GEOTECHNICAL STUDY
NORTH PARKING LOT
THE VILLAGE AT CORTE MADERA
1618 REDWOOD HIGHWAY
CORTE MADERA, CALIFORNIA

Kleinfelder Project No. 20180061.001A

Prepared for:

Restoration Hardware
15 Koch Road Suite J
Corte Madera, CA 94925

May 22, 2017

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May 22, 2017
Kleinfelder Project No. 20180061.001A

Restoration Hardware
15 Koch Road Suite J
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Attention: Mr. Stuart Wagner
Senior Leader, Planning and Pre-Development
swagner@restorationhardware.com

Subject: Geotechnical Study
North Parking Lot
The Village at Corte Madera
1618 Redwood Highway
Corte Madera, California

Dear Mr. Wagner:

Kleinfelder is pleased to present this report summarizing our geotechnical study for the proposed North Parking Lot improvements at The Village at Corte Madera located at 1618 Redwood Highway in Corte Madera, California. The purpose of our geotechnical study was to evaluate subsurface soil conditions beneath the site and to provide geotechnical recommendations for design and construction. The conclusions and recommendations presented in this report are subject to the limitations presented in Section 5 of this report. An information sheet from Geoprofessional Business Association (GBA) is presented in Appendix C, and provides important information about this geotechnical engineering report.

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have any questions, please contact the undersigned at (949) 727-4466, or Mark Klaver at (916) 366-1701.

Respectfully submitted,

KLEINFELDER, INC.

Martin Pucci, PE
Project Engineer

Brian E. Crystal, PE, GE
Senior Project Manager

cc: Mark Klaver, Kleinfelder
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Appendix B  Laboratory Testing Results
Appendix C  Important Information About Your Geotechnical Engineering Report
1 INTRODUCTION

This report presents the results of our geotechnical study for the proposed North Parking Lot improvements at The Village at Corte Madera located at 1618 Redwood Highway in Corte Madera, California. The location of the project site is shown on Figure 1, Site Vicinity Map. The purpose of our geotechnical study was to evaluate subsurface soil conditions beneath the site and to provide geotechnical recommendations for design and construction. The scope of our services was presented in our proposal titled, “Proposal for Geotechnical Study, North Parking Lot, The Village at Corte Madera, 1618 Redwood Highway, Corte Madera, California”, dated March 15, 2017.

Our report includes a description of the work performed, a discussion of the geotechnical conditions observed at the site, and recommendations developed from our engineering analyses of field and laboratory data. An information sheet prepared by GBA (Geoprofessional Business Association) is also included in Appendix C of this report. We recommend individuals using this report read the limitations presented in Section 5 along with the attached GBA document.

In preparation of this current study and during development of our conclusions, the following report was reviewed to assess subsurface conditions and seismic hazards deeper than those explored during this current investigation.


1.1 PROJECT DESCRIPTION

The proposed project consists of converting the existing gravel lot located north of The Village at Corte Madera mall into a paved parking lot anticipated to accommodate approximately 450 parking spaces. In addition to the parking spaces, other improvements include concrete sidewalks, landscaping, light standards, and underground utilities. Grading plans are not available at this time. We have, therefore, assumed that the grades will not change significantly, except to establish finished grades and positive site drainage. We anticipate that cuts and fills no more than 2 feet will be required to achieve the finished grades, and that excavations for underground utilities are expected to be less than about 5 feet deep.
We understand the project is being driven by the planned future development of a new Restoration Hardware store within the mall and that Restoration Hardware is required to lead the entitlement process and develop design documents. We understand that Macerich, the mall owner, will ultimately construct the parking lot improvements at the time permits for the new lot and store are issued. Plans prepared by MBH Architects and Kimley-Horn & Associates dated December 16, 2016 provide the latest plans for the site.

1.2 SCOPE OF SERVICES

The scope of our geotechnical study consisted of a review of existing geologic and geotechnical data near the site, a site reconnaissance, subsurface exploration program, percolation rate testing, geotechnical laboratory testing, engineering evaluation and analysis, and preparation of this report. Studies to assess environmental hazards that may affect the soil and groundwater at the site were beyond our geotechnical scope of work. A description of our scope of services performed for the geotechnical portion of the project follows.

1.2.1 Task 1 – Site Reconnaissance

A reconnaissance of the site and immediate vicinity was conducted to observe existing conditions and features that would impact our investigation or project geotechnical design/construction. At the time of our reconnaissance Kleinfelder marked the site for Underground Service Alert (USA), and met with a subcontracted private utility locator to mark underground utilities. After the site was marked and Kleinfelder received responses from local utilities the final locations of our six test pits were selected.

1.2.2 Task 2 – Field Exploration

The field exploration was conducted on April 25, 2017 and included excavating six test pits to depths of approximately 4½ to 5 feet below grade. The approximate locations of the test pits (TP-1 through TP-6) are shown on Figure 2, Site Plan. The locations shown on Figure 2 were estimated by our field geologist based on measurements from existing features at the site. Therefore, the locations should be considered accurate only to the degree implied by the methods used. The exploration program was conducted under the supervision of our registered geotechnical engineer.

Test pits were excavated using a mini-excavator, equipped with a 36-inch-wide bucket. The excavations were performed by Pearson Exploration of Sebastopol, California. Materials
encountered in each test pit were visually classified in the field and logs were recorded. Disturbed bulk samples, and hand-driven, 2.5-inch diameter by 6-inch long tube samples were collected from the test pits and retained for laboratory testing.

Upon completion, test pits were backfilled with excavated soil placed in lifts and compacted by bucket-tamping the soil with the mini excavator bucket.

1.2.3  Task 3 – Percolation Rate Testing

At the completion of the test pit excavations the subsurface conditions encountered were evaluated, and four locations were chosen for percolation testing to evaluate the anticipated percolation rate of the existing fill soils. The four percolation test locations are presented on Figure 2, Site Plan. Percolation testing was performed in general accordance with California Test Method 749 (CT 749), Method for Determining the Percolation Rate of Soils Using a 12-inch-diameter-test hole.

At each percolation test location, a 3-foot-wide by 10-feet long by 1-foot deep trench was excavated. After the shallow trench excavation, an approximate 12-inch-diameter, 12-inch deep hole was excavated in the center of the trench. Pea gravel was then placed within the bottom 2 inches of the 12-inch-deep hole, and a 10-inch-diameter perforated schedule 40 PVC pipe was placed into the center of the hole. Following placement of the PVC pipe, pea gravel was placed around the perimeter of the pipe within the annular space up to the top of the 12-inch-deep hole. After placement of the pea gravel, a water source was setup to presoak the test hole by utilizing 55 gallon drums and a float valve within the test hole in order to maintain the proper presoaking water height within the test hole. Presoaking occurred for a minimum of 18 hours prior to initiation of the percolation testing. Prior to each percolation test the water source was turned off, and the beginning water level was recorded. After the beginning water level was recorded the time required for the water level to drop ½ inch (if percolation rate was slow) or 1 inch (if percolation rate was faster) was recorded. Using the time required for the water to drop a certain distance allows the calculation of uncorrected percolation rates. A total of 1, 5, 4, and 3 tests were performed in Percolation Tests 1 through 4, respectively. At the completion of the testing, the average uncorrected percolation rate was calculated. Corrected percolation rates were calculated using uncorrected percolation rates, the total hole diameter, the inside and outside diameter of the perforated pipe, and the porosity of the pea gravel. Calculated percolation rates are provided in Section 3.10 of this report.
At the completion of percolation testing the test holes were disassembled, and the shallow trench excavations were backfilled with the soil that was removed during excavation.

1.2.4 Task 4 – Laboratory Testing

Laboratory testing was performed on representative bulk samples to assist in soil classification and development of engineering parameters for geotechnical design. Geotechnical laboratory testing was performed at Kleinfelder’s laboratory in Hayward, California. The testing program included the following:

- Moisture Content (ASTM D2216);
- Sieve Analysis of Soils (ASTM D6913);
- Atterberg Limits Testing (ASTM D4318); and
- Resistance Value (R-Value) Testing (ASTM D2844).

One composite sample was also tested for corrosion potential by Cerco Analytical, Inc. of Concord, California. Tests performed included the following:

- pH and Minimum Resistivity (ASTM D4972 and ASTM G57, respectively);
- Sulfide Content (ASTM D4658M
- Redox Potential (ASTM D1498)
- Soluble Chloride Content (ASTM D4327); and
- Soluble Sulfate Content (ASTM D4327).

The results of all laboratory tests are included in Appendix B. The results of soil corrosion potential testing are discussed in Section 3.9.

1.2.5 Task 5 – Geotechnical Analyses

We analyzed field and laboratory data in conjunction with the assumed finished grades and planned improvements to provide geotechnical recommendations for design and construction. We evaluated feasible foundation systems for light standards, pavement design, and earthwork recommendations. Seismic design parameters in accordance with the 2016 California Building Code (CBC) are also presented (Section 3.2).
1.2.6 Task 6 – Report Preparation

This report summarizes the services performed, data acquired, our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed improvements. Our report includes the following items:

- Vicinity map and site plan showing the approximate test pit and the percolation test locations;
- Test Pit Logs (Appendix A);
- Results of laboratory testing (Appendix B);
- Discussion of general site conditions;
- Discussion of general subsurface conditions encountered in our field exploration;
- Recommendations for seismic design parameters in accordance with Chapter 16 of the 2016 CBC;
- Design recommendations for drilled piers supporting light standards;
- Recommendations for site preparation and earthwork;
- Recommendations for flexible pavement structural sections;
- Preliminary corrosivity testing results and evaluation of the on-site soils; and
- Results of the percolation testing (Section 3.10) and an assessment of pervious pavement feasibility.
2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The planned parking lot expansion is located in the existing gravel lot located northeast of the Nordstrom Store. The parking lot is in use sporadically for overflow parking. The gravel lot perimeter is bounded by Redwood Highway to the southwest, and by a dredged flood control slough to the northwest, north, and east. The existing surface of this area is relatively flat and is mostly surfaced with clean crushed rock. Existing pavement is located near the entry at the southwest boundary which includes accessible parking. Existing drop inlets are located throughout the parking lot which are connected to the existing storm drain system.

2.2 SUBSURFACE CONDITIONS

In general, the subsurface conditions consist of existing fill to depths ranging from 4 to 6 feet over re-worked bay mud. The fill consists of about 6 inches of crushed rock and poorly graded gravel over clayey gravel with varying amounts of sand, cobbles and concrete/brick debris. The re-worked bay mud encountered was typically a stiff fat clay with varying amounts of sand and gravel.

2.3 GROUNDWATER

Groundwater was not encountered in the test pits, which extended to 6 feet below the ground surface. However, a review of previously acquired data near the parking lot indicates that groundwater can be as shallow as 3 feet below the ground surface. The groundwater level will be directly influenced by the water level within the slough, which is, at the time of this study, approximately 8 feet below the surface grade elevation of the gravel lot. However, a tidal gate at north of the site controls the flow of water into the slough, therefore water levels are expected to fluctuate. Irrigation of landscaped areas on or adjacent to the site can cause zones of perched water and fluctuations of local groundwater levels as well.
3 CONCLUSIONS AND RECOMMENDATIONS

3.1 GENERAL

Based on the results of our field exploration, laboratory testing and engineering analyses conducted during this study, it is our professional opinion that the proposed project is geotechnically feasible, provided the recommendations presented in this report are incorporated into the project design and construction. The following opinions, conclusions, and recommendations are based on the properties of the materials encountered in the test pits, the results of the laboratory testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of the project are presented in the following report sections.

3.2 CBC SEISMIC DESIGN PARAMETERS

Based on information obtained from previous investigations, published geologic literature and maps, and on our interpretation of the 2016 California Building Code (CBC) criteria, it is our opinion that the project site may be classified as Site Class E, Soft Clay Soil, according to Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE/SEI 7-10 (2010). Approximate coordinates for the site are noted below.

Latitude: 37.93207°N
Longitude: 122.51300°W

The Risk-Targeted Maximum Considered Earthquake (MCE_R) mapped spectral accelerations for 0.2 seconds and 1 second periods (S_a and S_1) were estimated using Section 1613.3 of the 2016 CBC and the U.S. Geological Survey (USGS) web based application (available at https://earthquake.usgs.gov/designmaps/us/application.php). The mapped acceleration values and associated soil amplification factors (F_a and F_v) based on the 2016 CBC and corresponding site modified spectral accelerations (S_{MS} and S_{M1}) and design spectral accelerations (S_{DS} and S_{D1}) are presented below in Table 1.
Table 1

2016 CBC Seismic Design Parameters

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<tr>
<td>PGAₘ (g)</td>
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3.3 FOUNDATIONS

3.3.1 General

We understand that there will be light standards constructed throughout the interior and perimeter of the parking lot that will be supports on short drilled piers that are typically embedded approximately 6 feet below grade. Recommendations for the design and construction of shallow foundations and drilled pile foundations are presented below.

3.3.2 Drilled Pier Foundations

Axial Capacity

The compressive axial capacity of drilled piers may be estimated based on an allowable unit skin friction capacity of 350 pounds per square foot. The upper 1 foot of the skin friction capacity should be neglected. The uplift capacity may be estimated as 70 percent of the allowable compressive axial capacity. A one-third increase in the allowable capacities may be used for transient loading conditions such as wind or seismic loads.
Settlement
Settlement of the proposed light standards on drilled piers, as recommended, is estimated to be less than ½ inch.

Lateral Resistance
The drilled pier foundations lateral resistance can be designed in general accordance with Section 1807.3 of the 2013 CBC. Two lateral bearing pressures are provided for design of the drilled pier foundations; (1) lateral pressure for interior piers located at least 10 feet laterally from the top of the perimeter fill slope, and (2) lateral pressure for perimeter drilled piers located within 10 feet laterally of the top of the perimeter fill slope. We recommend a lateral soil bearing pressure of 250 psf per foot of depth below grade for the interior piers and 125 psf per foot of depth below grade for perimeter piers. The lateral soil bearing pressure should not exceed 2,500 psf. The above lateral bearing pressures assume that the drilled piles will not be embedded more than 8 feet below the existing grade.

Since drilled piles will act as isolated pole foundations, the allowable lateral soil bearing pressure may be increased by a factor of 2 for short-term lateral loads provided the structure will not be adversely affected by ½ inch of lateral movement at the ground surface.

Installation of Drilled Pile Foundations
The performance and capacities of piles can be influenced significantly by the selected construction methods and procedures used. Sloughing of the side walls may occur in the onsite gravelly soils. In addition, groundwater is anticipated to be approximately 8 feet below the current grades. The boreholes for the drilled piles may have to be cased. If casing is used, we recommend its removal from the excavation as concrete is being placed. The bottom of the casing should be maintained below the top of the concrete during casing withdrawal and concrete placement operations. Continuous vibration of the casing or other methods may be required to reduce the potential for voids occurring within the concrete mass during casing withdrawal.

The steel reinforcement and concrete placement should occur as soon as possible after completion of the excavation and observation of the shaft, and no longer than 8 hours after completion of the excavation. Concrete should be pumped to the bottom of drilled shafts using a down-hole tremie. If steel casing is used, the casing should be removed as the concrete is placed but the bottom of the casing should be kept at least 5 feet below the top of the concrete.
3.4 EARTHWORK

3.4.1 General

Site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state or federal specifications, and the recommendations included in this report. References to maximum unit weights are established in accordance with the latest version of ASTM Standard Test Method D1557. The earthwork operations should be observed and tested by a representative of the geotechnical engineer.

3.4.2 Site Preparation

Abandoned utilities, foundations, and other existing improvements that will be decommissioned within the proposed improvement areas should be removed and the excavation(s) backfilled with engineered fill. Debris produced by demolition operations, including wood, metal, piping, plastics, etc., should be separated and disposed of off-site. Existing utility pipelines or conduits that extend beyond the limits of the proposed construction and are to be abandoned in place, should be plugged with non-shrinking cement grout to prevent migration of soil and/or water. Demolition, disposal and grading operations should be observed and tested by a representative of the geotechnical engineer. Areas to receive fill should be stripped of all dry, loose or soft earth materials and undocumented fill materials to the satisfaction of the geotechnical engineer.

- **Pavement, Sidewalks and Other Flatwork Areas:** Because of the variability in the existing fill, we recommend that the existing soils be overexcavated to a depth of at least 18 inches below the existing grade or planned subgrade elevation and replaced as structural fill. This structural fill layer is intended to provide uniform support for the proposed pavements and flatwork areas. Depending on the observed condition of the existing soils, deeper overexcavation may be required in some areas. The overexcavation should extend horizontally beyond the limits of the improvements a lateral distance equal to two feet, if possible.

After site preparation and prior to placement of fills, the excavation bottom should be observed and approved by a representative of the geotechnical engineer. After approval, the subgrade should be scarified to a depth of 6 to 8 inches, moisture conditioned to at least 2 percent above optimum, and compacted to at least 90 percent of the maximum dry unit weight.
3.4.3 Fill Material and Compaction Criteria

The on-site soils, consistent with those identified in our test pits and minus debris (concrete and brick fragments), cobbles larger than 3 inches, organic matter, or other deleterious materials, are expected to be suitable for reuse in the site fills. Rock or other fragments greater than 3 inches in size should not be used in the fills.

Fill soils should be compacted to at least 90 percent of the maximum dry unit weight (ASTM D1557). The upper 12 inches below pavements should be compacted to at least 95 percent. Fill should be placed in loose horizontal lifts not more than 8 inches thick (loose measurement). The moisture content of the fill should be maintained at least 2 percent above optimum during compaction. It is likely that processing (moisture reduction or adding water) of the existing fill soils may be required prior to placement as structural fill. Utility trench backfill should be mechanically compacted. Flooding should not be permitted.

The moisture content of the engineered fill is considered very important, and therefore, both relative compaction and moisture content should be used to evaluate compaction acceptance. If both criteria are not within the specified tolerances, the fill should not be accepted, and the contractor should rework the material until the fill is placed within the specified tolerances.

Import materials, if required, should have Plasticity Index (PI) of less than 12 with no more than 30 percent of the particles passing the No. 200 sieve and no particles greater than 3 inches in maximum dimension. The maximum expansion index for imported soils may be modified by the project geotechnical engineer depending on its proposed use. Imported fill should be documented to be free of hazardous materials, including petroleum or petroleum byproducts, chemicals and harmful minerals. Kleinfelder should be provided the opportunity to evaluate and perform geotechnical index testing on the proposed imported materials prior to their transportation and use on site.

3.4.4 Wet Soils

Depending on the time of year, it is possible that elevated moisture contents will be encountered within the upper soils. These conditions could seriously impede grading by causing an unstable subgrade condition. Recommendations for typical remedial measures are included in Section 3.5.
3.4.5  Temporary Excavations

We anticipate that cuts will not be deeper than 5 feet deep. Cuts up to 5 feet high may be sloped back at an inclination of no steeper than 1.5:1 (horizontal to vertical) in existing site soils. Minor sloughing and/or raveling should be anticipated as they dry out. If signs of slope instability are observed, the inclination recommended above should be decreased until stability of the slope is obtained. In addition, at the first signs of slope instability, the geotechnical engineer should be contacted. Where space for sloped embankments is not available, shoring will be necessary. A representative of the geotechnical engineer should observe the excavations so that modifications can be made to the excavations, as necessary, based on variations in the encountered soil conditions. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.

Where sloped excavations are used, tops of the slopes should be barricaded so that vehicles and storage loads do not encroach within a distance from the top of the excavation equal to the depth of the excavation. Greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes. Kleinfelder should be advised of such heavy vehicle loadings so that specific setback requirements can be established. If temporary construction slopes are to be maintained during the rainy season, berms are recommended along the tops of the slopes to reduce runoff that may enter the excavation and erode the slope faces.

Temporary, shallow excavations with vertical side slopes less than 4 feet high should generally be stable, although sloughing may be encountered. Vertical excavations greater than 4 feet high should not be attempted without appropriate shoring to prevent local instability. All trench excavations should be braced and shored in accordance with good construction practice and all applicable safety ordinances and codes. The contractor should be responsible for the structural design and safety of the temporary shoring system, and we recommend that this design be submitted to Kleinfelder for review to check that their recommendations have been incorporated. For planning purposes, the on-site soils may be considered Type C, as defined using the current OSHA soil classification.

3.4.6  Trench Backfill

Pipe zone backfill (i.e. material beneath and in the immediate vicinity of the pipe) should consist of imported soil less than ¾-inch in maximum dimension. Trench zone backfill (i.e., material placed between the pipe zone backfill and finished subgrade) may consist of onsite soil or imported fill that meets the requirements for engineered fill provided above.
If imported material is used for trench zone backfill, we recommend it consist of silty sand. In general, gravel and cobble should not be used for trench zone backfill due to the potential for soil migration into the relatively large void spaces present in this type of material and water seepage along trenches backfilled with coarse-grained sand and/or gravel.

Recommendations provided above for pipe zone backfill are minimum requirements only. More stringent material specifications may be required to fulfill local building requirements and/or bedding requirements for specific types of pipes. We recommend the project civil engineer develop these material specifications based on planned pipe types, bedding conditions, and other factors beyond the scope of this study.

Trench backfill should be placed and compacted in accordance with recommendations provided for engineered fill in Section 3.4.3. Mechanical compaction is recommended; ponding or jetting should be avoided, especially in areas supporting structural loads or beneath concrete slabs supported on grade, pavements, or other improvements.

3.5 UNSTABLE SUBGRADE CONDITIONS

Pumping subgrade conditions may be encountered during site grading activities, and the subgrade may need to be stabilized. Additionally, should grading be performed during or following extended periods of rainfall, the moisture content of the near-surface soils may be significantly above the optimum moisture content. These conditions could seriously impede grading by causing an unstable subgrade condition. Typical remedial measures include the following:

- **Drying:** Drying unstable subgrade involves diskng or ripping wet subgrade to a depth of approximately 18 to 24 inches and allowing the exposed soil to dry. Multiple passes of the equipment (likely on a daily basis) will be needed because as the surface of the soil dries, a crust forms that reduces further evaporation. Frequent diskng will help prevent the formation of a crust and will promote drying. This process could take several days to several weeks depending on the depth of ripping, the number of passes, and the weather.

- **Removal and Replacement with Crushed Rock and Geotextile Fabric:** Unstable subgrade could be over-excavated approximately 12 to 24 inches below existing grade and replaced with ¾- or 1-inch crushed rock underlain by geotextile fabric. The geotextile fabric should consist of a woven geotextile, such as Mirafi 600X or equivalent. The final depth of removal will depend upon the conditions observed in the field once over-excavation begins. The
geotextile fabric should be placed in accordance with the manufacturer’s recommendations.

- **Soil Treatment**: Unstable subgrade could be stabilized by mixing the upper 12 to 18 inches of the subgrade with Portland cement, Class C flyash or lime. For estimating purposes, an application rate of 10 to 12 percent Class C flyash, 3 to 5 percent for high calcium quick lime, or 4 to 5 percent Portland cement may be used. Final application rates should be determined in the field at the time of construction in consultation with the geotechnical engineer. Chemical treatment should be performed by a specialty contractor experienced in this work and should be performed in accordance with Caltrans Standard Specifications. Since lime treatment uses the on-site soil, the expense of importing material can be avoided. Chemically treated areas will have a high pH level (pH over 10) that will need to be removed from landscape areas.

### 3.6 EXTERIOR FLATWORK

Prior to casting exterior flatwork, the subgrade soils should be overexcavated and recompacted, as recommended in Section 3.4.2. In the event that these subgrade soils are allowed to dry out, the exposed subgrade should be re-moisture conditioned. Careful control of the water/cement ratio should be performed to avoid shrinkage cracking due to excess water or poor concrete finishing or curing. Unreinforced slabs should not be built in areas where further saturation may occur following construction.

Exterior concrete slabs for pedestrian traffic or landscape should be at least 4 inches thick, and underlain by at least 6 inches of Class 2 aggregate base. Weakened plane joints should be located at intervals of about 6 feet.

### 3.7 SITE DRAINAGE

The performance of pavements partially depends on proper irrigation and how well runoff water drains from the site. This drainage should be maintained both during construction and over the entire life of the project.

We recommend that landscape planters either not be located adjacent to pavement areas or be properly drained to area drains. If planters are built near the pavement areas, they should be built such that water exiting from them will not seep beneath pavement. Maintenance personnel should be instructed to limit irrigation to the minimum actually necessary to properly sustain landscaping.
plants. Should excessive irrigation, waterline breaks or unusually high rainfall occur, saturated zones and “perched” groundwater may develop. Consequently, the site should be graded so that water drains away readily without saturating landscaped areas. Potential sources of water such as water pipes, drains, and the like should be frequently examined for signs of leakage or damage. Any such leakage or damage should be promptly repaired. Wet utilities should also be designed to be watertight.

3.8 PAVEMENT SECTIONS

3.8.1 Asphalt Concrete

The required pavement structural sections will depend on the expected wheel loads, volume of traffic, and subgrade soils. We have provided asphalt concrete pavement sections for various traffic indices. The traffic indices should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project.

The pavement subgrade should be prepared just prior to placement of the aggregate base course. Positive drainage of the paved areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Curbing located adjacent to paved areas should be founded in the subgrade, not the aggregate base, in order to provide a cutoff, which reduces water infiltration into the base course.

<table>
<thead>
<tr>
<th>Traffic Index, TI</th>
<th>Asphalt Concrete (inches)</th>
<th>Aggregate Base (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>3.0</td>
<td>6.0</td>
</tr>
<tr>
<td>5.0</td>
<td>4.0</td>
<td>7.0</td>
</tr>
<tr>
<td>6.0</td>
<td>4.5</td>
<td>9.0</td>
</tr>
<tr>
<td>7.0</td>
<td>4.5</td>
<td>12.5</td>
</tr>
</tbody>
</table>

Table values were rounded up to the nearest 1/2 inch.

The pavement sections presented above were established using the design criteria of the State of California, Department of Transportation, a design R-value of 15 was selected based on the soil types encountered, laboratory testing, and engineering judgement. The noted Traffic Indices,
a theoretical design life of 20 years and an assumption that pavements will be periodically
inspected and properly maintained were considered in the development of the design R-value.

3.8.2 Construction Considerations

The pavement sections provided above are contingent on the following recommendations being
implemented during construction.

- The subgrade for pavements should be prepared as recommended in Section 3.4.2.
- Subgrade soils should be in a stable, non-pumping condition at the time the aggregate
  base materials are placed and compacted.
- Aggregate base materials should be compacted to at least 95 percent relative compaction
  (ASTM D1557).
- Adequate drainage (both surface and subsurface) should be provided such that the
  subgrade soils and aggregate base materials are not allowed to become wet.
- Aggregate base materials should meet current Caltrans specifications for Class 2
  aggregate base.
- Asphalt paving materials and placement methods should meet current Caltrans
  specifications for asphalt concrete.

Pavement sections provided above are based on the soil conditions encountered during our field
investigation, our assumptions regarding final site grades, and limited laboratory testing.

3.9 SOIL CORROSION

The corrosion potential of the on-site materials to steel and buried concrete was preliminarily
evaluated. Laboratory testing was performed on a composite soil sample to evaluate pH,
minimum resistivity, chloride and soluble sulfate content. The test results are presented in
Table 3.

<table>
<thead>
<tr>
<th>Table 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion Test Results</td>
</tr>
<tr>
<td>Boring Depth, Minimum Resistance As Received, Minimum Resistivity 100% Saturation, pH, Soluble Sulfate Content, Soluble Chloride Content</td>
</tr>
<tr>
<td>Test Pits 1/2/4/6, 0.5-4.0, 1,600, 410, 7.95, 1,000, 550</td>
</tr>
</tbody>
</table>
These tests are only an indicator of soil corrosivity for the samples tested. Other soils found on site may be more, less, or of a similar corrosive nature. Imported fill materials should be tested to confirm that their corrosion potential is not more severe than those noted.

Based on the resistivity values, the onsite soils may be considered highly corrosive to extremely corrosive towards buried ferrous metals (Roberge, 2006). The concentrations of soluble sulfates indicate that the fill soils represent a Class S1 exposure to sulfate attack on concrete in contact. A concrete mix with Type II cement, a maximum water-cement ratio of 0.50, and minimum compressive strength of 4,000 psi should be used for concrete in contact with fill soils.

In addition to the Class S1 exposure to sulfate attack, reinforcing steel in concrete structures and pipes should be protected from chloride attack. The level of protection should be for soil with a chloride content of about 1,000 ppm. Possible methods of protection that could be used include increased concrete cover, low water-cement ratio, corrosion inhibitor admixture, silica fume admixture, and/or waterproof coating on the concrete exterior.

3.10 STORM WATER MANAGEMENT

As part of our scope, we performed percolation testing in order to assess the feasibility of incorporating permeable pavements into the project design. A description of the testing procedures and calculation of the corrected percolation rates was presented in Section 1.2.3. The calculated percolation rates are presented in Table 4.

<table>
<thead>
<tr>
<th>Percolation Test</th>
<th>Test Depth (feet)</th>
<th>Calculated Percolation Rate (inch/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perc-1</td>
<td>2.0</td>
<td>0.04</td>
</tr>
<tr>
<td>Perc-2</td>
<td>2.0</td>
<td>0.38</td>
</tr>
<tr>
<td>Perc-3</td>
<td>2.0</td>
<td>0.42</td>
</tr>
<tr>
<td>Perc-4</td>
<td>2.0</td>
<td>0.19</td>
</tr>
</tbody>
</table>

The percolation testing results indicate that the tested soils have a low percolation rate. It should be noted that the above calculated percolation rates are unfactored. A long-term design percolation rate would be much lower. Furthermore, the fill soils consist of high variable clayey
gravel underlain by re-worked bay mud comprised of fat clay and groundwater is anticipated to be within the upper 8 feet below grade.

Given the low infiltration capacity of the on-site soils and anticipated groundwater level, permeable pavements are not considered feasible for use at this site. We recommend that alternatives to infiltration Best Management Practices (BMPs), such as bio-filtration/bio-retention systems (bio-swales and planter boxes), be used at the project site for storm water quality management. We recommend that the bio-filtration/bio-retention systems be built such that water exiting from them will not seep beneath pavement or flatwork. If planters are located adjacent to flatwork or pavements, then some means of diverting water away from soils that support flatwork and pavements would be required, such as lining the planters.
4 ADDITIONAL SERVICES

4.1 PLANS AND SPECIFICATIONS REVIEW

We recommend that Kleinfelder perform a general review of the project plans and specifications before they are finalized to verify that our geotechnical recommendations have been properly interpreted and implemented during design. If we are not accorded the privilege of performing this review, we can assume no responsibility for misinterpretation of our recommendations.

4.2 CONSTRUCTION OBSERVATION AND TESTING

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes, and because we sample only a limited portion of the soils affecting the performance of the proposed improvements, unanticipated or changed conditions can be encountered during grading. Proper geotechnical observation and testing during construction are imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design process. Therefore, we recommend that Kleinfelder be retained during the construction of the proposed improvements to observe compliance with the design concepts and geotechnical recommendations, and to allow design changes in the event that subsurface conditions or methods of construction differ from those assumed while completing this study.

Our services are typically needed at the following stages of grading:

- after demolition;
- during grading;
- after the overexcavation, but prior to scarification;
- during utility trench backfill;
- during base placement and site paving; and
- during drilling of drilled pier foundations.
5 LIMITATIONS

This geotechnical study has been prepared for the exclusive use of the Restoration Hardware and their agents for specific application to the proposed North Parking Lot improvements at The Village at Corte Madera located at 1618 Redwood Highway in Corte Madera, California. The findings, conclusions and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The scope of services was limited to those described in Section 1.2. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. The conclusions of this assessment are based on our field exploration and laboratory testing programs, and engineering analyses.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues addressed in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. It is possible that soil or groundwater conditions could vary between or beyond the points explored. If soil or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction, including the locations of the improvements, changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid until the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.
Our geotechnical scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field. Kleinfelder must be retained so that all geotechnical aspects of construction will be monitored on a full-time basis by a representative from Kleinfelder, including site preparation, preparation of foundations, and placement of engineered fill and trench backfill. These services provide Kleinfelder the opportunity to observe the actual soil and groundwater conditions encountered during construction and to evaluate the applicability of the recommendations presented in this report to the site conditions. If Kleinfelder is not retained to provide these services, we will cease to be the engineer of record for this project and will assume no responsibility for any potential claim during or after construction on this project. If changed site conditions affect the recommendations presented herein, Kleinfelder must also be retained to perform a supplemental evaluation and to issue a revision to our original report.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Bidders may not rely on interpretations, opinion, recommendations, or conclusions contained in the report. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder’s geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction.

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 one year from the date of the report. Land use, site conditions (both on site and off site) 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 this report and the nature of the new project, 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 the client agrees to defend, indemnify, and hold harmless Kleinfelder from any claims or liability associated with such unauthorized use or non-compliance.
REFERENCES

American Concrete Institute (ACI), 2011. Building Code Requirements for Structural Concrete (ACI 318-11) and Commentary.

American Society of Civil Engineers (ASCE), Minimum Design Load for Buildings and Other Structures (ASCE7-10), 2010.


The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to the accuracy or completeness of the information contained on this graphic representation. The information contained on this graphic representation is at the sole risk of the party using or misusing the information.
If the sampler is not able to be driven at least 6 inches, then 50/X
indicates number of blows required to drive the identified sampler
GW-GM, GW-GC, GW-SC, GP-GM, GP-GC, SP-SM, SW-SC,
passing the No. 200 sieve require dual USCS symbols, ie., GW-GM,
Plasticity Chart, and coarse grained soils with between 5% and 12% 
were modified where appropriate based on gradation and index 
presented on the logs were based on visual classification in the field
In general, Unified Soil Classification System designations 
point of exploration on the date indicated.
Logs represent general soil or rock conditions observed at the 
conditions between individual sample locations.
No warranty is provided as to the continuity of soil or rock 
boundaries only. Actual transitions may be gradual or differ from 
those shown.
Logs represent general soil or rock conditions observed at the 
point of exploration on the date indicated.
In general, Unified Soil Classification System designations 
presented on the logs were based on visual classification in the field 
and were modified where appropriate based on gradation and index property testing.
Fine grained soils that plot within the hatched area on the 
Plasticity Chart, and coarse grained soils with between 5% and 12% 
passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, 
GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, 
SP-SC, SC-SC.
If sampler is not able to be driven at least 6 inches then 50/X 
indicates number of blows required to drive the identified sampler X 
inches with a 140 pound hammer falling 30 inches.

### Unified Soil Classification System (ASTM D 2487)

| Clean Gravel with <5% Finest | GW | Well-Graded Gravels, 
Gravel-Sand Mixtures with Little or No Finest |
| Clean Gravel with >12% Finest | GP | Poorly Graded Gravels, 
Gravel-Sand Mixtures with Little Finest |
| Gravels with >12% Finest | GW-GM | Well-Graded Gravels, 
Gravel-Sand Mixtures with Little Finest |
| Gravels with >12% Finest | GP-GM | Poorly Graded Gravels, 
Gravel-Sand Mixtures with Little Finest |
| Gravels with >12% Finest | GP-GC | Poorly Graded Gravels, 
Gravel-Sand Mixtures with Little Finest |
| Gravels with >12% Finest | GC-GM | Clayey Gravels, 
Gravel-Sand Mixtures |
| Gravels with >12% Finest | GC-GC | Clayey Gravels, 
Gravel-Sand-Clay Mixtures |
| Clean Sands with <5% Finest | SW | Well-Graded Sands, 
Sand-Gravel Mixtures with Little or No Finest |
| Clean Sands with >12% Finest | SP | Poorly Graded Sands, 
Sand-Gravel Mixtures with Little Finest |
| Sands with >12% Finest | SW-SM | Well-Graded Sands, 
Sand-Gravel Mixtures with Little Finest |
| Sands with >12% Finest | SP-SM | Poorly Graded Sands, 
Sand-Gravel Mixtures with Little Finest |
| Sands with >12% Finest | SM | Silty Sands, Sand-Gravel-Silt Mixtures |
| Sands with >12% Finest | SC | Clayey Sands, 
Sand-Gravel-Clay Mixtures |
| Sands with >12% Finest | SC-SC | Clayey Sands, 
Sand-Gravel-Clay Mixtures |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | ML | Inorganic Silts and Very Fine Sands, Silty or 
Clayey Fine Sands, Silts with Slight Plasticity |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | CL | Inorganic Clays of Low to Medium Plasticity, Gravelly 
Clays, Sandy Clays, Silty Clays, Lean Clays |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | CL-ML | Inorganic Clays, Silts of Low Plasticity, Gravelly 
Clays, Sandy Clays, Silty Clays, Lean Clays |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | OL | Organic Silts & Organic Silty Clays 
of Low Plasticity Mixtures |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | MH | Inorganic Silts, Micaceous or 
Diatomaceous Fine Sand or Silt |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | CH | Inorganic Clays of High Plasticity, 
Sandy Clays and Silts |
| Fine Grained Soils (More than half of material is smaller than the #200 sieve) | OH | Organic Clays & Organic Silts of 
Medium-to-High Plasticity |

**Notes:**
- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
### Structure

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stratified</td>
<td>Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness</td>
</tr>
<tr>
<td>Laminated</td>
<td>Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness</td>
</tr>
<tr>
<td>Fissured</td>
<td>Breaks along definite planes of fracture with little resistance to fracturing</td>
</tr>
<tr>
<td>Slickensided</td>
<td>Fracture planes appear polished or glossy, sometimes striated</td>
</tr>
<tr>
<td>Blocky</td>
<td>Cohesive soil that can be broken down into small angular lumps which resist further breakdown</td>
</tr>
<tr>
<td>Lensed</td>
<td>Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay, note thickness</td>
</tr>
<tr>
<td>Homogeneous</td>
<td>Same color and appearance throughout</td>
</tr>
</tbody>
</table>

### Plasticity

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-plastic</td>
<td>A 1/8-in. (3 mm.) thread cannot be rolled at any water content.</td>
</tr>
<tr>
<td>Low (L)</td>
<td>The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.</td>
</tr>
<tr>
<td>Medium (M)</td>
<td>The thread is easy to roll and not much time is required to reach the plastic limit. The lump or thread crumbles when drier than the plastic limit.</td>
</tr>
<tr>
<td>High (H)</td>
<td>It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit</td>
</tr>
</tbody>
</table>

### Moisture Content

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>Absence of moisture, dusty, dry to the touch</td>
</tr>
<tr>
<td>Moist</td>
<td>Damp but no visible water</td>
</tr>
<tr>
<td>Wet</td>
<td>Visible free water, usually soil is below water table</td>
</tr>
</tbody>
</table>

### Reaction with Hydrochloric Acid

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>No visible reaction</td>
</tr>
<tr>
<td>Weak</td>
<td>Some reaction, with bubbles forming slowly</td>
</tr>
<tr>
<td>Strong</td>
<td>Violent reaction, with bubbles forming immediately</td>
</tr>
</tbody>
</table>

### Apparent / Relative Density - Coarse-Grained Soil

<table>
<thead>
<tr>
<th>DENSITY</th>
<th>SPT-N60 (# blows/ft)</th>
<th>MODIFIED CA SAMPLER (# blows/ft)</th>
<th>CALIFORNIA SAMPLER (# blows/ft)</th>
<th>RELATIVE DENSITY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Loose</td>
<td>&lt;4</td>
<td>&lt;4</td>
<td>&lt;4</td>
<td>&lt;6</td>
</tr>
<tr>
<td>Loose</td>
<td>4 - 10</td>
<td>4 - 12</td>
<td>4 - 15</td>
<td>15 - 35</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>10 - 30</td>
<td>12 - 35</td>
<td>15 - 40</td>
<td>35 - 65</td>
</tr>
<tr>
<td>Dense</td>
<td>30 - 50</td>
<td>35 - 60</td>
<td>40 - 70</td>
<td>65 - 85</td>
</tr>
<tr>
<td>Very Dense</td>
<td>&gt;50</td>
<td>&gt;60</td>
<td>&gt;70</td>
<td>85 - 100</td>
</tr>
</tbody>
</table>

### Consistency - Fine-Grained Soil

<table>
<thead>
<tr>
<th>CONSISTENCY</th>
<th>UNCONFINED COMPRESSIVE STRENGTH (q_p, psf)</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Soft</td>
<td>&lt; 1000</td>
<td>Thumb will penetrate soil more than 1 in. (25 mm.)</td>
</tr>
<tr>
<td>Soft</td>
<td>1000 - 2000</td>
<td>Thumb will penetrate soil about 1 in. (25 mm.)</td>
</tr>
<tr>
<td>Firm</td>
<td>2000 - 4000</td>
<td>Thumb will indent soil about 1/4-in. (6 mm.)</td>
</tr>
<tr>
<td>Hard</td>
<td>4000 - 8000</td>
<td>Thumb will not indent soil but readily indented with thumbnail</td>
</tr>
<tr>
<td>Very Hard</td>
<td>&gt; 8000</td>
<td>Thumb will not indent soil</td>
</tr>
</tbody>
</table>

### CEMENTATION

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakly</td>
<td>Crumbles or breaks with handling or slight finger pressure</td>
</tr>
<tr>
<td>Moderately</td>
<td>Crumbles or breaks with considerable finger pressure</td>
</tr>
<tr>
<td>Strongly</td>
<td>Will not crumble or break with finger pressure</td>
</tr>
</tbody>
</table>

### Munsell Color

<table>
<thead>
<tr>
<th>NAME</th>
<th>ABBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>R</td>
</tr>
<tr>
<td>Yellow Red</td>
<td>YR</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
<tr>
<td>Green Yellow</td>
<td>GY</td>
</tr>
<tr>
<td>Green</td>
<td>G</td>
</tr>
<tr>
<td>Blue Green</td>
<td>BG</td>
</tr>
<tr>
<td>Blue</td>
<td>B</td>
</tr>
<tr>
<td>Purple Blue</td>
<td>PB</td>
</tr>
<tr>
<td>Purple</td>
<td>P</td>
</tr>
<tr>
<td>Red Purple</td>
<td>RP</td>
</tr>
<tr>
<td>Black</td>
<td>N</td>
</tr>
</tbody>
</table>

### Soil Description Key

**NOTE:** AFTER TERZAGHI AND PECK, 1948

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**GKLEINFELDER**

**Bright People. Right Solutions.**

**GEOTECHNICAL STUDY**

**RESTORATION HARDWARE - NORTH PARKING LOT**

**THE VILLAGE AT CORTE MADERA**

**CORTE MADERA, CALIFORNIA**

**PROJECT NO.: 20180061**

**DRAWN BY:** JCR

**CHECKED BY:** WVM

**DATE:** MAY 2017

**REVISED:** -

**FIGURE A-2**
Unit Descriptions

1. POORLY GRADED GRAVEL (GP) - gray to light gray, dry, loose, fine to coarse grained sand, subangular to subrounded gravel to 1" (Aggregate Base/Fill)

2. CLAYEY GRAVEL WITH SAND (GC) - mottled grayish brown, brownish gray, light grayish brown, medium dense to dense, moist, fine to coarse grained sand, subangular to angular gravel to 3", occasional cobbles to 5", concrete debris/blocks (Fill)

3. FAT CLAY (CH) - dark gray to greenish gray, moist, stiff, organic odor, fine to coarse grained sand, angular gravel to 1.5", pocket penetrometer=1.5 tsf (Reworked Bay Mud)

Logged By: C. Ewing
Date: 4/25/17
Logged By: C. Ewing
Date: 4/25/17

Unit Descriptions

1. POORLY GRADED GRAVEL (GP) - gray to light gray, dry, loose, fine to coarse grained sand, subangular to subrounded gravel to 1", (Aggregate Base/Fill)

2. CLAYEY GRAVEL WITH SAND (GC) - brownish gray to grayish brown, dry to moist, dense, fine to coarse grained sand, subangular to angular gravel to 3", cobbles to 6", debris present (concrete brick, asphalt) (Fill)

Note: Reworked bay mud surface encountered at 6' bgs

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**Unit Descriptions**

1. **POORLY GRADED GRAVEL (GP)** - gray to light gray, dry, loose, fine to coarse grained sand, subangular to subrounded gravel to 1", (Aggregate Base/Fill)

2. **CLAYEY GRAVEL WITH SAND (GC)** - brownish gray to grayish brown, dry to moist, dense, fine to coarse grained sand, subangular to angular gravel to 3", cobbles to 6", debris present (concrete brick, asphalt), (Fill)

   XXXX Reworked clay layer, dark gray, fine to coarse grained sand, gravel to 3"
Logged By: C. Ewing
Date: 4/25/17

Unit Descriptions

1. POORLY GRADED GRAVEL (GP) - light gray, (Aggregate Base/Fill)

2. CLAYEY GRAVEL WITH SAND (GC) - grayish brown, reddish brown, brownish gray, dry to moist, dense, fine to coarse grained sand, subangular to angular gravel to 3", cobbles to 6", (Fill)

3. FAT CLAY WITH GRAVEL (CH) - dark gray, moist, stiff, fine to coarse grained sand, subangular gravel to 3", pocket penetrometer=2.0 tsf (Fill)
Unit Descriptions

1. POORLY GRADED GRAVEL (GP) - gray to light gray, dry, loose, fine to coarse grained sand, subangular to subrounded gravel to 1” (Aggregate Base/Fill)

2. CLAYEY GRAVEL WITH SAND (GC) - mottled grayish brown, brownish gray, reddish brown, dry to moist, dense, fine to coarse grained sand, subangular to angular gravel to 3”, cobbles to 6”, concrete debris, local layers of increased clay content, (Fill)

3. FAT CLAY WITH SAND AND GRAVEL (CH) - dark gray to greenish gray, moist, stiff, fine to coarse grained sand, subangular gravel to 3”, organic odor, pocket penetrometer=1.75 tsf (Reworked Bay Mud)
Unit Descriptions

1. POORLY GRADED GRAVEL (GP) - gray to light gray, dry, loose, fine to coarse grained sand, subangular to subrounded gravel to 1” (Aggregate Base/Fill)

2. CLAYEY GRAVEL WITH SAND (GC) - mottled grayish brown, brownish gray, reddish brown, dense, dry to moist, fine to coarse grained sand, subangular to angular gravel to 3”, cobbles to 6”, concrete debris, layers of increased clay content, (Fill)

3. FAT CLAY WITH SAND AND GRAVEL (CH) - dark gray to greenish gray, moist, stiff, fine to coarse grained sand, subangular to angular gravel to 3”, organic odor, pocket penetrometer=1.75 tsf (Reworked Bay Mud)
Laboratory Test Report

Soil Test Report: Atterberg Limits

Tested on: 5/8/2017 by C. Pimentel
Material Description: Brown Clayey Gravel with Sand (GC)
Sample Location: Bulk Unit 2 (TP-1, TP-2, TP-4 & TP-6)

Test Method: ASTM D4318
Liquid Limit: 35
Plastic Limit: 19
Plasticity Index: 16

Soil Classification: GC
ASTM D2487

Reviewed on 5/9/2017 by Cindy Pimentel, Senior Technician

Limitations: Pursuant to applicable building codes, the results presented in this report are for the exclusive use of the client and the registered design professional in responsible charge. The results apply only to the samples tested. If changes to the specifications were made and not communicated to Kleinfelder, Kleinfelder assumes no responsibility for pass/fail statements (meets/did not meet), if provided. This report may not be reproduced, except in full, without written approval of Kleinfelder.
Laboratory Test Report

Client: Restoration Hardware, Inc.
Project: 20180061.001A

Villages at Corte Madera N Parking Lot
01-000L - Lab Testing

Report No.: 17-HAY-00737 Rev. 0
Issued: 5/9/2017

Field ID: HL10116
Sampled by: Date: 4/25/2017
Submitted by: M. Pucci Date: 5/2/2017

Tested on 5/2/2017 by J. Savage
Test Method: ASTM D2844
Material Description: Brown Clayey Gravel with Sand (GC)
Specific Location: Bulk Unit 2 (TP-1, TP-2, TP-4 & TP-6)

<table>
<thead>
<tr>
<th>Briquette No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Unit Weight at Test (pcf)</td>
<td>114.5</td>
<td>118.2</td>
<td>117.9</td>
</tr>
<tr>
<td>Expansion Pressure (psi)</td>
<td>160</td>
<td>87</td>
<td>303</td>
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<tr>
<td>Exudation Pressure (psi)</td>
<td>356</td>
<td>176</td>
<td>504</td>
</tr>
<tr>
<td>Moisture at Time of Test (%)</td>
<td>13.6</td>
<td>14.8</td>
<td>12.6</td>
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<tr>
<td>Resistance Value</td>
<td>21</td>
<td>11</td>
<td>31</td>
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</tbody>
</table>

R - VALUE AT 300 PSI EXUDATION PRESSURE: 18

Reviewed on 5/9/2017 by Cindy Pimentel,
Senior Technician

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Laboratory Test Report

<table>
<thead>
<tr>
<th>U.S. Standard</th>
<th>Sieve Size</th>
<th>% Passing</th>
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</thead>
<tbody>
<tr>
<td>6 Inch</td>
<td>150-mm</td>
<td>100</td>
</tr>
<tr>
<td>3 Inch</td>
<td>75-mm</td>
<td>100</td>
</tr>
<tr>
<td>2 Inch</td>
<td>50-mm</td>
<td>97</td>
</tr>
<tr>
<td>1 1/2 Inch</td>
<td>37.5-mm</td>
<td>97</td>
</tr>
<tr>
<td>1 Inch</td>
<td>25-mm</td>
<td>89</td>
</tr>
<tr>
<td>3/4 Inch</td>
<td>19-mm</td>
<td>84</td>
</tr>
<tr>
<td>1/2 Inch</td>
<td>12.5-mm</td>
<td>77</td>
</tr>
<tr>
<td>3/8 Inch</td>
<td>9.5-mm</td>
<td>72</td>
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<tr>
<td>No. 4</td>
<td>4.75-mm</td>
<td>62</td>
</tr>
<tr>
<td>No. 8</td>
<td>2.36-mm</td>
<td>55</td>
</tr>
<tr>
<td>No. 16</td>
<td>1.18-mm</td>
<td>49</td>
</tr>
<tr>
<td>No. 30</td>
<td>0.60-mm</td>
<td>45</td>
</tr>
<tr>
<td>No. 50</td>
<td>0.30-mm</td>
<td>39</td>
</tr>
<tr>
<td>No. 100</td>
<td>0.15-mm</td>
<td>33</td>
</tr>
<tr>
<td>No. 200</td>
<td>0.07-mm</td>
<td>28.7</td>
</tr>
</tbody>
</table>

Tested on 5/5/2017 by B. O'Neil
Material Description: Brown Clayey Gravel with Sand (GC)
Location: Bulk - Unit 2 (TP-1, TP-2, TP-4 & TP-6)
Test Method: ASTM D6913

Reviewed on 5/9/2017 by Cindy Pimentel, Senior Technician

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Laboratory Test Report

Client: Restoration Hardware, Inc.
Project: 20180061.001A
Villages at Corte Madera N Parking Lot
01-000L - Lab Testing

Report No.: 17-HAY-00737 Rev. 0
Issued: 5/9/2017
Field ID: HL10116
Sampled by:
Submitted by: M. Pucci
Date: 4/25/2017
Date: 5/2/2017

Tested on 5/4/2017 by B. O'Neil

Test Method: ASTM D2216

<table>
<thead>
<tr>
<th>Boring:</th>
<th>Sample:</th>
<th>Depth:</th>
<th>Water Content, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-1</td>
<td></td>
<td>2</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Remarks:

Reviewed on 5/9/2017 by Cindy Pimentel,
Senior Technician

Limitations: Pursuant to applicable building codes, the results presented in this report are for the exclusive use of the client and the registered design professional in responsible charge. The results apply only to the samples tested. If changes to the specifications were made and not communicated to Kleinfelder, Kleinfelder assumes no responsibility for pass/fail statements (meets/did not meet). If provided. This report may not be reproduced, except in full, without written approval of Kleinfelder.
<table>
<thead>
<tr>
<th>Job/Sample No.</th>
<th>Sample I.D.</th>
<th>Redox (mV)</th>
<th>pH</th>
<th>Resistivity (As Received) (ohms-cm)</th>
<th>Resistivity (100% Saturation) (ohms-cm)</th>
<th>Sulfide (mg/kg)*</th>
<th>Chloride (mg/kg)*</th>
<th>Sulfate (mg/kg)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1705089-001</td>
<td>Unit 2 @ 0'-4.0' Bulk</td>
<td>+480</td>
<td>7.95</td>
<td>1,600</td>
<td>410</td>
<td>N.D.</td>
<td>550</td>
<td>1,000</td>
</tr>
</tbody>
</table>

**Method:**
- ASTM D1498
- ASTM D4972
- ASTM G57
- ASTM G57
- ASTM D4658M
- ASTM D4327

**Reporting Limit:**
- 50
- 15
- 15

**Date Analyzed:**
- 16-May-2017
- 16-May-2017
- 18-May-2017
- 18-May-2017
- 19-May-2017
- 16-May-2017
- 16-May-2017

* Results Reported on "As Received" Basis
N.D. - None Detected

**Quality Control Summary:** All laboratory quality control parameters were found to be within established limits
Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

**Important Information about This Geotechnical-Engineering Report**

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

**Geotechnical-Engineering 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 given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared solely for the client. Th se who rely on a geotechnical-engineering report prepared for a different client can be seriously misled. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.

**Read this Report in Full**

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it in its entirety. Do not rely on an executive summary. Do not read selected elements only. Read this report in full.

**You Need to Inform Your Geotechnical Engineer about Change**

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the configuration-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- 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;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the 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. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

**This Report May Not Be Reliable**

**DO** not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If your geotechnical engineer has not indicated an “apply-by” date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

**Most of the “Findings” Related in This Report Are Professional Opinions**

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.
This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals’ plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you’ve included the material for informational purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer’s services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.