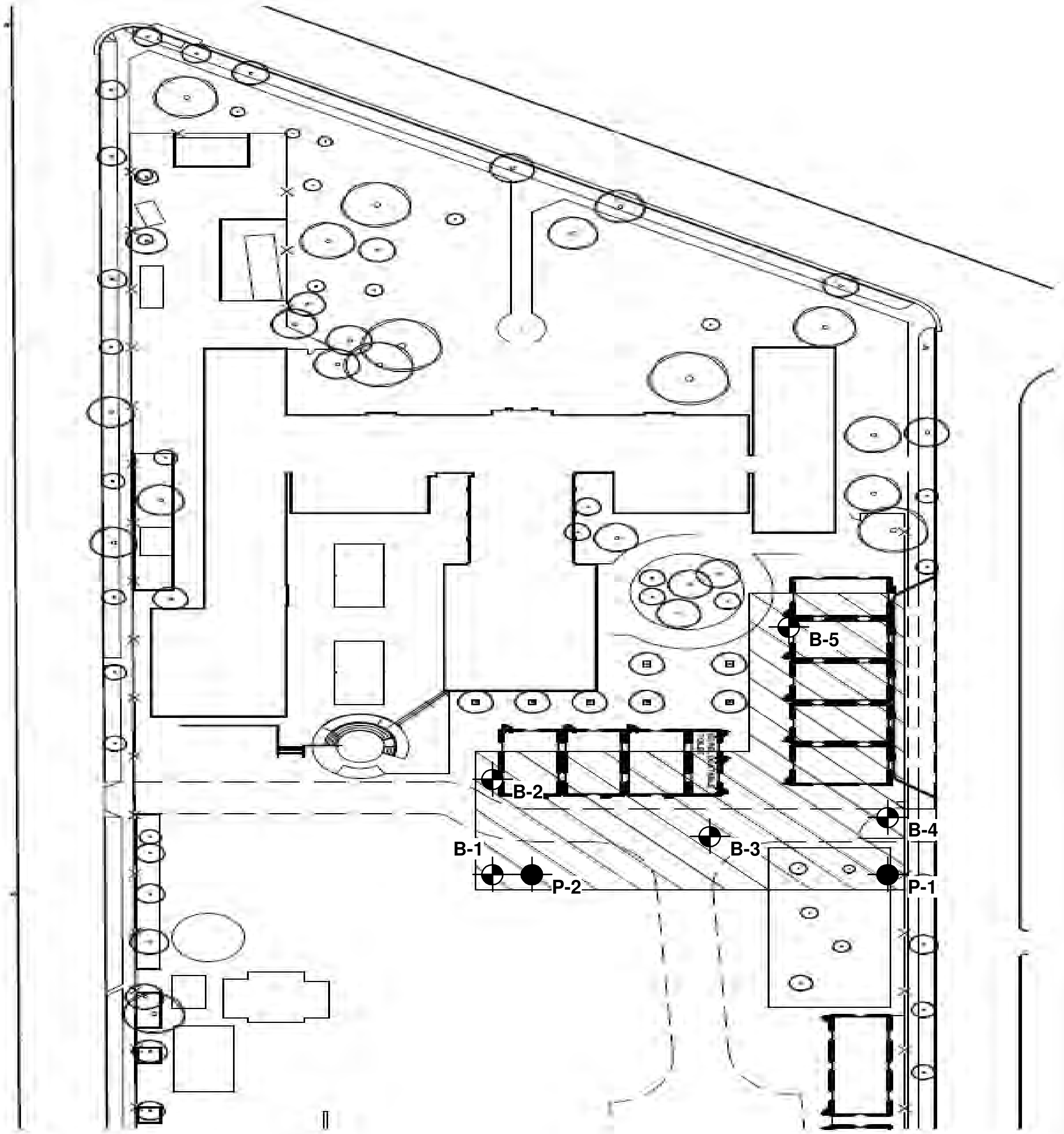


EXPLANATION

Approximate Boring Location

Approximate Perc Test Location

(All Locations Approximate)

SITE PLAN	SCALE: NOT TO SCALE	DATE: 12/08/2011	SALEM engineering group, inc.
GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED NEW CLASSROOM BUILDING 744 EAST DORAN STREET GLENDALE, CALIFORNIA	DRAWN BY: CC	APPROVED BY: CJ	
	PROJECT NO. 3-211-0979	FIGURE NO. 1	

APPENDIX

A

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

1.0 FIELD INVESTIGATION: The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Exploratory borings were advanced at the site. The boring locations are shown on the attached site plan.

The soils encountered were logged in the field during the exploration and with supplementary laboratory test data are described in accordance with the Unified Soil Classification System.

Penetration and/or Resistance tests were performed at selected depths. These tests represent the resistance to driving a 2-and/or 3-inch outside diameter core barrel, respectively, 18 inches into the soil. The N-Value obtained from the Standard Penetration Test (SPT) and/or driving the Modified California Sampler (MCS) was recorded based on the number of blows required to penetrate the last 12 inches. The driving energy was provided by a hammer weighing 140 pounds, falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. All samples were returned to our laboratory for evaluation.

2.0 LABORATORY INVESTIGATION: The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were determined for the undisturbed samples representative of the subsurface material. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 200 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Coarse-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			***Cohesive Soils***		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 – 15	4 – 10	Soft	3 – 5	2 – 4
Medium dense	16 – 40	11 – 30	Firm	6 – 10	5 – 8
Dense	41 – 65	31 – 50	Stiff	11 – 20	9 – 15
Very dense	>65	>50	Very Stiff	21 – 40	16 – 30
			Hard	>40	>30

MCS = Modified California Sampler SPT = Standard Penetration Test Sampler

Project: Proposed Classroom Building at RD White Elementary School

Project No: 3-211-0979

Client: Glendale Unified School District

Boring No. B-1

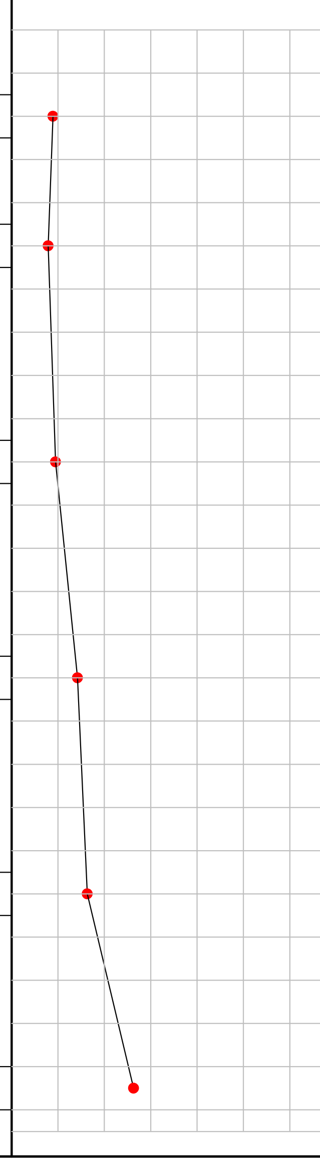
Figure No.: A-1

Location: 744 E. Doran Street, Glendale, CA

Logged By: S.K.

Depth to Water> **Initial:** None **Completion:**

SUBSURFACE PROFILE			SAMPLE					Penetration Test	Water Level
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sample Type	Penetration	Blow Count	20 60 100	
		Ground Surface							
0		**Asphaltic Concrete = 6 inches**							
		Aggregate Base Material = 2 inches	N/A	3.0	MCS		17		
		Silty Sand (SM) Dense; damp; light brown; coarse to medium-grained; gravels below 3 feet; drills firm.							
5			119.0	8.4	MCS		15		
10		Grades denser; increased gravels below 10 feet.	N/A	3.7	SPT		18		
15			N/A	4.1	SPT		27		
		Grades denser; heavy gravels and cobbles below 17 feet.							
20		Grades coarser with heavier gravels.	N/A	3.5	SPT		31		
			N/A	4.1	SPT		50		
25		End of Borehole							



Drill Method: Hollow Stem Auger

Drill Rig: Mobile B-61

Driller: G.P. Drilling

SALEM
Engineering Group, Inc.

Drill Date: 12.03.2011

Hole Size: 6½ inch

Sheet: 1 of 1

Project: Proposed Classroom Building at RD White Elementary School
Project No: 3-211-0979

Client: Glendale Unified School District

Boring No. B-2

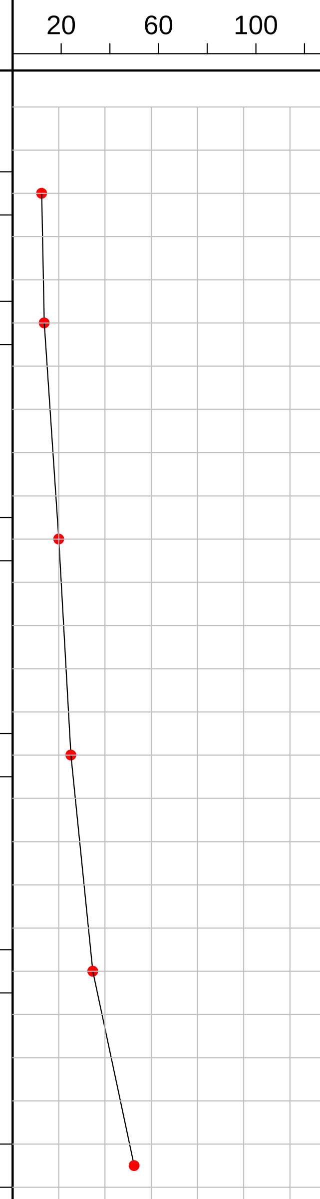
Figure No.: A-2

Location: 744 E. Doran Street, Glendale, CA
Logged By: S.K.

Depth to Water> **Initial:** None **Completion:**

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sample Type	Penetration	Blow Count
		Ground Surface					
0		**Silty Sand (SM)** Loose; damp; brown; medium to fine-grained; trace of gravel; drills easily.	123.9	4.2	MCS		12
5			122.1	3.6	MCS		13
		Increased gravels and cobbles below 8 feet.					
10		Grades medium dense; coarser; increased gravels.	N/A	3.8	SPT		19
15		Grades denser.	N/A	3.1	SPT		24
20			N/A	4.0	SPT		33
		Grades denser and coarser with heavy gravels and cobbles below 22 feet.					
		Grades very dense.	N/A	N/A	SPT		50
25		End of Borehole					

Penetration Test



Water Level

Drill Method: Hollow Stem Auger
Drill Date: 12.03.2011

Drill Rig: Mobile B-61
Hole Size: 6½ inch

Driller: G.P. Drilling
Sheet: 1 of 1

SALEM
Engineering Group, Inc.

Project: Proposed Classroom Building at RD White Elementary School
Project No: 3-211-0979

Client: Glendale Unified School District

Boring No. B-3

Figure No.: A-3

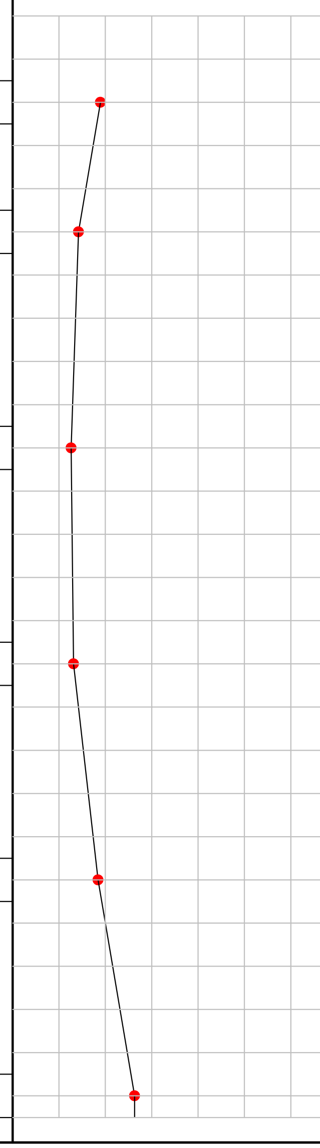
Location: 744 E. Doran Street, Glendale, CA
Logged By: S.K.

Depth to Water> **Initial:** None **Completion:**

Depth (ft)	Description	Dry Density (pcf)	Moisture Content (%)	Sample Type	Blow Count
	Ground Surface				
0	**Asphaltic Concrete = 6 inches**				
	Aggregate Base Material = 3 inches				
		120.0	4.9	MCS	36
	Silty Sand (SM) Medium dense; damp; brown; coarse to medium-grained; some gravel below 2 feet; drills very hard.				
5		119.4	4.1	MCS	27
	Grades less dense; coarser; increased gravels below 8 feet.				
	Silty Sand/Sand (SM/SP) Medium dense; damp; brown; coarse to medium-grained; drills easily.				
10		N/A	3.4	SPT	24
15		N/A	4.0	SPT	25
20		N/A	3.8	SPT	35
	Grades denser; increased gravels and cobbles below 21 feet.				
25	Grades very dense.	N/A	4.3	SPT	50

Penetration Test

20 60 100



Water Level

Drill Method: Hollow Stem Auger
Drill Date: 12.03.2011

Drill Rig: Mobile B-61
Hole Size: 6½ inch

Driller: G.P. Drilling
Sheet: 1 of 2

SALEM
Engineering Group, Inc.

Project: Proposed Classroom Building at RD White Elementary School | **Project No:** 3-211-0979

Client: Glendale Unified School District | **Figure No.:** A-3

Boring No. B-3

Location: 744 E. Doran Street, Glendale, CA | **Logged By:** S.K.

Depth to Water> **Initial:** None | **Completion:**

SUBSURFACE PROFILE		SAMPLE					
Depth (ft)	Description	Dry Density (pcf)	Moisture Content (%)	Sample Type	Penetration	Blow Count	Penetration Test
30	Heavy gravels and cobbles; very hard drilling.	N/A	2.7	SPT		50	
35	Grades denser with increased gravel.	N/A	4.2	SPT		50	
40	Very hard drilling.	N/A	N/A	SPT		50	
	Auger Refusal at 41½ Feet Due To Heavy Gravel & Cobbles						
45							
50							

Penetration Test scale: 20, 60, 100. Water Level column.

Drill Method: Hollow Stem Auger | **Drill Date:** 12.03.2011

Drill Rig: Mobile B-61 | **Hole Size:** 6½ inch

Driller: G.P. Drilling | **Sheet:** 2 of 2

SALEM
Engineering Group, Inc.

Project: Proposed Classroom Building at RD White Elementary School

Project No: 3-211-0979

Client: Glendale Unified School District

Boring No. B-4

Figure No.: A-4

Location: 744 E. Doran Street, Glendale, CA

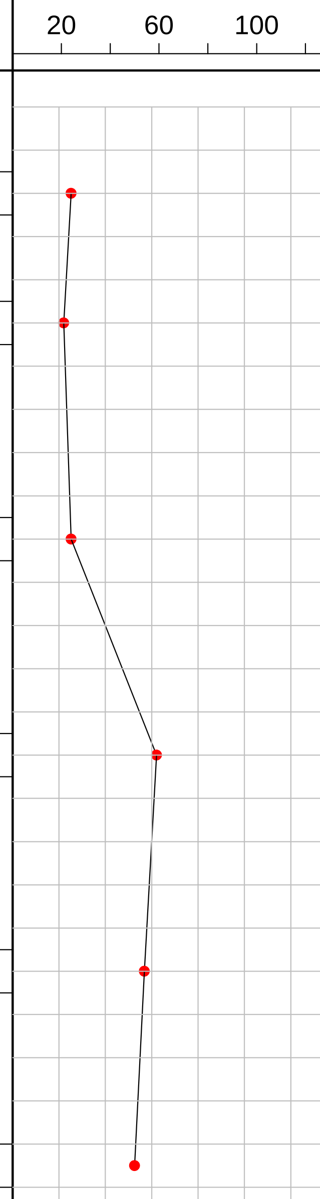
Logged By: S.K.

Depth to Water> **Initial:** None **Completion:**

SUBSURFACE PROFILE / SAMPLE

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture Content (%)	Sample Type	Penetration	Blow Count	Water Level
0		Ground Surface						
0		**Asphaltic Concrete = 5 inches**						
		Silty Sand (SM) Dense; dry; brown; medium to fine-grained; trace of gravel; drills firmly.	122.6	2.1	MCS		24	
5		Grades less dense; gravels coarser.	N/A	3.4	MCS		21	
10		Grades denser; increased gravels below 11 feet.	N/A	3.6	SPT		24	
15		Grades very dense; increased gravels.	N/A	4.0	SPT		59	
20			N/A	4.5	SPT		54	
		Grades denser; increased gravels; very hard drilling.	N/A	3.7	SPT		50	
25		End of Borehole						

Penetration Test



Drill Method: Hollow Stem Auger

Drill Rig: Mobile B-61

Driller: G.P. Drilling

SALEM
Engineering Group, Inc.

Drill Date: 12.03.2011

Hole Size: 6½ inch

Sheet: 1 of 1

Project: Proposed Classroom Building at RD White Elementary School
Project No: 3-211-0979

Client: Glendale Unified School District

Boring No. B-5

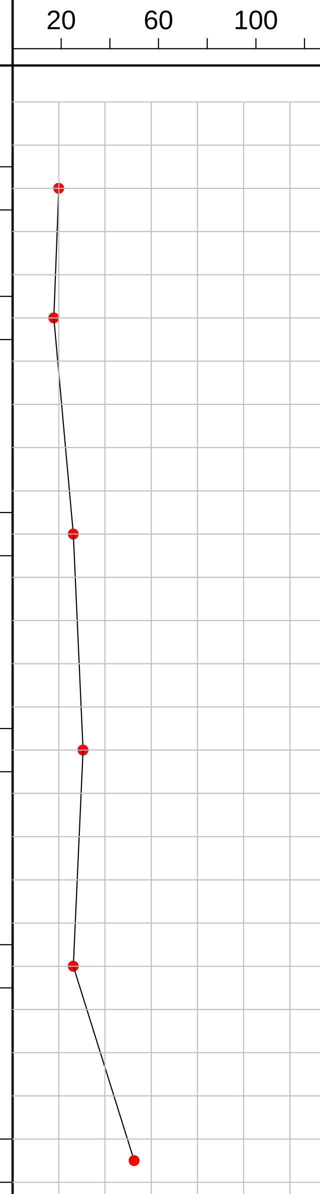
Figure No.: A-5

Location: 744 E. Doran Street, Glendale, CA
Logged By: S.K.

Depth to Water>
Initial: None
Completion:

SUBSURFACE PROFILE		SAMPLE				
Depth (ft)	Description	Dry Density (pcf)	Moisture Content (%)	Sample Type	Penetration	Blow Count
	Ground Surface					
0	**Asphaltic Concrete = 9 inches**					
	Silty Sand/Sand (SM/SP) Medium dense; dry; light brown; coarse to medium-grained; minor gravels; drills firmly.	N/A	2.6	MCS		19
5		N/A	2.8	MCS		17
10	Grades denser and coarser.	N/A	3.3	SPT		25
15		N/A	4.1	SPT		29
	Increased gravels and cobbles below 17 feet.					
20		N/A	N/A	SPT		25
	Increased gravels and cobbles below 21 feet; very hard drilling.					
		N/A	N/A	SPT		50
25	End of Borehole					

Penetration Test



Water Level

Drill Method: Hollow Stem Auger
Drill Date: 12.03.2011

Drill Rig: Mobile B-61
Hole Size: 6½ inch

Driller: G.P. Drilling
Sheet: 1 of 1

SALEM
Engineering Group, Inc.

Percolation Test P-1

Project: RD White Elementary School
744 East Doran Street
Glendale, CA

Job No.: 3-211-0979
Date Drilled: 12/3/2011
Soil Classification: Silty Sand

Vol. in 1" Wtr Col. (in^3) 12.6
Safety Factor: 5

Test Hole No.: P-1
Test Hole Dia.: 4 inches
Tested by: SK

Test Date: 12/4/2011
Presoaking Date: 12/3/2011

Time Start	Time Finish	Depth of Test Hole (ft)	Refill- Yes or No	Elapsed Time (hrs:min)	Initial Water Level* (ft)	Final Water Level (ft)*	Δ Water Level (in.)	Δ Min.	Perc Rate (min/in)	Ht. of Water Column (in.)	Wetted Surf. Area of Column (in^2)	Abs Rate (GFD) [No SF]	Abs Rate (GFD) [with SF]
8:15	8:25	6.00	No	0:10	2.98	3.88	10.8	10	0.9	25.4	332.3	36.67	7.33
8:25	8:35	6.00	No	0:10	3.88	4.64	9.1	10	1.1	16.3	217.6	47.27	9.45
8:35	8:45	6.00	No	0:10	4.64	5.35	8.5	10	1.2	7.8	110.6	86.91	17.38
8:45	8:55	6.00	Yes	0:10	1.50	2.24	8.9	10	1.1	45.1	579.6	17.28	3.46
8:57	9:07	6.00	No	0:10	2.24	2.68	5.3	10	1.9	39.8	513.2	11.61	2.32
9:07	9:17	6.00	No	0:10	2.68	3.06	4.6	10	2.2	35.3	455.9	11.28	2.26
9:17	9:27	6.00	No	0:10	3.06	3.40	4.1	10	2.5	31.2	404.6	11.37	2.27
9:27	9:37	6.00	No	0:10	3.40	3.72	3.8	10	2.6	27.4	356.4	12.15	2.43
9:37	9:47	6.00	No	0:10	3.72	4.02	3.6	10	2.8	23.8	311.1	13.05	2.61
9:47	9:57	6.00	No	0:10	4.02	4.30	3.4	10	3.0	20.4	268.9	14.09	2.82
9:57	10:07	6.00	No	0:10	4.30	4.57	3.2	10	3.1	17.2	228.2	16.02	3.20
10:07	10:17	6.00	No	0:10	4.57	4.83	3.1	10	3.2	14.0	189.0	18.62	3.72
Recommended for Design:							**Percolation Rate**		**3.2**		**Absorption Rate**		**2.77**

SALEM engineering group, inc.

Percolation Test P-2

Project: RD White Elementary School
744 East Doran Street
Glendale, CA

Job No.: 3-211-0979
Date Drilled: 12/3/2011
Soil Classification: Silty Sand

Vol. in 1" Wtr Col. (in^3) 12.6
Safety Factor: 5

Test Hole No.: P-2
Test Hole Dia.: 4 inches
Tested by: SK

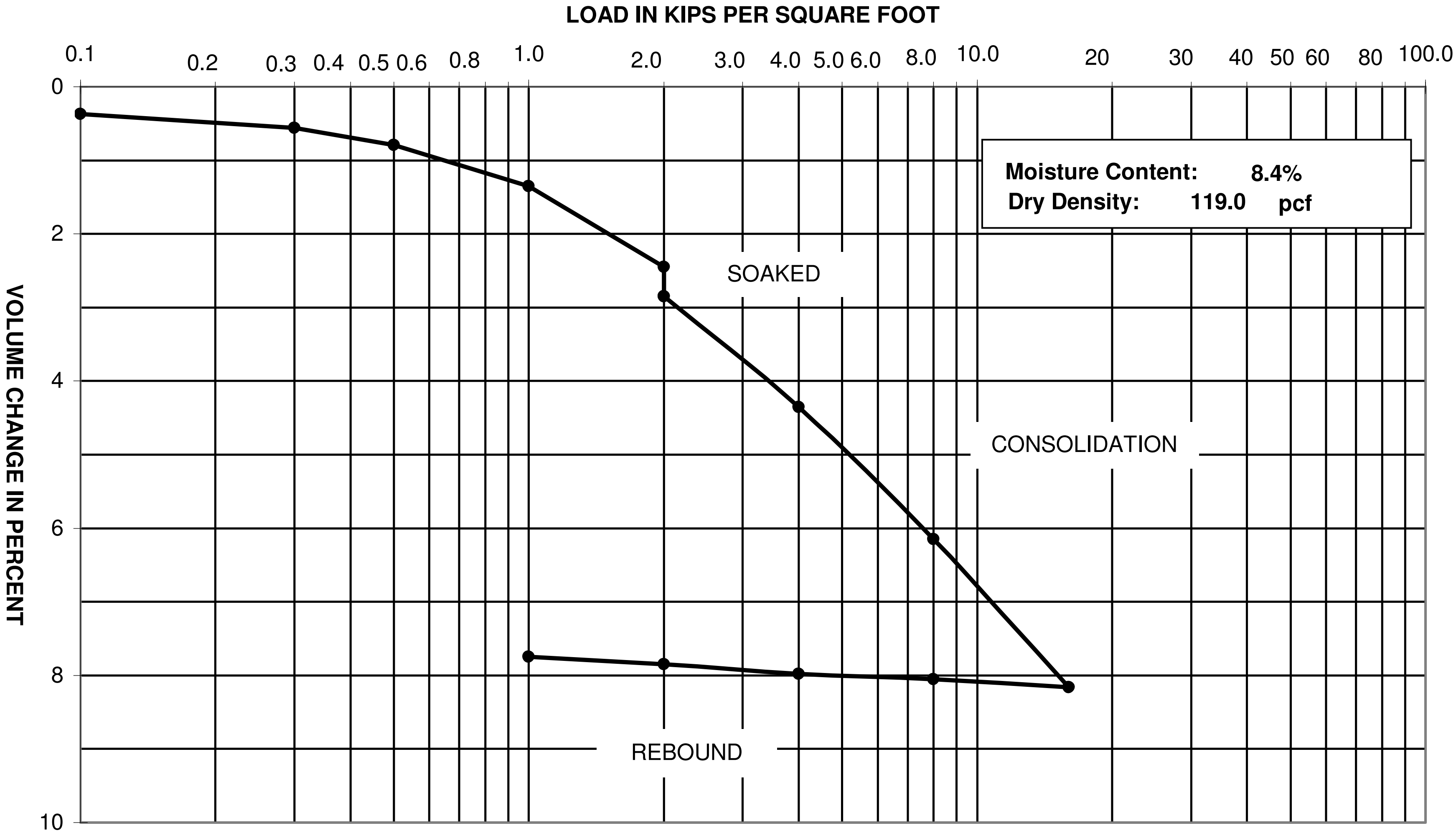
Test Date: 12/4/2011
Presoaking Date: 12/3/2011

Time Start	Time Finish	Depth of Test Hole (ft)	Refill-Yes or No	Elapsed Time (hrs:min)	Initial Water Level* (ft)	Final Water Level (ft)*	Δ Water Level (in.)	Δ Min.	Perc Rate (min/in)	Ht. of Water Column (in.)	Wetted Surf. Area of Column (in^2)	Abs Rate (GFD) [No SF]	Abs Rate (GFD) [with SF]
8:20	8:30	8.00	No	0:10	3.25	3.94	8.3	10	1.2	48.7	624.8	14.95	2.99
8:30	8:40	8.00	No	0:10	3.94	4.50	6.7	10	1.5	42.0	540.4	14.03	2.81
8:40	8:50	8.00	No	0:10	4.50	4.98	5.8	10	1.7	36.2	468.0	13.88	2.78
8:50	9:00	8.00	No	0:10	4.98	5.40	5.0	10	2.0	31.2	404.6	14.05	2.81
9:00	9:10	8.00	No	0:10	5.40	5.77	4.4	10	2.3	26.8	348.8	14.36	2.87
9:10	9:20	8.00	No	0:10	5.77	6.10	4.0	10	2.5	22.8	299.1	14.94	2.99
9:20	9:30	8.00	No	0:10	6.10	6.40	3.6	10	2.8	19.2	253.8	16.00	3.20
9:30	9:40	8.00	No	0:10	6.40	6.68	3.4	10	3.0	15.8	211.6	17.91	3.58
9:40	9:50	8.00	No	0:10	6.68	6.95	3.2	10	3.1	12.6	170.9	21.39	4.28
9:50	10:00	8.00	No	0:10	6.95	7.20	3.0	10	3.3	9.6	133.2	25.41	5.08
10:00	10:10	8.00	No	0:10	7.20	7.43	2.8	10	3.6	6.8	98.5	31.60	6.32
10:10	10:20	8.00	No	0:10	7.43	7.65	2.6	10	3.8	4.2	65.3	45.57	9.11
Recommended for Design:							**Percolation Rate**		**3.8**		**Absorption Rate**		**4.82**

SALEM engineering group, inc.

CONSOLIDATION - PRESSURE TEST DATA

ASTM D 2435



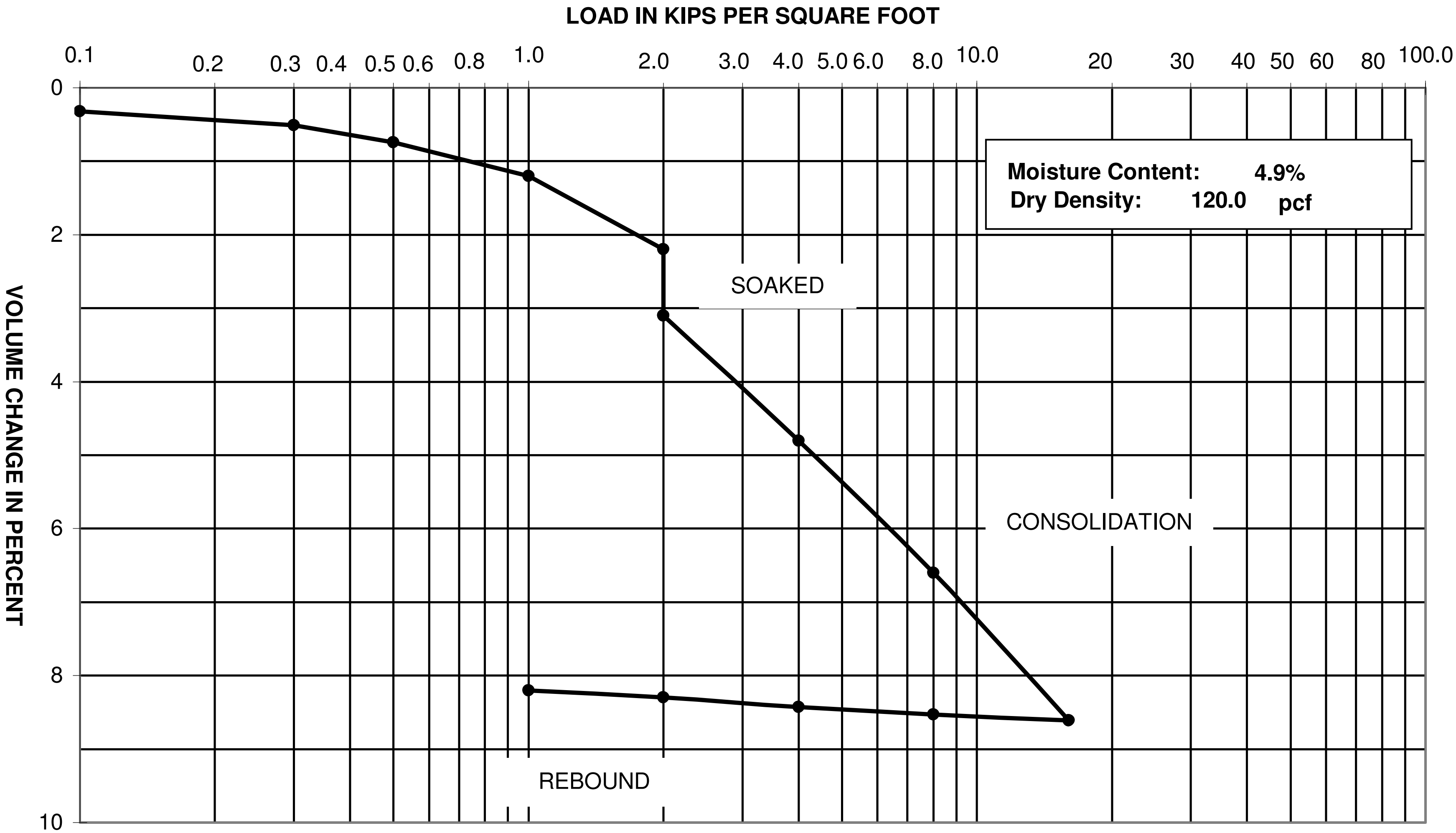
Project Name:R.D White Elementary

Project Number:3-211-0979

Boring: B-1 @ 5'

SALEM Engineering Group, Inc.

CONSOLIDATION - PRESSURE TEST DATA
ASTM D 2435



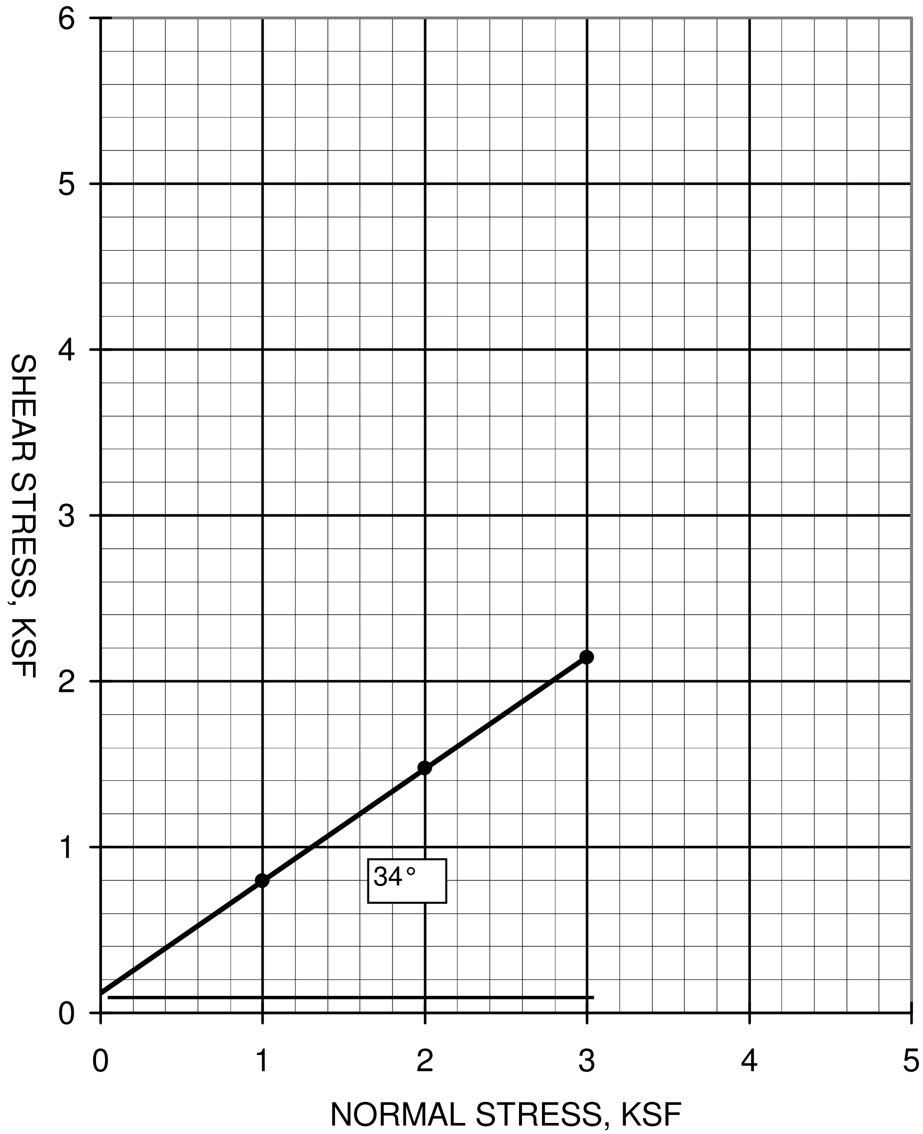
Project Name:R.D White Elementary

Project Number:3-211-0979

Boring: B-3 @ 2'

SALEM Engineering Group, Inc.

SHEAR STRENGTH DIAGRAM
(DIRECT SHEAR)
ASTM 3080



Project Name:R.D White Elementary

Project Number:3-211-0979

Boring: B-2 @ 2'
Soil Type:

Friction Angle: 34 degrees
Cohesion: 120 psf

Moisture Content 4.2%

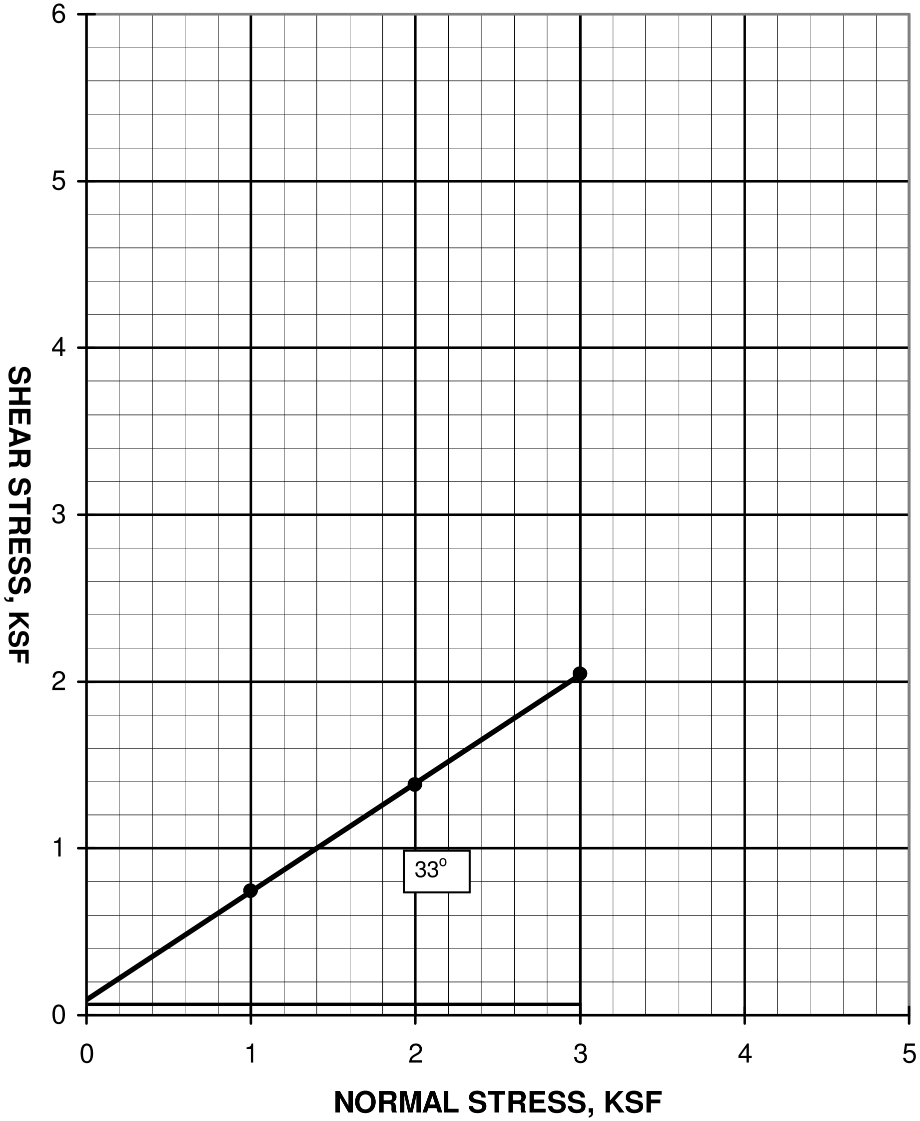
Dry Density 123.9 pcf

SALEM Engineering Group, Inc.

SHEAR STRENGTH DIAGRAM

(DIRECT SHEAR)

ASTM 3080



Project Name:R.D White Elementary

Project Number:3-211-0979

Boring: B-3 @ 5'
Soil Type:

Friction Angle: 33 degrees
Cohesion: 90 psf

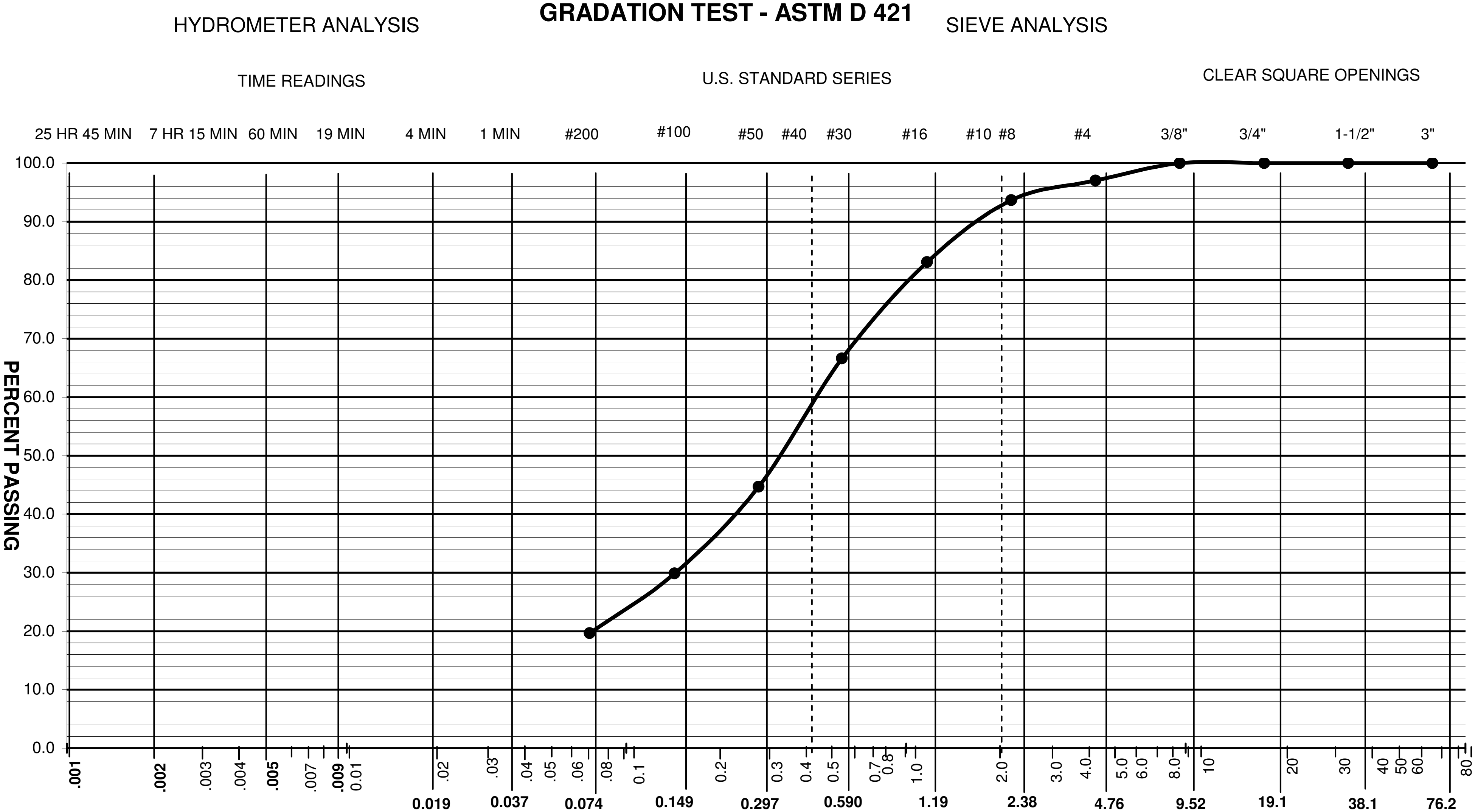
Moisture Content 4.1%

Dry Density 119.4 pcf

SALEM Engineering Group, Inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 421



CLAY (PLASTIC) TO SILT (NON-PLASTIC)	SAND			GRAVEL		COBBLE
	FINE	MEDIUM	COARSE	FINE	COARSE	

Project Name:R.D White Elementary

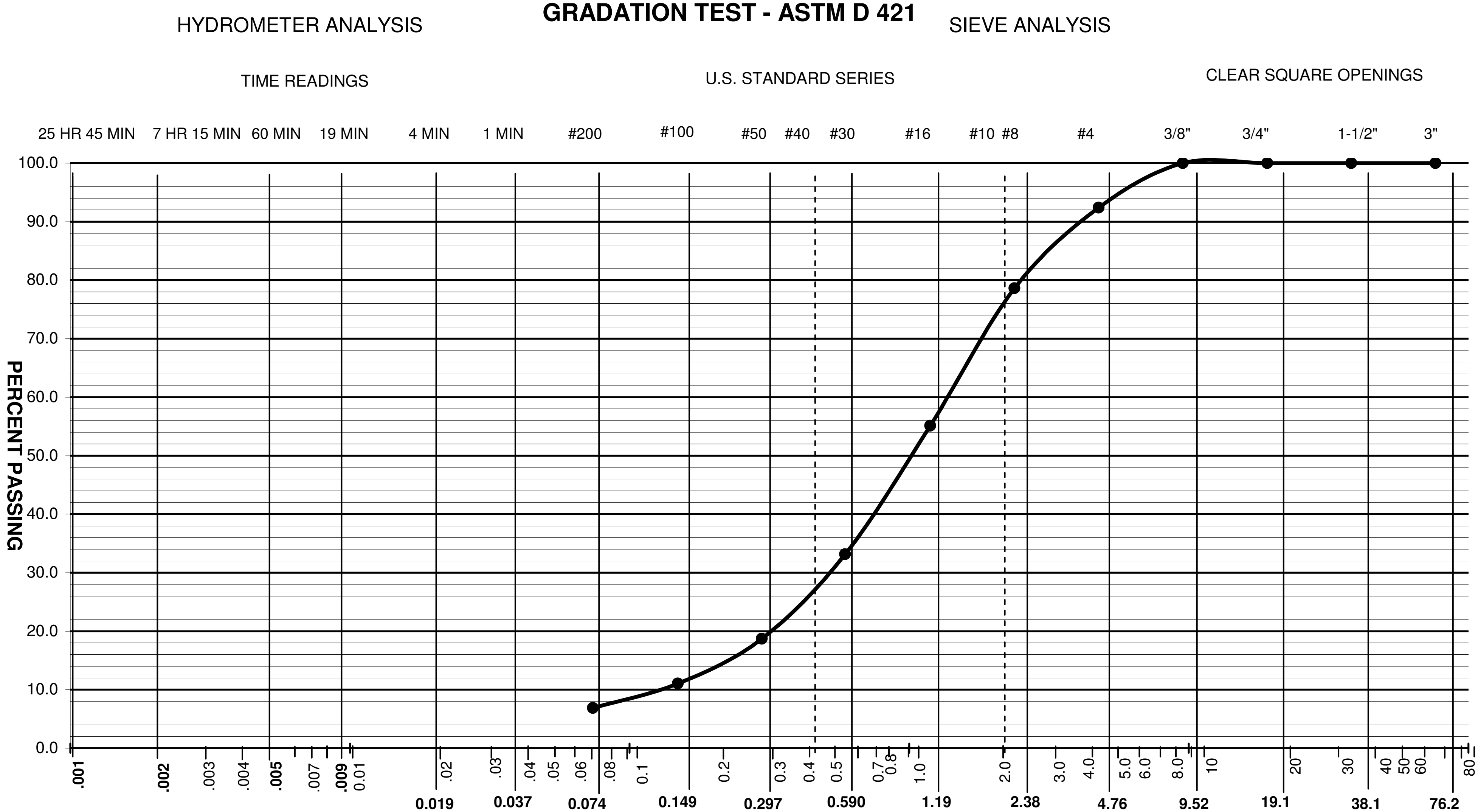
Project Number:3-211-0979

Boring: B-3 @ 2'

SALEM Engineering Group, Inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 421



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<tr><td>FINE</td><td>MEDIUM</td><td>COARSE</td><td>FINE</td><td>COARSE</td></tr>
</table>

Project Name:R.D White Elementary

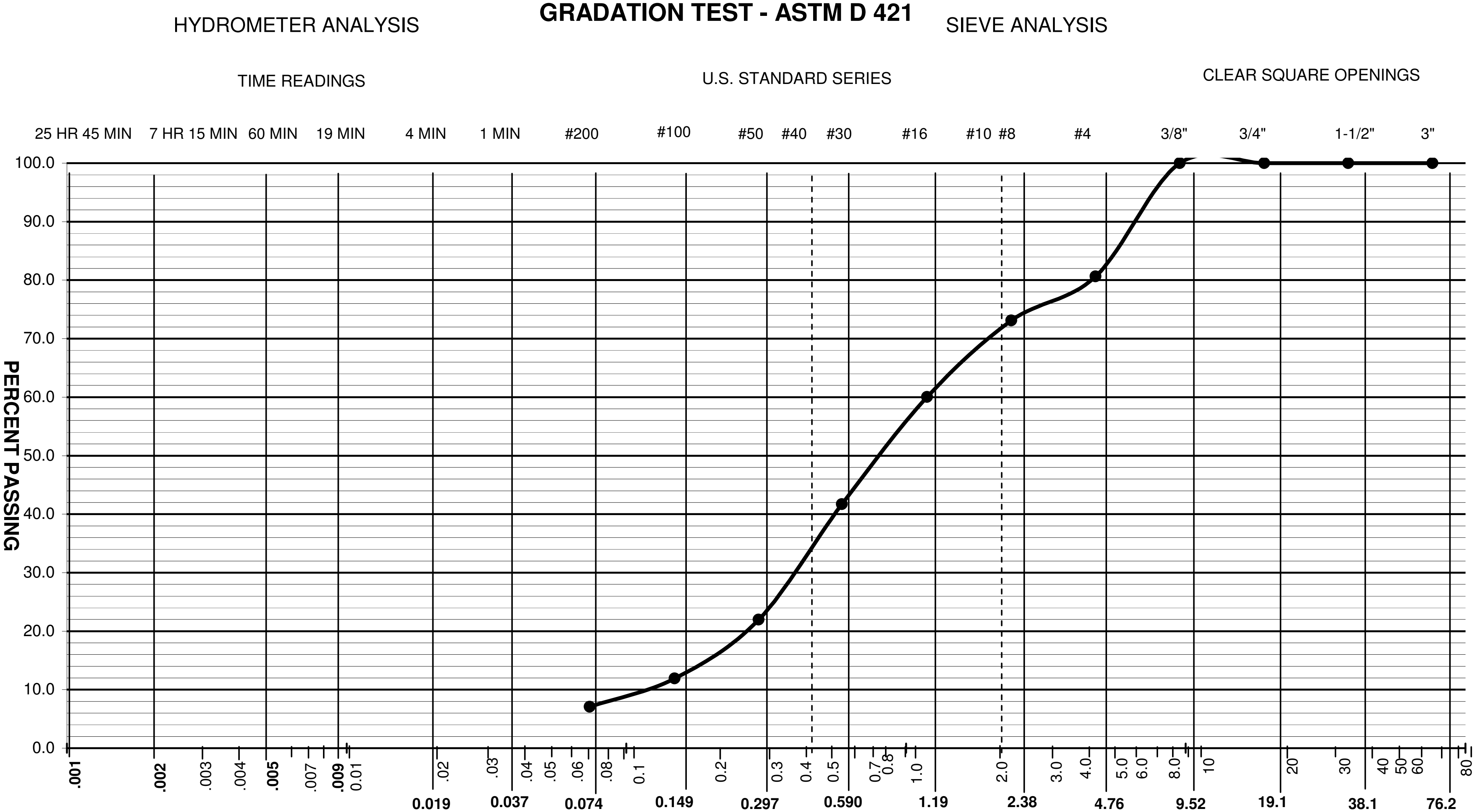
Project Number:3-211-0979

Boring: B-3 @ 10'

SALEM Engineering Group, Inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 421



CLAY (PLASTIC) TO SILT (NON-PLASTIC)	SAND			GRAVEL		COBBLE
	FINE	MEDIUM	COARSE	FINE	COARSE	

Project Name:R.D White Elementary

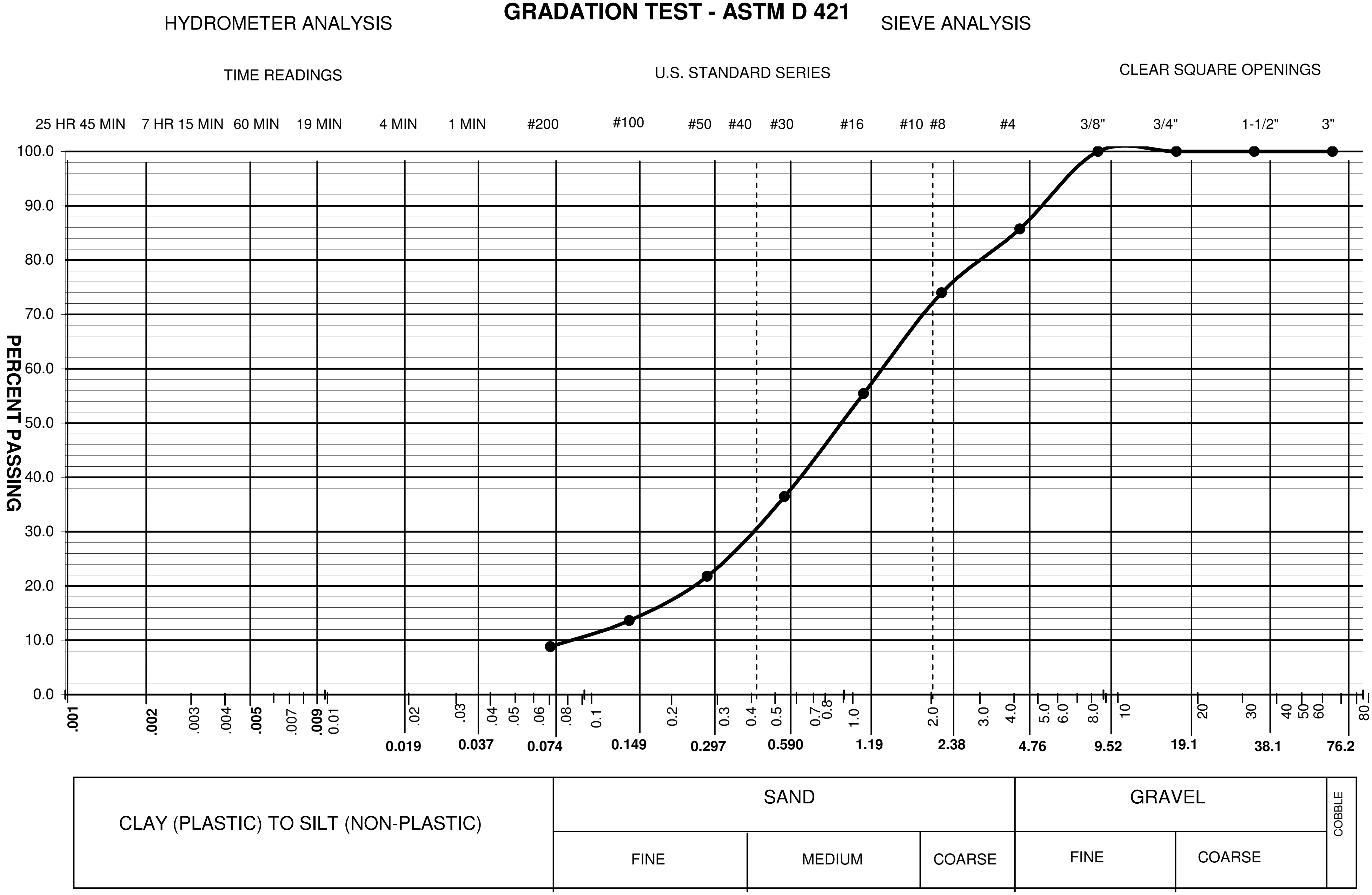
Project Number:3-211-0979

Boring: B-3 @ 20'

SALEM Engineering Group, Inc.

PARTICLE SIZE DISTRIBUTION DIAGRAM

GRADATION TEST - ASTM D 421



Project Name:R.D White Elementary

Project Number:3-211-0979

Boring: B-3 @ 30'

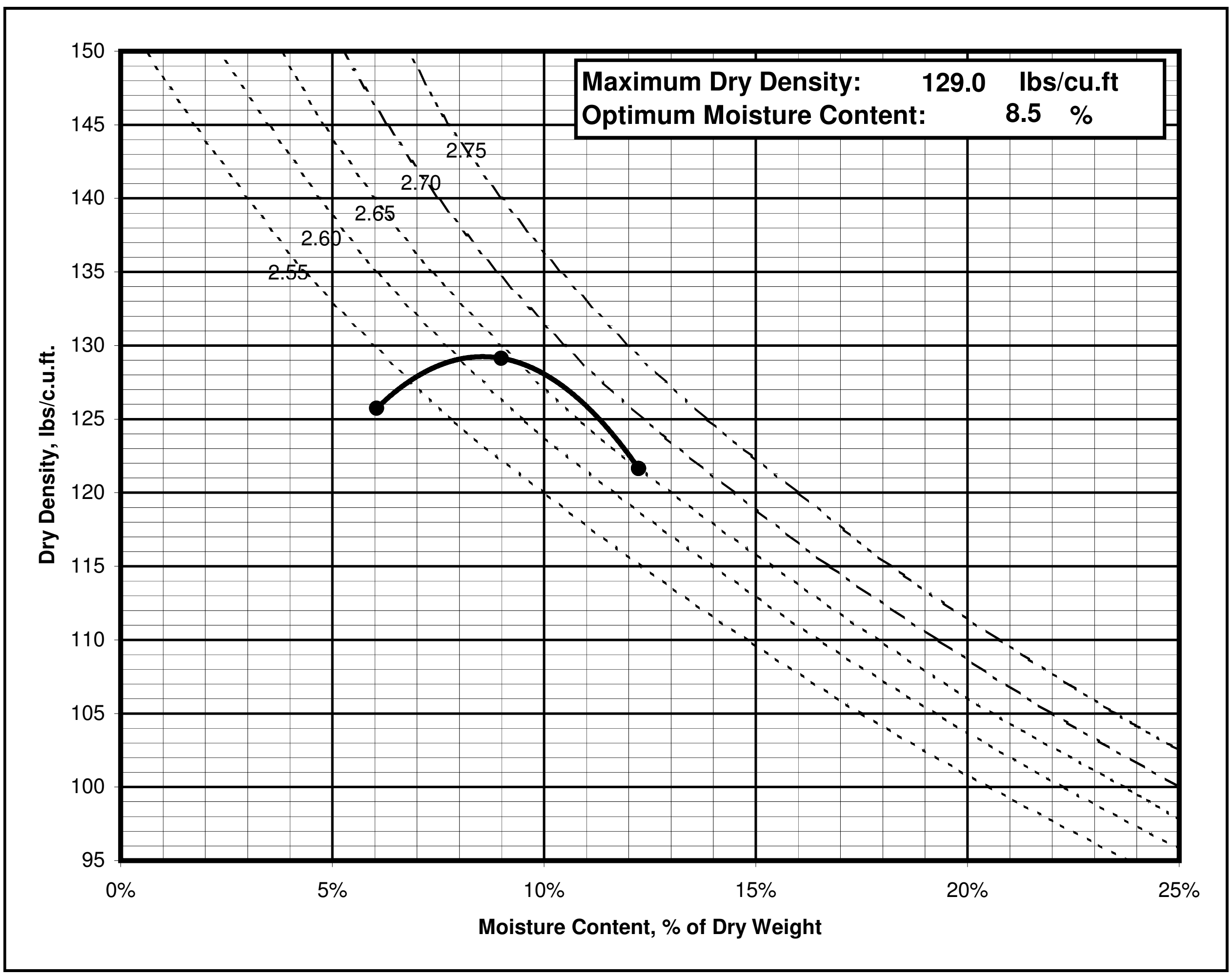
SALEM Engineering Group, Inc.

LABORATORY COMPACTION CURVE
ASTM - D1557, D698

Project Name:R.D White Elementary
Project Number:3-211-0979
Date Tested:12/7/11
Sample Location: B-1 @ 0-3'
Sample Description:(SM) Silty Sand

Sample/Curve Number: 1
Test Method: 1557 A

	1	2	3
Weight of Moist Specimen & Mold, gm	4354.6	4306.4	4418.1
Weight of Compaction Mold, gm	2298.5	2298.5	2298.5
Weight of Moist Specimen, gm	2056.1	2007.9	2119.6
Volume of mold, cu. ft.	0.0332	0.0332	0.0332
Wet Density, lbs/cu.ft.	136.5	133.3	140.7
Weight of Wet (Moisture) Sample, gm	200.0	200.0	200.0
Weight of Dry (Moisture) Sample, gm	178.2	188.6	183.5
Moisture Content, %	12.2%	6.0%	9.0%
Dry Density, lbs/cu.ft.	121.6	125.7	129.1



SALEM Engineering Group, Inc.

EXPANSION INDEX TEST
ASTM D 4829 / UBC Std. 29-2

Project Name:R.D White Elementary
Project Number:3-211-0979
Date:12/7/11
Sample location/ Depth: B-1 @ 0-3'
Sample Number:1
Soil Classification: (SM) Silty Sand

Trial #	**1**	**2**	**3**
Weight of Soil & Mold, gms	614.6		
Weight of Mold, gms	187.0		
Weight of Soil, gms	427.6		
Wet Density, Lbs/cu.ft.	129.0		
Weight of Moisture Sample (Wet), gms	300.0		
Weight of Moisture Sample (Dry), gms	281.9		
Moisture Content, %	6.4		
Dry Density, Lbs/cu.ft.	121.2		
Specific Gravity of Soil	2.6		
Degree of Saturation, %	49.3		

Time	Inital	30 min	1 hr	6 hrs	12 hrs	24 hrs
Dial Reading	0	--	--	--	--	0.001

Expansion Index $_{measured}$ = 1
Expansion Index $_{50}$ = 0.7

Expansion Index = 1

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

CHEMICAL ANALYSIS

SO_4 - Modified Caltrans 417 & Cl - Modified Caltrans 417/422

Project Name:R.D White Elementary
Project Number:3-211-0979
Date: 12/7/11
Soil Classification:

Sample Number	Sample Location	Soluble Sulfate SO_4-S		Soluble Chloride Cl		pH
1a.	B-1 @ 0-3'	89	mg/Kg	36	mg/Kg	7.2
1b.	B-1 @ 0-3'	92	mg/Kg	37	mg/Kg	7.2
1c.	B-1 @ 0-3'	87	mg/Kg	35	mg/Kg	7.3
Average		**89**	**mg/Kg**	**36**	**mg/Kg**	**7.2**

APPENDIX B

APPENDIX B

GENERAL EARTHWORK /PAVEMENT SPECIFICATIONS

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

1.0 SCOPE OF WORK: These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including, but not limited to, the furnishing of all labor, tools and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans and disposal of excess materials.

2.0 PERFORMANCE: The Contractor shall be responsible for the satisfactory completion of all earthworks in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of SALEM Engineering Group, Incorporated, hereinafter referred to as the Soils Engineer and/or Testing Agency. Attainment of design grades, when achieved, shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary adjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

3.0 TECHNICAL REQUIREMENTS: All compacted materials shall be densified to no less that 95 percent of relative compaction based on ASTM D1557 Test Method-07, UBC or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

4.0 SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Report.

The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Report and the Contractor shall not be relieved of liability under the Contractor for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

5.0 DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work.

Site preparation shall consist of site clearing and grubbing and preparation of foundation materials for receiving fill.

6.0 CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Soils Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill or tree root excavation should not be permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

7.0 SUBGRADE PREPARATION: Surfaces to receive Engineered Fill, building or slab loads, shall be prepared as outlined above, scarified to a minimum of 8 inches, moisture-conditioned as necessary, and recompacted to 95 percent relative compaction.

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and recompacted to 95 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any of the fill material.

8.0 EXCAVATION: All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

9.0 FILL AND BACKFILL MATERIAL: No material shall be moved or compacted without the presence of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills, provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

10.0 PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer. Both cut and fill shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

11.0 SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing, or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill is as specified.

12.0 DEFINITIONS - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term “Standard Specifications”: hereinafter referred to is the January 1991 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

13.0 SCOPE OF WORK - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically notes as "Work Not Included."

14.0 PREPARATION OF THE SUBGRADE - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

15.0 UNTREATED AGGREGATE BASE - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class II material, 1½ inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent. The aggregate base material shall be spread and compacted in accordance with Section 26 of the Standard Specifications. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

16.0 AGGREGATE SUBBASE - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class II material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent, and it shall be spread and compacted in accordance with Section 25 of the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

17.0 ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be AR-4000. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a combination steel-wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

18.0 FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.