BANCROFT MIDDLE SCHOOL

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GEOTECHNICAL INVESTIGATION REPORT
PROPOSED TRACK AND FIELD IMPROVEMENTS
BANCROFT MIDDLE SCHOOL
SAN LEANDRO, CALIFORNIA

March 13, 2007

File No.: 80716/RPT

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Mr. Mark Goralka, P.E.
Engineering and Transportation Department
City of San Leandro
835 East 14th Street
San Leandro, CA 94577

SUBJECT: Geotechnical Investigation Report for the Proposed Track and Field Improvements at Bancroft Middle School in San Leandro, California

Dear Mr. Goralka:

We are pleased to submit two copies of our geotechnical investigation report for the proposed track and field improvements at Bancroft Middle School. We transmitted 2 additional copies of this report to the project architect, Harris Design. In general, the project will consist of improving the track and field areas and basketball court areas, as well as constructing a new fence along the east side of the campus. A synthetic turf field is planned.

Based on our investigation data and analyses, we believe the proposed improvements may be constructed as proposed, provided the recommendations presented in this report are incorporated into the design and followed during construction.

This report contains a description of our subsurface investigation, geotechnical conclusions and recommendations for design and construction of the pavements for the basketball courts, foundations for the new fence, and earthwork for this project. The conclusions and recommendations presented are based on limited subsurface exploration and laboratory testing programs. Consequently, variations between anticipated and actual subsurface conditions may be found at localized areas during construction. If significant variations in the subsurface conditions are encountered during construction, Kleinfelder should review the recommendations presented herein and provide supplemental recommendations. You have informed us that the nature of this project does not require a geological and seismic hazards evaluation in accordance with California Geological Survey Note 48.

KLEINFELDER 7133 Koll Center Parkway, Suite 100, Pleasanton, CA 94566-3101 (925) 484-1700 (925) 484-5838 fax

We appreciate the opportunity to provide our services to you on this project, and we trust this report satisfies your needs at this time. We look forward to providing additional services for your future projects. If you have any questions concerning the information presented in this report, or related project matters, please contact us at (925) 484-1700.

Sincerely,

KLEINFELDER, INC.

For

Carrie L. Foulk, CE #62240
Project Manager

Donald G. Gray, GE #351
GeoSciences Group Manager

REGISTERED PROFESSIONAL ENGINEER
DONALD G. GRAY
No. 351
Exp. 12/31/07
GEOTECHNICAL
STATE OF CALIFORNIA

CLF/DGG/jmk

cc: Bill Harris – Harris Design

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

GEOTECHNICAL INVESTIGATION REPORT
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BANCROFT MIDDLE SCHOOL
SAN LEANDRO, CALIFORNIA

TABLE OF CONTENTS

Section **Page**

GEOTECHNICAL INVESTIGATION REPORT
PROPOSED TRACK AND FIELD IMPROVEMENTS
BANCROFT MIDDLE SCHOOL
SAN LEANDRO, CALIFORNIA

TABLE OF CONTENTS

PLATES AND APPENDICES

GEOTECHNICAL INVESTIGATION REPORT
PROPOSED TRACK AND FIELD IMPROVEMENTS
BANCROFT MIDDLE SCHOOL
SAN LEANDRO, CALIFORNIA

1 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed track and field improvements at Bancroft Middle School. The school is located at 1150 Bancroft Avenue in San Leandro, California. Our investigation has been performed for the City of San Leandro (City) and was coordinated with Mr. Mark Goralka with the City.

1.1 Project Description

The Site Plan, Plate 1, shows the proposed track and field improvements based on a site plan for the project by Harris Design, dated September 2006. The project will include construction of the following:

- A new synthetic turf field approximately within the limits of the existing field.
- A new synthetic 3-lane running track surrounding the new turf area and along the east side of the site.
- New asphalt paved basketball courts approximately within the limits of the existing basketball courts.
- A new 20-foot high fence along the eastern margin of the site.
- A new service road along the east side of the site between the track and new fence.

We anticipate that the turf will be underlain by drain rock layers over a prepared subgrade that is sloped to drain, and that prefabricated drainage panels will be placed over the subgrade. Grading plans are not yet available. We anticipate that grading will consist mostly of cuts and fills up to about two feet to facilitate surface drainage and to prepare the subgrade for the synthetic turf field.

1.2 Purpose and Scope of Services

The purpose of our study is to provide geotechnical recommendations for the project. Our scope of work includes:

- Investigate subsurface conditions by drilling nine borings,
- Perform laboratory testing and engineering analyses,
- Develop geotechnical recommendations for grading and foundations, and
- Present the results of our investigation and our geotechnical recommendations in this report.

The scope of our services was presented in our revised proposal dated January 9, 2007 (File No. 01003PROP). Our scope of services specifically excludes design of the field drainage, track surfacing or the synthetic turf.

2 SITE DESCRIPTION AND EXISTING SURFACE CONDITIONS

The existing and proposed improvements are shown on the Site Plan, Plate 1. The track and field are located at the north end of the middle school campus with the basketball courts to the north and west of the field. There is an asphalt paved strip along the east side of the field that appears to be used as a running track. The basketball courts are currently asphalt paved. The asphalt is in fair condition with block and transverse cracking throughout. The campus is bounded by the heavily vegetated San Leandro Creek on the northwest; Bancroft Avenue on the west; residential housing on the east; and Estudillo Avenue on the south. The topography of the campus is relatively flat throughout, at an approximate elevation of 69 feet above mean sea level, with gentle slopes along San Leandro Creek.

3 FIELD EXPLORATION

The field exploration consisted of drilling nine borings designated B-1 through B-9. The approximate locations of these borings are shown on the Site Plan, Plate 1. Shallow borings (about 5 feet deep) were located in the grass field and basketball courts to help evaluate grading conditions. Deeper borings (about 12 feet deep) were drilled along the existing track near the new fence area.

Prior to the start of the subsurface investigation, Underground Services Alert (USA) was contacted to locate utilities. We also hired an underground utility locator to check the boring locations for underground utilities. A drilling permit was also obtained from Alameda County Public Works Agency.

The borings were drilled to depths of about 5 to 12 feet using a truck-mounted drill rig equipped with hollow-stem augers. During drilling, our field geologist observed the work and selected depths for sampling. Logs of the borings are presented in Appendix B. A legend for the boring logs is presented on Plate B-1.

Relatively undisturbed samples were taken at the direction of the field geologist during drilling. The samples of the subsurface materials were obtained using a California sampler with a 2.5-inch inside diameter and a 3-inch outside diameter. The California sampler was driven 18 inches using a 140-pound hammer falling 30 inches, and blow counts for successive 6-inch penetration intervals were recorded. The blow counts corresponding to the last 12 inches of penetration were reported on the boring logs. After the sampler was withdrawn from the boreholes, the samples were removed, sealed to reduce moisture loss, labeled, and returned to our laboratory.

Soil classifications made in the field from auger cuttings and samples, were re-evaluated in the laboratory after further examination and testing. The soils were classified in general accordance with the Unified Soil Classification System presented on Plate B-1, Boring Log Legend. Sample classifications, blow counts recorded during sampling, and other related information was recorded on the soil boring logs. The boring logs for borings B-1 through B-9 are presented on Plates B-2 through B-10 in Appendix B.

The locations of the borings were estimated by our engineer based on rough measurements from the limits of existing landmarks. The elevations of the borings were estimated based on the USGS quad sheet for the area. As such, the locations and elevations of the borings should be considered approximate. Upon completion, the borings were backfilled with soil cuttings (borings under 5 feet deep) or grout (borings greater than 5 feet deep). Where borings were located in paved areas, the holes were capped with a cold asphalt patch.

4 LABORATORY TESTING

Laboratory tests were performed on selected soil samples to evaluate engineering properties. The testing program included Atterberg limits, moisture content, dry density, unconfined compression, sieve analysis, Resistance (R)-Value and corrosivity tests. Most of the results of the tests performed in our laboratory are presented on the boring logs. Graphic presentation of the Atterberg limits, compression tests, and R-Value are presented on Plates C-1 through C-4 in Appendix C.

CERCO Analytical performed a chemical analysis on samples of the upper soils from boring B-1 to evaluate the corrosive potential of the near-surface soil. The results of the chemical testing (utilizing ASTM Methods) are presented in Appendix D.

5 SUBSURFACE CONDITIONS

The borings drilled within the existing basketball courts encountered 2 to 4 inches of asphaltic concrete (AC) over 4 inches of aggregate base (AB) at the surface. The borings drilled around the perimeter of the field encountered about 6 inches of silty sand fill at the surface. The borings drilled in the middle of the existing field encountered about 1 to 2 feet of clay or gravelly fill over about 2 feet of native clay. The upper approximately one foot of the clay below the fill had been lime-treated in borings B-4 and B-5. Underlying these surface materials in all of the borings, we encountered medium stiff to hard clayey silt and silty clay to the depths explored of 5 to 12 feet. One exception is boring B-7, which encountered loose silty sand at about 8 feet below existing ground surface. Laboratory tests indicate the silty clays near the surface are low plasticity. No free groundwater was encountered to the maximum depths explored of 12 feet.

We understand that the east side of the existing turf area was formerly occupied by portable classrooms, which were removed about two years ago so the grass field could be reconstructed. The classrooms were apparently placed on an aggregate base (AB) surface overlying the native site soils. In boring B-4 we encountered what appears to be AB below the existing grass. We suspect the upper portion of the former field area was lime-treated to stabilize it and support the AB and classrooms. We do not have details of the construction for the classrooms or re-establishment of the current grass area and we do not know the limits of the lime treatment.

The above is a general description of soil and groundwater conditions encountered at the site in the borings drilled for this investigation. A more detailed description of the encountered soil and groundwater conditions is presented on the Log of the Boring, Plates B-2 through B-10 in Appendix B. Soil and groundwater conditions can deviate from those conditions encountered at the boring locations. If significant variations in the subsurface conditions are encountered during construction, it may be necessary for Kleinfelder to review the recommendations presented herein, and recommend adjustments as necessary.

6 DISCUSSION & CONCLUSIONS

6.1 General

Based on our review of the subsurface information and our engineering analyses, we believe the proposed track and field improvements project may be constructed as proposed, provided the recommendations provided in this report are incorporated in design and followed during construction.

6.2 Foundations

Based on the results or our investigation and our engineering analyses, we conclude that the fence posts for the proposed 20-foot high fence may be supported on drilled piers to help resist wind loads. We do not anticipate significant settlement of the fence posts provided the recommendations contained in the Recommendations section of this report are incorporated in design and followed during construction.

6.3 Synthetic Turf

It is our understanding that a design/build synthetic turf contractor will prepare the underdrainage design for the synthetic turf. Maintaining positive surface drainage for the subgrade below the synthetic turf is important. Low spots could lead to ponding of water on the subgrade, thereby creating soft and unstable areas. In addition, ponding could lead to poor drainage performance of the turf surface after construction.

Our borings indicate the site soils may have a low permeability based on their high clay content. Infiltration of surface water is expected to be slow, especially in the winter months. Drainage of the natural or synthetic turf fields should not rely on significant infiltration of rainwater. Drainage should be provided by sloping subgrades or subdrains. While our scope of services does not include design recommendations for the synthetic turf and its drainage system, we have been involved in construction observations, testing and forensic evaluations of several of these systems. As a result of our experience, the importance of installing an adequate number of collector drains under the field cannot be overemphasized.

6.4 Geologic and Seismic Hazards

While our scope does not include a full hazard assessment, we have concluded that the primary geologic and seismic concern is the potential for strong ground shaking from earthquakes, which is typical of the entire San Francisco Bay Area.

The site is not located within an Alquist-Priolo Earthquake Fault Zone, and no mapped active fault traces are known to transverse the project site. Therefore, the risk of ground rupture from an earthquake event occurring at the site is considered to be low. However, we anticipate that the site will be subjected to strong shaking from an earthquake that occurs on one of the active or potentially active faults in the area. The proposed fence should be designed to resist earthquake shaking. California Building Code (Reference 1) seismic parameters are presented in the Recommendations section of this report.

The site is within a State of California Seismic Hazards Zone for liquefaction. Liquefaction is a condition where saturated, granular soils undergo a substantial loss of strength and deformation due to pore pressure increase, resulting from cyclic stress application induced by earthquakes. In the process, the soil acquires a mobility sufficient to permit both horizontal and vertical movements, if the soil is not confined. Soils most susceptible to liquefaction are loose, clean, uniformly graded, silt and fine sand deposits. Considering that the site soils consist primarily of clays, and free water was not encountered within the borings, the potential for significant distress due to liquefaction within the maximum depths explored (12 feet), is considered to be low.

6.5 Grading

Based on our experience in the area, grading during the rainy season may be difficult due to the clayey and silty soils at the site. If earthwork operations and construction for this project are scheduled to be performed during the rainy season or in areas containing saturated soils, provisions may be required for drying of soil or providing admixtures to the soil prior to compaction. If desired, we can provide recommendations for wet weather earthwork and alternatives for drying the soil prior to compaction. Conversely, additional moisture may be required during dry months. Water trucks should be made available in sufficient numbers to provided adequate water during earthwork operations. Portions of the existing grass field were soft and wet during our field investigation and one of the borings planned for the turf area (B-3) had to be relocated next to a paved area. The presence of the lime-treated soils in the other two grass area boring suggests that soft or wet soils needed to be stabilized for the former classrooms.

6.6 Soil Corrosivity

Near-surface samples retrieved from boring B-1 , which is representative of soil that would be in contact with concrete and underground utilities, was tested for Redox, pH, resistivity, chloride, and sulfate in accordance with ASTM test methods. Our subcontractor, CERCO Analytical of Pleasanton, California, performed these tests, and classified the soil based on their test results as "moderately corrosive". The results of the tests, and CERCO's evaluation are presented in Appendix D. A corrosion expert should perform a more detailed investigation, if desired.

7 RECOMMENDATIONS

Our geotechnical recommendations for the project are presented in the following sections:

7.1 Foundations

7.1.1 Drilled Piers

Drilled piers should be used for support of the fence posts. The piers should derive their capacities through skin friction along the sides of the piers. The piers can be designed using an allowable skin friction of 400 psf, which includes a factor of safety (FS) of at least 2. This value may be increased by one-third when designing for wind and/or seismic loading. Friction support in the top foot from the ground surface should be neglected unless the surrounding surface is confined by paving. The piers should have a minimum depth of 5 feet and should have a minimum diameter of 16 inches if reinforcing cages are used, or 12 inches if no cages are used. The piers should not be placed closer than three diameters, center-to-center. For resistance to uplift loads, the weight of the drilled pier and the skin friction between the piers and soil may be used. Allowable skin friction values to resist uplift may be considered as 200 psf. A one-third increase is permitted for wind and/or seismic loading. The allowable uplift should not exceed the weight of an inverted 30° cone of soil, weighing 110 pounds per cubic foot (pcf), from the base of the pier.

Resistance to lateral loads can be provided by passive resistance against the drilled piers using an allowable equivalent fluid pressure of 300 pcf acting against the piers, which includes an FS of about 1½. The passive resistance may be applied to a width of two times the diameter of the drilled piers provided the piers are spaced at least six pier diameters, center to center.

We recommend steel reinforcement and concrete be placed within about 4 to 6 hours upon completion of each drilled pier hole; as a minimum, the holes should be poured the same day they are drilled. The steel reinforcement should be centered in the drilled hole. Concrete used for pier construction should be discharged vertically into the holes to reduce aggregate segregation. Under no circumstances should concrete be allowed to free-fall against either the steel reinforcement or the sides of the excavation during construction. Although free groundwater was not encountered during our investigation, water may still be encountered within the drilled pier holes, depending on seasonal or irrigation conditions. If water more than 6 inches deep is present during concrete placement, either the water needs to be pumped out or the concrete placed into the hole using tremie methods. If tremie methods are used, the end of the tremie pipe must remain below the surface of the in-place concrete at all times. In order to develop the design skin friction value previously provided, concrete used for pier construction should have a slump of at least 6 to 8 inches. Casing is not anticipated at most locations due to the nature of the soils; however, casing should be available on site. Sandy soils were encountered in one of the three borings drilled along the proposed fence area. Our borings indicate that the drilled piers can be drilled with a flight auger drill rig, subject to access restrictions.

The bottom of the drilled holes should be cleaned such that no more than 2 inches of loose soil remains in the hole prior to placement of concrete. A representative from Kleinfelder should be present to observe drilled holes to confirm bottom conditions prior to placing steel reinforcement or pouring concrete.

7.1.2 Near-Source Factors

Based on our borings, we classify the site as a stiff soil site or Soil Profile Type S_D, as presented in Table 16A-J of the 2001 CBC. Soil Profile Type S_D is defined as a stiff soil profile with shear wave velocities between 180 m/s (600 feet/sec) and 360 m/s (1,200 feet/sec), SPT-N = 15 - 50 blows/foot, or S_u = 50 - 100 kPa (1,000 - 2,000 psf) for the upper 30 meters (100 feet).

For a code equivalent lateral force design, we recommend using the procedures provided in the 2001 CBC. The near-source factors N_a and N_v in the code are incorporated into the seismic coefficients C_a and C_v, which are both used to estimate the total design lateral force or shear at the base of the structure. The values of these factors depend on the distance of the structure from the fault and the fault type. The near-source factors for each structure can be obtained from Tables 16A-S through 16A-U of the 2001 CBC. The seismic coefficients C_a and C_v can be obtained from Tables 16A-Q and 16A-R of the 2001 CBC, respectively.

For this site, the Hayward fault should be considered as the source for the near-fault motions, since it is the closest significant fault within 15 km of the site (the distance for near-fault considerations). Based on the information presented in Table 16A-U of the of the 2001 CBC, the Hayward fault can be classified as Seismic Source Type A.

According to Table 3.2-1 and Sheet F-17 of ICBO (Reference 3) the Hayward fault is located about 1.5 kilometers from the site. Based on this information, the near-source factors N_a and N_v are 1.5 and 2.0 respectively.

7.2 Earthwork

A summary of fill compaction recommendations for this project is presented in Exhibit 1 of Appendix A. Laboratory maximum dry density and optimum moisture content relationships should be evaluated based on ASTM Test Designation D 1557 (latest edition). Kleinfelder should observe and perform laboratory and field density tests during grading.

7.2.1 Subgrade Preparation

Subgrade preparation should begin with stripping of vegetation and organic laden topsoil, where these materials exist within areas of improvements. Stripping to a minimum depth of approximately 2 to 3 inches should be adequate in the existing grass and landscape areas. If significant amounts of organics are encountered below this depth, additional stripping may be required. Stripping should extend at least three feet beyond the improvements, where possible. Stripped topsoil may be stockpiled for later use in landscaping areas; however, this material should not be reused for engineered fill.

Following stripping and demolition, areas of the site to receive fill should be scarified to a minimum depth of 12 inches, moisture-conditioned, and recompacted as indicated in Appendix A. Scarification should extend laterally a minimum of three feet beyond improvements, where possible. Any loose or soft soil encountered during scarification should be removed and replaced with engineered fill, as determined by our field representative.

Existing soil exposed during grading should be kept near optimum moisture content until it is covered. Re-grading or overexcavation and replacement of soil that is allowed to dry and desiccate may be required. Moisture conditioning of subgrades beneath fill and improvements should be performed in-accordance with Appendix A.

7.2.2 Fill Material

Except for organic laden soil, the on-site soil is suitable for use as general engineered fill if it is free of deleterious matter. Maximum particle size for fill material should be limited to 3 inches, with at least 90 percent by weight passing the 1-inch sieve. Where imported fill is required, it should conform to the same gradation requirements and the following material properties:

Plasticity Index	15 or less
Liquid Limit	30 or less
Percent Soil Passing #200 Sieve	8% to 40%

Highly pervious materials such as pea gravel or clean sands are not recommended because they permit transmission of water to the underlying soils.

7.2.3 Excavation and Backfill

We anticipate that excavations for utility trenches or other excavations can be made with either a backhoe or trencher. We expect the walls of trenches less than 5 feet deep to stand near vertical without support except if clean sand is encountered.

Where trenches or other excavations are extended deeper than 5 feet, the excavation may become unstable and should be evaluated to monitor stability prior to personnel entering the trenches. Shoring or sloping of any deep trench wall may be necessary to protect personnel and to provide stability. All trenches should conform to the current OSHA requirements for work safety. Excavations should be located so that no structures, foundations, or slabs are located above a plane projected 26 degrees upward from any point in an excavation, regardless of whether it is shored or unshored.

Backfills for trenches or other small excavations beneath improvements should be compacted as noted in Appendix A. Special care should be taken in the control of utility trench backfilling under pavement areas. Poor compaction may cause excessive settlements resulting in damage to overlying improvements. Utility trenches located in landscaped areas should also be capped with a minimum of 12 inches compacted on-site clayey soils.

7.3 Basketball Court Pavement

Pavements for this project will consist of new asphalt paved basketball courts approximately within the limits of the existing basketball courts and a service road along the east side of the new track. We have made our pavement design assuming the pavement subgrade soil will be similar to the near surface soils described in the boring logs. This assumption is based on our understanding that grading and soil removal in the paved areas will be minimal. If site grading exposes soil other than that assumed, or if import fill is used to construct pavement subgrades, we should perform additional tests to confirm or revise the recommended pavement section for actual field conditions.

A representative bulk sample of the near surface soil was obtained by compositing the soils within the upper two feet of the borings, except for the lime treated soils in B-4 and B-5. The sample was tested to assess the Resistance (R) value of the soils for use in the design of flexible pavements. The results of the test indicated an R-value of 10 (see Plate C-4).

We recommend using 2 inches of asphaltic concrete (AC) over 4 inches of aggregate base (AB) over prepared subgrade for the basketball court pavement section. This is approximately the same as the existing pavement section encountered in our borings. In areas where the new court is within the boundaries of the existing court, and the existing pavement is free of alligator cracking or other signs of significant distress, the existing pavement section could be left in place. An alternative to reconstructing the courts would be to apply a slurry seal surface treatment. This will improve the appearance of the surface for a while, but cracks in the current paving will ultimately "reflect" through the slurry seal. Another alternative would be to overlay the existing surface with at least 1½ inches of asphalt. Use of a paving fabric between the old surface and new overlay should significantly reduce reflection cracking.

The new service road should be designed for a section of at least 2 inches of AC over 8 inches of AB. This is based on a Traffic Index of 4.0 which is for automobiles and pickups and only occasional heavier trucks. This section is not adequate for routine truck traffic such as delivery and garbage vehicles.

In areas where the existing pavement section needs replacing, we recommend that the subgrade soil over which the pavement section is to be placed be moisture conditioned and compacted according to the recommendations in Appendix A. Court areas should be sloped and drainage gradients maintained to carry all surface water off the site. Surface water ponding should not be allowed anywhere on the site during or after construction.

In addition, we recommend that all pavements conform to the following criteria:

- All trench backfills, including utility and sprinkler lines, should be properly placed and adequately compacted to provide a stable subgrade.
- An adequate drainage system should be provided to prevent surface water or subsurface seepage from saturating the subgrade soil.

The aggregate base and asphalt concrete materials should conform to ASTM test procedures and work should be performed in accordance with Caltrans Standard Specifications, latest edition. Existing asphalt concrete may be pulverized and mixed with the underlying base for use as Class 2 AB provided it meets the gradation requirements in the Caltrans Standard Specifications for Class 2 AB.

Subgrade soils beneath paved areas tend to be wet and may require additional time to dry. Therefore, time should be factored into the construction schedule to allow for drying of the subgrade soils once the AC is removed.

8 ADDITIONAL SERVICES AND LIMITATIONS

8.1 Additional Services

The review of plans and specifications, and field observation and testing during construction by Kleinfelder are an integral part of the conclusions and recommendations made in this report. If Kleinfelder is not retained for these services, the client will be assuming Kleinfelder's responsibility for any potential claims that may arise during or after construction due to the misinterpretation of the recommendations presented herein. The recommended tests, observations, and consultation by Kleinfelder during construction include, but are not limited to:

- Review of plans and specifications,
- Observations of site grading, including stripping and engineered fill construction,
- Observation of foundation construction, and
- Field density testing of fills, backfill, and finished subgrades.

8.2 Limitations

The services provided under this contract as described in this report include professional opinions and judgments based on the data collected. These services have been performed according to generally accepted geotechnical engineering practices that exist in the San Francisco Bay Area at the time the report was written. No warranty is expressed or implied. This report is issued with the understanding that the owner chooses the risk he wishes to bear by the expenditures involved with the construction alternatives and scheduling that is chosen.

The conclusions and recommendations of this report are for the proposed Track and Field Improvements at Bancroft Middle School in San Leandro, California. The conclusions and recommendations in this report are invalid if:

- The proposed construction, as described, changes,
- The report is used for adjacent or other property,
- The Additional Services section of this report is not followed,
- Changes in grades occur between the issuance of this report and construction, or
- Any other change is implemented which materially alters the project from that proposed at the time this report was prepared.

The conclusions and recommendations presented in this report are based on information obtained from the following:

- 9 borings performed for this investigation,
- The observations of our field engineer at the site during our field investigation, and
- The results of laboratory tests.

The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by our firm during the construction phase to evaluate compliance with our recommendations. If we are not retained for these services, Kleinfelder cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of Kleinfelder's report by others. Furthermore, Kleinfelder will cease to be the Geotechnical-Engineer-of-Record at the time another consultant is retained for follow-up service to this report.

The boring logs do not provide a warranty as to the conditions that may exist at the entire site. The extent and nature of subsurface soil and groundwater variations may not become evident until construction begins. It is possible that variations in soil conditions between borings could exist between or beyond the points of exploration or that groundwater elevations may change, both of which may require additional studies, consultation, and possible design revisions. If conditions are encountered in the field during construction, which differ from those described in this report, our firm should be contacted immediately to provide any necessary revisions to these recommendations.

It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety, including the Additional Services and Limitations sections.

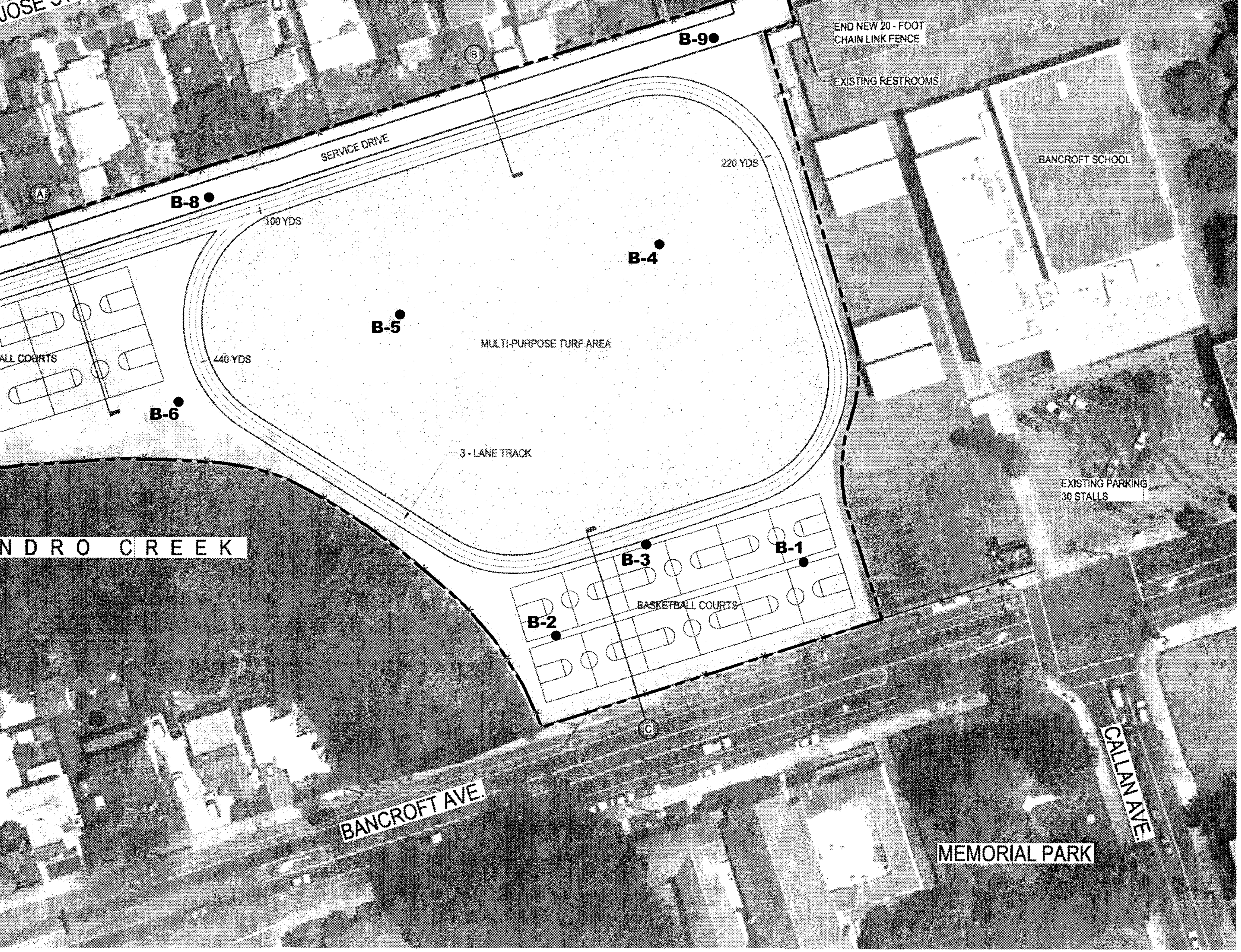
This report may be used only by the client and only for the purposes stated within a reasonable time from its issuance, but in no event later than three years from the date of the report. Land or facility use, on and off-site conditions, regulations, or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non- compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and client agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

9 REFERENCES

1. California Building Code (2001), California Building Standards Commission.

2. California Building Standards Commission (1998), California Code of Regulations, Title 24, California Building Standards Code.

3. International Conference of Building Officials (ICBO) (1998), Maps of Known Active Fault Near-Source Zones in California and Adjacent Portion of Nevada – To be used with the 1997 Uniform Building Code, prepared by the California Department of Conservation, Division of Mines and Geology in cooperation with Structural Engineers Association of California – Seismology Committee, February.



DRAWN BY: J. Sala	SITE PLAN	KLEINFELDER	PLATE

EXHIBIT 1
SUMMARY OF COMPACTION RECOMMENDATIONS

Area	Compaction Recommendation (1),(3),(4),(5),(6)
General Engineered Fill	Compact to at least 90 percent compaction at near or above optimum moisture content.
Trenches(2)	Compact to at least 90 percent compaction at near or above optimum moisture content.
Pavements	Compact pavement subgrade for track and play courts to at least 90 percent compaction at above optimum moisture content. Compact subgrade for the service road and all aggregate base to at least 95 percent compaction at near optimum moisture content.

Notes:

(1) All compaction requirements refer to relative compaction as a percentage of the laboratory standard described by ASTM D-1557.

(2) In landscaping areas only, this percent compaction in trenches may be reduced to 85 percent.

(3) Depths are below finished subgrade elevation.

(4) Fill material should be compacted in lifts not exceeding 8 inches in loose thickness.

(5) All subgrades should be firm and unyielding.

(6) Fills greater than 7 feet in depth should be compacted to a minimum of 95 percent below 7 feet.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY	GW		Well-graded gravels or gravel with sand, little or no fines.
		GP		Poorly-graded gravels or gravel with sand, little or no fines.
		GM		Silty gravels, silty gravel with sand mixture.
		GC		Clayey gravels, clayey gravel with sand mixture
	SAND AND SANDY	SW		Well-graded sands or gravelly sands, little or no fines.
		SP		Poorly-graded sands or gravelly sands, little or no fines.
		SM		Silty sand.
		SC		Clayey sand.

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS	ML		Inorganic silts and very fine sands, rock flour or clayey silts with slight plasticity.
		CL		Inorganic lean clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
		OL		Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS	MH		Inorganic elastic silts, micaceous or diatomaceous or silty soils.
		CH		Inorganic fat clays (high plasticity).
		OH		Organic clays of medium high to high plasticity.
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils.

Standard Penetration Split Spoon Sampler 2.0 inch O.D., 1.4 inch I.D.

Modified California Sampler 2.5 inch O.D., 2.0 inch I.D.

Bulk Sample

California Sampler, 3.0 inch O.D., 2.5 inch I.D.

Shelby Tube 3.0 inch O.D.

0745, 5/31 — Approximate water level first observed in boring. Time recorded in reference to a 24 hour clock.

0800, 5/31 — Approximate water level observed in boring following drilling

PEN	Pocket Penetrometer reading, in tsf
TV:Su	Torvane shear strength, in ksf

LL	LIQUID LIMIT	TX	TRIAXIAL SHEAR
PI	PLASTICITY INDEX	CONSOL	CONSOLIDATION
%-#200	SIEVE ANALYSIS (#200 SCREEN)	R-Value	RESISTANCE VALUE
DS	DIRECT SHEAR	SE	SAND EQUIVALENT
C	COHESION (PSF)	EI	EXPANSION INDEX
PHI	FRICTION ANGLE	FS	FREE SWELL (U.S.B.R.)

Notes: Blow counts represent the number of blows a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18 inch penetration, unless otherwise noted.

The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

KLEINFELDER

PROJECT NO. **80716**

BORING LOG LEGEND

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE

B-1

2:55:03 PM

Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 5 ft	Notes:	Asphaltic-Concrete pavement

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: **Estimated 68 feet (MSL)**)
								ASPHALT-CONCRETE - 4 inches thick
								AGGREGATE BASE - 4 inches thick
	■	11					2.3	**LEAN CLAY (CL)** - very dark brown, moist, very stiff, low plasticity, silty, trace fine grained sand
5	■	9	95	15.6			1.8	**SILT (ML)** - brown, moist, stiff, trace fine grained sand
								Boring terminated at approximately 5 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
10								
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-1

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE

B-2

Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 5 ft	Notes:	Asphaltic-Concrete pavement

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION — Surface Elevation: **Estimated 68 feet (MSL)**
								ASPHALT-CONCRETE - 2 inches thick
								AGGREGATE BASE - 4 inches thick
	■	12				LL=31; PI=15	1.3	**LEAN CLAY (CL)** - very dark brown, moist, stiff, low plasticity, silty, trace fine grained sand
5	■	6					0.8	**SILT (ML)** - brown, moist, medium stiff, trace fine grained sand
								Boring terminated at approximately 5 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
10								
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-2

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-3**

Date Completed:	**2/19/07**	*Drilling method:*	**8" Hollow Stem Auger**
Logged By:	**O. Khan**	*Hammer Wt:*	**140 lbs., 30" drop**
Total Depth:	**Approximately 5 ft**	*Notes:*	**Grass Field**

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION *Surface Elevation:* **Estimated 68 feet (MSL)**
								SILTY SAND (SM) - brown, moist, loose (FILL)
	■	8	83	20.9			0.8	**LEAN CLAY (CL)** - very dark brown, moist, medium stiff, low plasticity, with rootlets, silty, trace fine grained sand
5	■	7					0.8	**SILT (ML)** - brown, moist, medium stiff, trace fine grained sand
								Boring terminated at approximately 5 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
10								
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-3

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE

B-4

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Date Completed:	2/19/07	*Drilling method:*	8" Hollow Stem Auger
Logged By:	O. Khan	*Hammer Wt:*	140 lbs., 30" drop
Total Depth:	Approximately 5 ft	*Notes:*	Grass Field

Surface Elevation: **Estimated 68 feet (MSL)**

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								SILTY CLAY (CL) - dark brown, moist, low plasticity
								CLAYEY GRAVELS (GC) - dark brown, moist, dense, coarse gravel (FILL)
	■	43					>4.0	**LEAN CLAY (CL)** - very dark brown, moist, hard, low plasticity, silty, trace fine grained sand, lime treated
							1.5	
								SILT (ML) - brown, moist, stiff to very stiff
5	■	11				LL=25; PI=4	1.9	- sandy
								Boring terminated at approximately 5 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
10								
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-4

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-5**

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Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 5 ft	Notes:	Grass Field

	FIELD		LABORATORY					DESCRIPTION
Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	Surface Elevation: **Estimated 68 feet (MSL)**
								SILTY CLAY (CL) - dark brown, moist, low plasticity with rootlets
	■	31					>4.0	**LEAN CLAY (CL)** - very dark brown, dry, hard, silty, trace fine grained sand, lime treated
5	■	7					1.5	**SILT with CLAY (CL)** - brown, moist, stiff, low plasticity, trace fine grained sand
								Boring terminated at approximately 5 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
10								
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-5

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-6**

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Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 5 ft	Notes:	Asphaltic-Concrete pavement

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: **Estimated 68 feet (MSL)**)
								ASPHALT-CONCRETE - 2 inches thick
								AGGREGATE BASE - 4 inches thick
							1.5	**LEAN CLAY (CL)** - very dark brown, moist, stiff, low plasticity, silty, trace fine grained sand
		16					>4.0	**SILT (ML)** - brown, dry, hard, trace fine grained sand
							4.0	- hard
5		12	93	13.2				
								Boring terminated at approximately 5 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
10								
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-6

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-7**

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Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 12 ft	Notes:	Grass Field

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION Surface Elevation: **Estimated 68 feet (MSL)**
								SILTY SAND (SM) - gray-brown, loose (FILL)
								LEAN CLAY (CL) - very dark brown, moist, stiff, low plasticity, silty, trace fine grained sand
	■	8					1.5	
								LEAN CLAY (CL) - brown, moist - medium stiff, trace fine grained sand
						LL=28; PI=9	0.8	
5	■	7	90	32.1	0.6 @ 3.5%			
								SILTY SAND (SM) - brown, moist, loose, fine to medium grained sand with some gravel
10								
	■	14				Passing -#200=9%		
								Boring terminated at approximately 12 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-7

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-8**

Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 12 ft	Notes:	Grass Field

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION (Surface Elevation: **Estimated 68 feet (MSL)**)
								SILTY SAND (SM) - gray-brown, loose (FILL)
								LEAN CLAY (CL) - very dark brown, moist, hard, low plasticity
		33	117	7.3	2.6 @ 4.5%		>4.0	
							2.5	**SILT (ML)** - brown, slightly moist, very stiff, trace fine grained sand
5		14						
10							>4.0	- hard
		36	94	13.0				
								SILTY CLAY (CL) - dark brown, moist, hard, low plasticity
								Boring terminated at approximately 12 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
15								
20								

KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-8

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-9**

Date Completed:	2/19/07	Drilling method:	8" Hollow Stem Auger
Logged By:	O. Khan	Hammer Wt:	140 lbs., 30" drop
Total Depth:	Approximately 12 ft	Notes:	Grass Field

Surface Elevation: Estimated 68 feet (MSL)

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								SILT (ML) - very dark brown, moist, hard, low plasticity, with clay, with trace of gravel
	■	17					>4.0	
5	■	11	98	15.3			3.8	- very stiff
10	■	24					2.8	
								Boring terminated at approximately 12 feet. Boring backfilled with soil cuttings. Capped with cold patch. No free flowing water encountered.
15								
20								

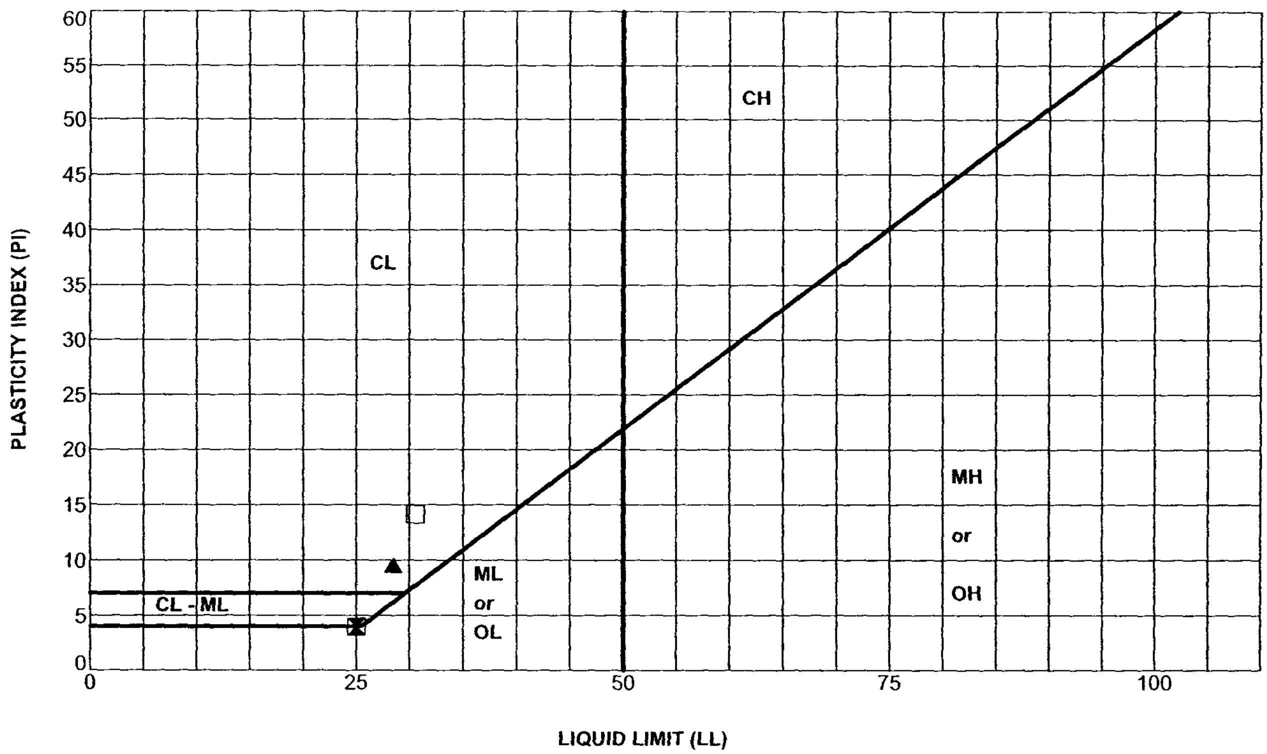
KLEINFELDER

PROJECT NO. 80716

LOG OF BORING NO. B-9

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE **B-10**



SYMBOL	BORING	DEPTH, ft	LL	PL	PI	SAMPLE DESCRIPTION
□	B-2	2.0	31	16	15	Dark Brown Lean Clay (CL)
⊠	B-4	4.5	25	21	4	Brown Sandy Silt (ML)
▲	B-7	4.0	28	19	9	Brown Lean Clay (CL)

Unified Soil Classification

Fine Grained Soil Groups

Symbol	LL < 50	Symbol	LL > 50
ML	Inorganic clayey silts to very fine sands of slight plasticity	MH	Inorganic silts and clayey silts of high plasticity
CL	Inorganic clays of low to medium plasticity	CH	Inorganic clays of high plasticity
OL	Organic silts and organic silty clays of low plasticity	OH	Organic clays of medium to high plasticity, organic silts

*PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318 (DRY PREP)

KLEINFELDER

PROJECT NO. 80716

ATTERBERG LIMITS*

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE

C-1

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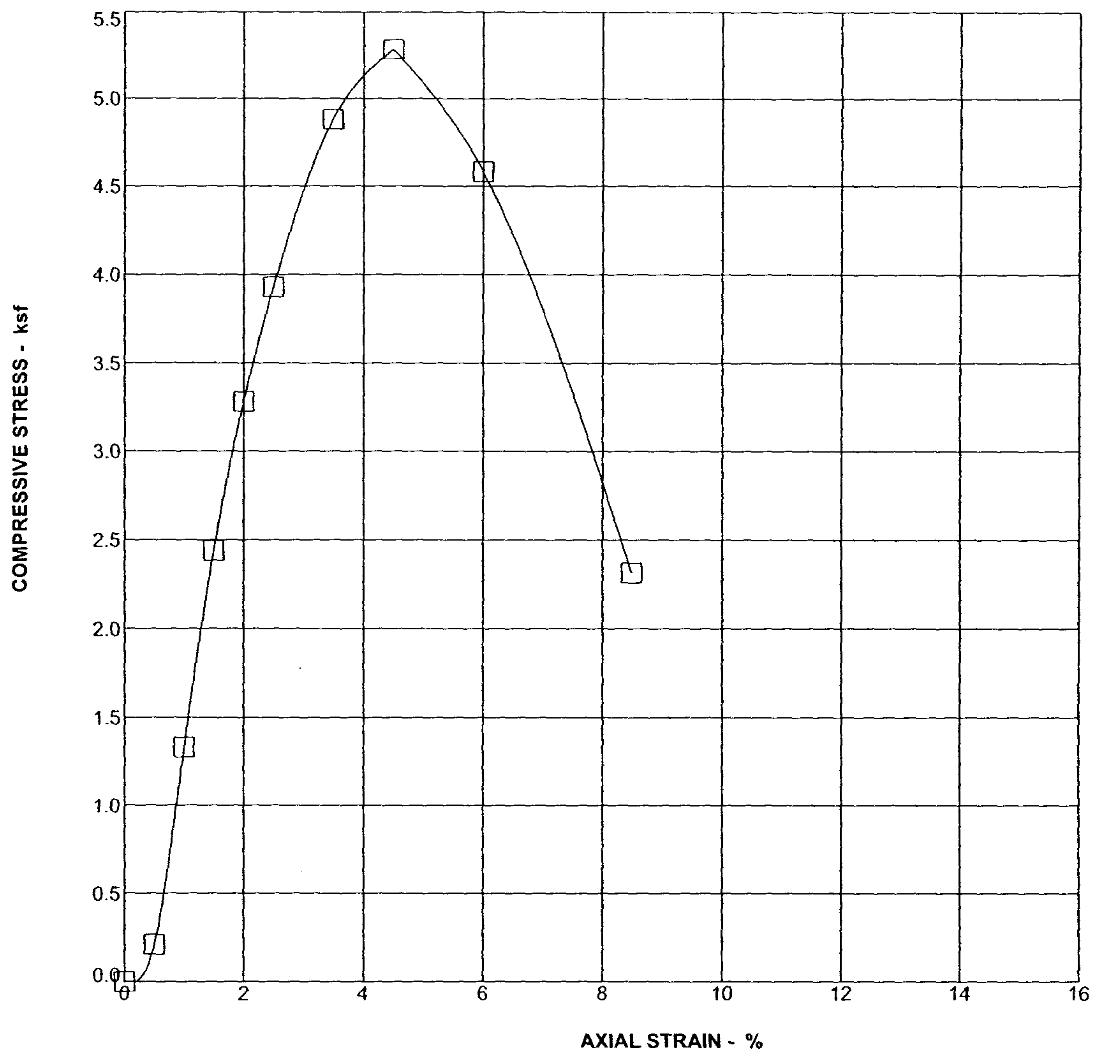

BORING NO.	B-8	**DRY DENSITY - pcf**	117
DEPTH - ft	2	**WATER CONTENT - %**	7.3

SAMPLE DESCRIPTION Very Dark Brown Lean Clay (CL)

MAXIMUM COMPRESSIVE STRESS= 5.28 ksf at 4.5 % STRAIN

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*PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2166

KLEINFELDER

UNCONFINED COMPRESSION*

PLATE

C-2

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PROJECT NO. 80716

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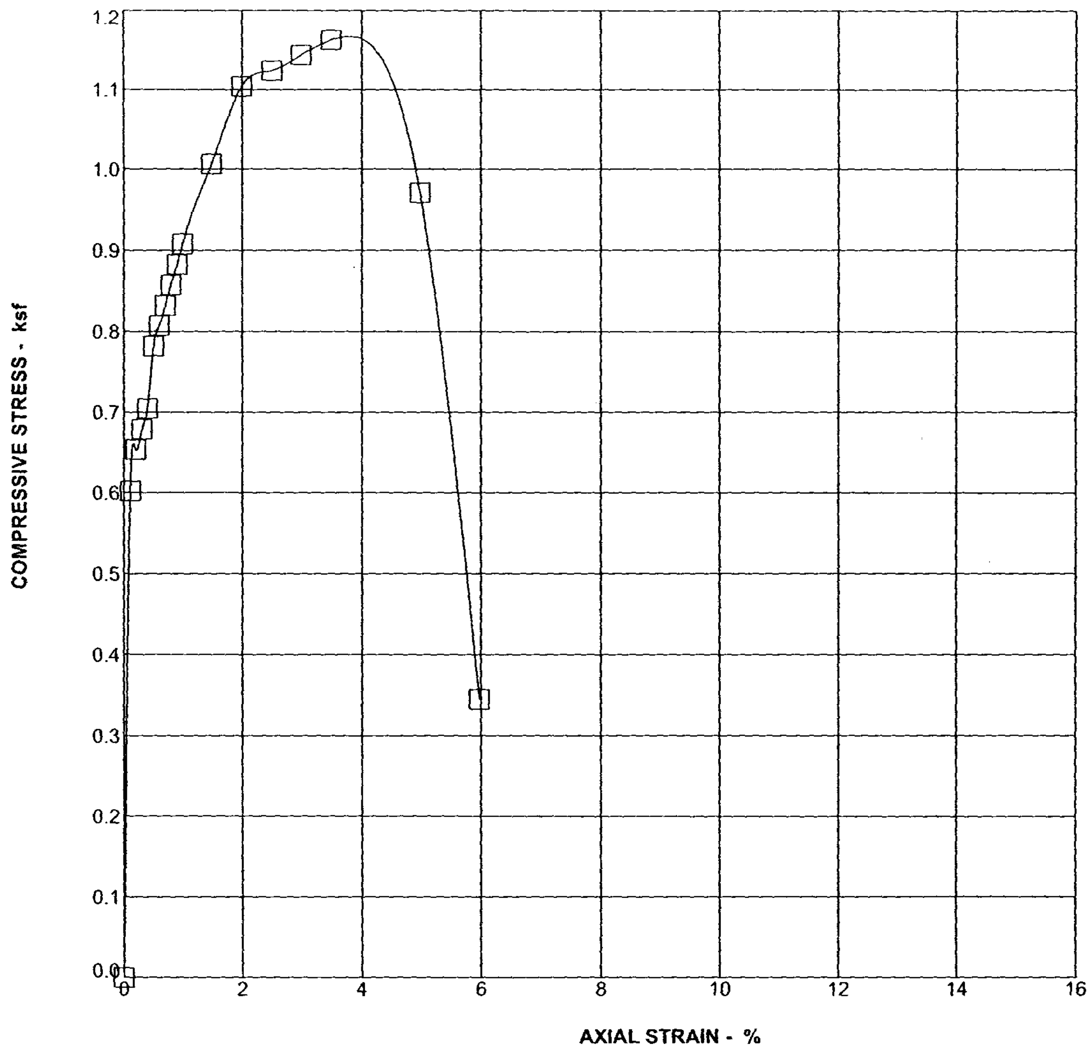

BORING NO.	B-7	**DRY DENSITY - pcf**	90
DEPTH - ft	4.5	**WATER CONTENT - %**	32.1

SAMPLE DESCRIPTION Brown Lean Clay (CL)

MAXIMUM COMPRESSIVE STRESS= 1.16 ksf at 3.5 % STRAIN

*PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2166

KLEINFELDER

PROJECT NO. *80716*

UNCONFINED COMPRESSION*

BANCROFT MIDDLE SCHOOL FIELDS
150 BANCROFT AVENUE
SAN LEANDRO, CALIFORNIA

PLATE

C-3

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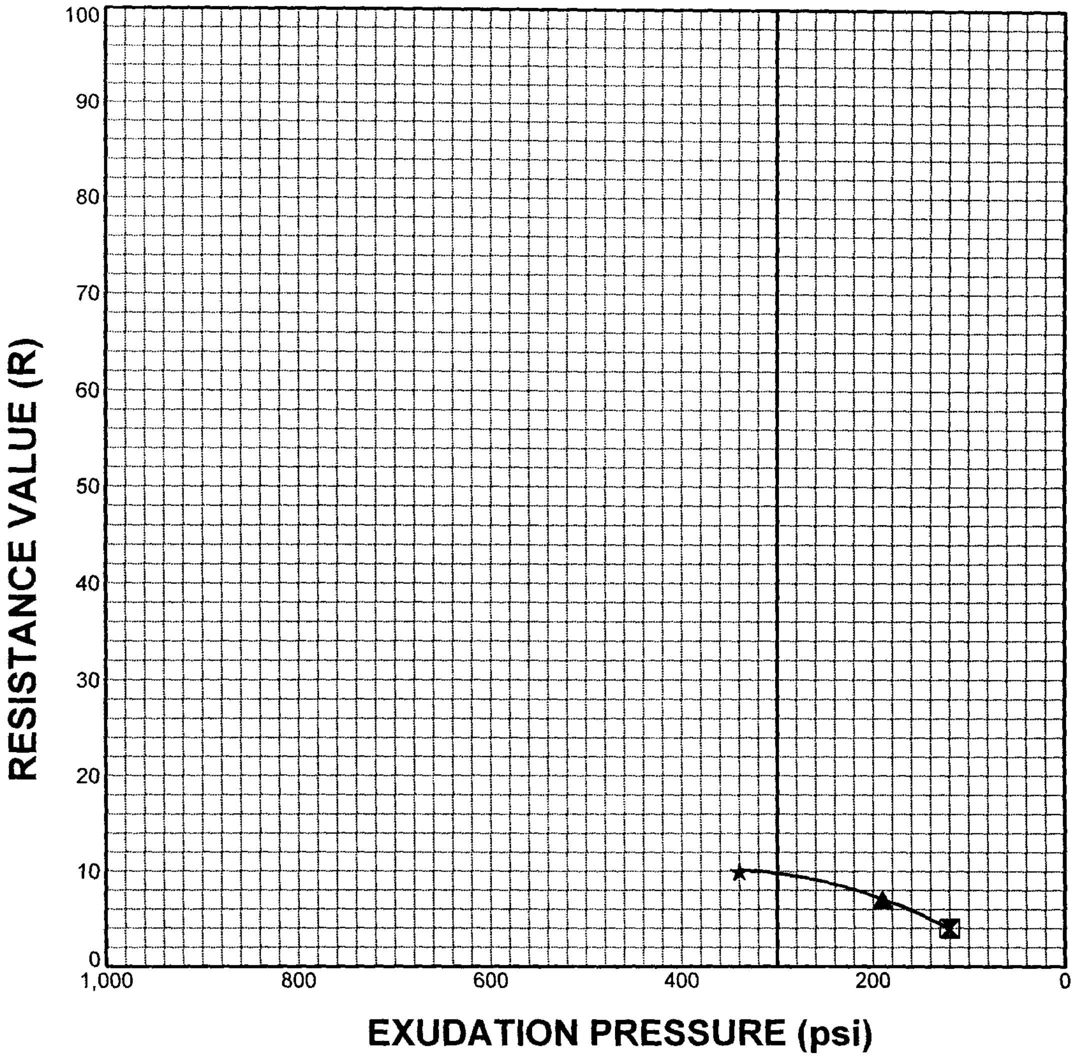

SPECIMEN NO.	⊠	▲	★
MOISTURE CONTENT (%)	21.6	19.3	16.9
DRY DENSITY (PCF)	101.6	105.1	110.1
EXUDATION PRESSURE (PSI)	120	190	340
EXPANSION PRESSURE (PSF)	0	0	0
RESISTANCE VALUE (R)	4	7	10

Date Received: 3/6/2007

SAMPLE SOURCE	CLASSIFICATION	SAND EQUIVALENT	EXPANSION PRESSURE	R-VALUE
(PL10735) Composite - Upper two feet of borings	Brown Clayey Silt	---	0 psf	**10**

ASTM D 2844, Cal Test 301

KLEINFELDER	**RESISTANCE VALUE TEST DATA**	*PLATE*
PROJECT NO. 80716	BANCROFT MIDDLE SCHOOL FIELDS 150 BANCROFT AVENUE SAN LEANDRO, CALIFORNIA	**C-4**

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3/13/2007 7:54:57 AM

California State Certified Laboratory No.2153

CERCO
analytical, inc.

3942-A Valley Avenue
Pleasanton, CA 94566-4715
925.462.2771 • Fax: 925.462.2775
www.cercoanalytical.com

5 March, 2007

Job No.0702149
Cust. No.10527

Mr. Don Gray
Kleinfelder
7133 Koll Center Parkway
Pleasanton, CA 94566

Subject: Project No.: 80716
Project Name: Not Indicated
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Gray:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on February 20, 2007. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a detection limit of 15 mg/kg.

The sulfate ion concentration reflects none detected with a detection limit of 15 mg/kg.

The pH of the soil is 6.4 which may present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 460-mV, which is indicative of aerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

Cheryl McMillen for
J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical, inc.
3942-A Valley Avenue
Pleasanton, CA 94566-4715
925.462.2771 • Fax: 925.462.2775
www.cercoanalytical.com

Client: Kleinfelder
Client's Project No.: 80716
Client's Project Name: Bancroft MS Field
Date Sampled: Not Indicated
Date Received: 20-Feb-07
Matrix: Soil
Authorization: Signed Laboratory Testing Program (P.O. No.R9699)

Date of Report: 5-Mar-2007

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
0702149-001	1C, B-716 @ 2'	460	6.4	-	3,300	-	N.D.	N.D.

	Redox	pH	Conductivity	Resistivity	Sulfide	Chloride	Sulfate
Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Detection Limit:	-	-	10	-	50	15	15
Date Analyzed:	26-Feb-2007	1-Mar-2007	-	2-Mar-2007	-	2-Mar-2007	2-Mar-2007

* Results Reported on "As Received" Basis

N.D. - None Detected

Cheryl McMillen
Laboratory Director

__Quality Control Summary__ **- All laboratory quality control parameters were found to be within established limits**