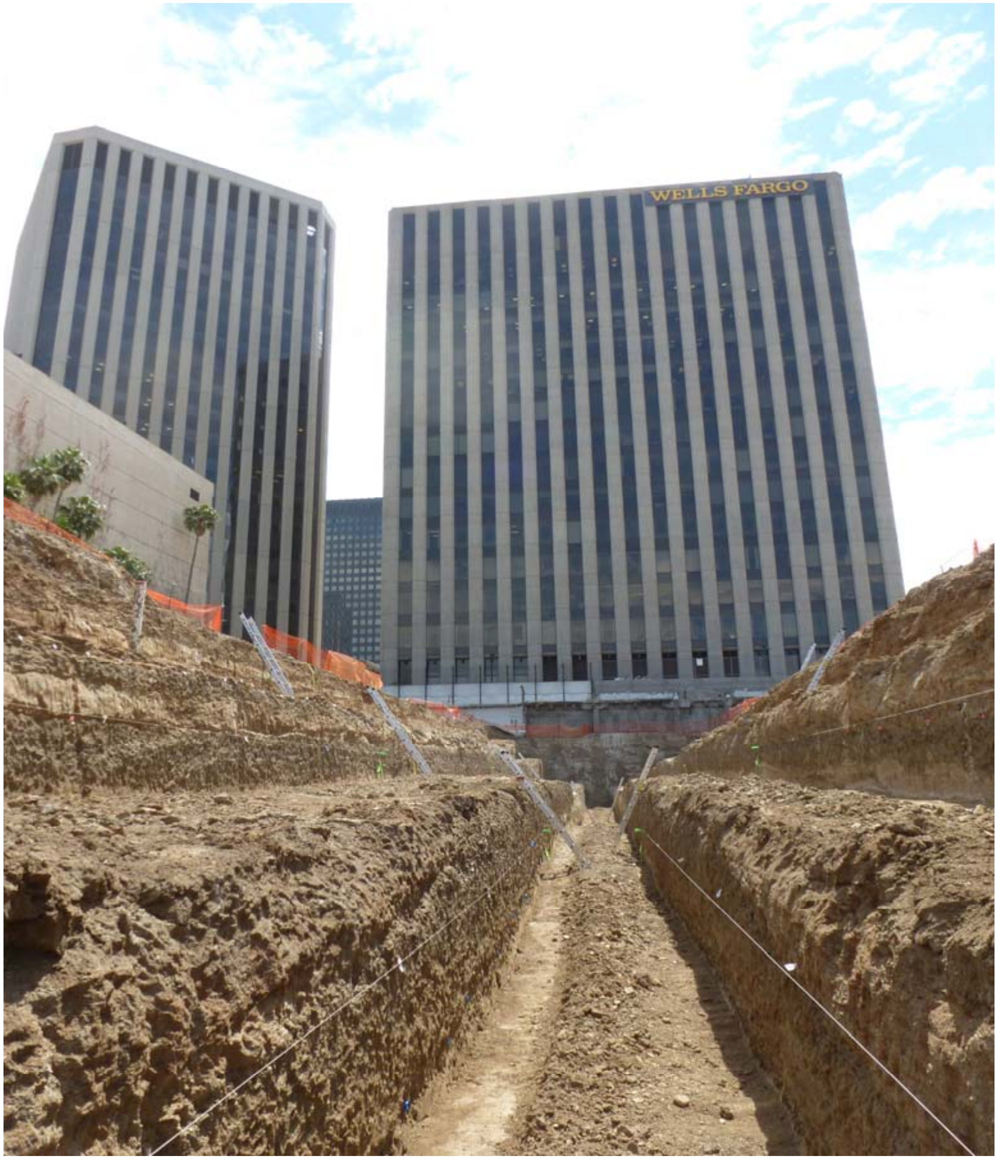

REPORT OF FAULT RUPTURE HAZARD INVESTIGATION
10000 SANTA MONICA BOULEVARD
LOS ANGELES, CALIFORNIA

AUGUST 2012

***PREPARED FOR*:**
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GEOCON WEST, INC.

August 24, 2012

Crescent Heights
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Attention: Mr. Chaim Elkoby, Director of Special Projects

Subject: REPORT OF FAULT RUPTURE HAZARD INVESTIGATION
PROPOSED DEVELOPMENT
10000 SANTA MONICA BOULEVARD
CENTURY CITY DISTRICT
LOS ANGELES, CALIFORNIA

Dear Mr. Elkoby:

Geocon West, Inc. and Feffer Geological Consulting are pleased to submit this report summarizing our fault rupture hazard investigation for the proposed development at 10000 Santa Monica Boulevard in the Century City District of Los Angeles, California. The investigation was performed to satisfy one of the conditions of approval for the project tentative tract map (Tentative Tract Map No. 71555-CN) required by the Los Angeles Department of Building and Safety, Grading Division (LADBS). It is our understanding that this report will be submitted to the City of Los Angeles Department of Building and Safety, Grading Division for their review and approval.

We appreciate the opportunity to be of service to you. Please contact us if you have any questions regarding this report, or if we may be of further service.

Very truly yours,

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FAULT RUPTURE HAZARD INVESTIGATION

1. EXECUTIVE SUMMARY

This report presents the results of our site-specific fault rupture hazard investigation for the proposed development at 10000 Santa Monica Boulevard in the Century City District of Los Angeles, California. The investigation was performed to satisfy one of the conditions of approval for the project tentative tract map (Tentative Tract Map No. 71555-CN) required by the Los Angeles Department of Building and Safety, Grading Division (LADBS).

Prior geologic studies have been performed in the Century City-Beverly Hills area by Parsons Brinkerhoff (Parsons) for the purpose of evaluating faults associated with the West Beverly Hills Lineament (WBHL) and the Santa Monica Fault Zone (SMFZ) that may impact the proposed Westside Subway Extension Project. The geologic studies included subsurface explorations, consisting of continuous-core borings and cone penetration tests (CPTs), and geophysical surveys; however, trench excavations were not performed. Parsons' interpretation of the subsurface data identified a series of north-south trending faults that define the WBHL in the Century City-Beverly Hills area. These faults were considered active based solely on the interpreted offset of geologic units at depth and the presumed association with the active NIFZ. Two of the presumed "active" faults shown in the Parsons report traverse the 10000 Santa Monica site. The SMFZ was not identified at the Project Site.

The Parsons investigation also identified north-south trending faults associated with the WBHL to be present on the Beverly Hills High School site, located adjacent to and south of the 10000 Santa Monica site. To investigate these faults, Leighton Consulting, Inc. (Leighton) performed detailed studies for Beverly Hills Unified School District that included four exploratory trenches, 21 continuous core borings and 12 CPTs. Based on geologic units exposed in the site-specific trenches and explorations, Leighton concluded that no active faults are present at the high school site which could indicate active faulting at 10000 Santa Monica Boulevard.

Kenney GeoScience (Kenney) was part of the Beverly Hills Unified School District investigative team acting as an overview consultant for the fault investigation. In addition to the overview role, Kenney performed geomorphic, structural, and stratigraphic analysis to evaluate the regional geomorphology and pedochronology of the Century City area to understand the tectonic regime and to evaluate the location and activity levels of suspected faults in the area. The preliminary conclusions of the Kenney study, as they relate to the 10000 Santa Monica site, indicate that the faults proposed by Parsons as part of the WBHL do not exist.

Geocon West Inc. (Geocon) and Feffer Geological Consulting (Feffer) performed a site-specific fault rupture hazard investigation to evaluate the presence of the faults identified by Parsons at the 10000 Santa Monica site. Our investigation included excavation of one continuous exploratory trench across the Project Site to depths between 18 and 20 feet beneath the existing ground surface. The trench was excavated perpendicular to the trend of the postulated faults and shadowed the footprint of the proposed development at the Project Site to the south. Given that the WBHL is postulated to project in a northerly direction from the Newport-Inglewood Fault Zone located to the south, failure to detect active faulting within the trench would preclude faulting within the footprint of the proposed Project building.

The geologic units exposed in the trench consist of Pleistocene age Older Benedict Canyon Wash Deposits and localized paleochannel deposits that were logged as 10 distinct units. Holocene age sediments were not encountered at the Project Site. The age of the sediments was evaluated using standard stratigraphic-dating techniques and yielded a minimum age of between 30 and 60 ka (thousand years before present). The age of the entire stratigraphic section is estimated to be between 208 and 345 ka.

No faults were observed at the Project Site during our investigation. The units exposed within the trench are laterally continuous throughout the excavation and are not offset by faulting. This condition clearly rules out the presence of faulting within the depth explored.

Based on the results of our investigation, we conclude that active faults are not present beneath the footprint of the proposed development. Furthermore, if faults are present at depths below our exploration, these faults would not be considered active based on the minimum age of the sediments (>100 ka) at the base of the trench.

2. INTRODUCTION AND BACKGROUND

2.1. General

The Project Site is located at 10000 Santa Monica Boulevard in Los Angeles, California. The Project Site is bounded by Santa Monica Boulevard on the north, Moreno Drive on the east, Beverly Hills High School on the south, and an existing commercial high-rise development on the west. The location of the Project Site is indicated in Figure 1, Vicinity Map.

Prior to 2006, the Project Site was occupied by office and restaurant uses totaling over approximately 130,500 square feet with a separate above-ground parking structure. The Project Site is currently vacant. The proposed development will include a high-rise tower over one partial subterranean level and an adjacent parking structure. The proposed development and footprints of planned structures is indicated on Figure 2, Site Plan.

Topography at the Project Site has been altered by grading and demolition activities associated with the prior development. Current elevations range from approximately 275 feet in the northwest corner to 261 feet in the southeast corner. As indicated on Figure 3, Historical Topographic Map, site elevations in the 1920s ranged from 270 to 275 feet above mean sea level and the topography sloped gently to the east-northeast.

The Project Site is located in the Cheviot Hills and is underlain by Pleistocene age alluvial sediments. Geologic maps by the United States Geological Survey (Yerkes and Campbell, 2005) indicate that active faults are not present at the Project Site. Based on the USGS map, the closest active faults are the Santa Monica Fault, the Newport-Inglewood Fault, and the Hollywood Fault located 0.3 mile north-northwest, 0.2 mile east, and 1.4 mile north of the Project Site respectively. The geologic conditions in the project area are indicated on Figure 4, Regional Geologic Map.

In 2007 and 2011, Feffer Geological Consulting (Feffer) performed preliminary geotechnical investigations at the Project Site for the proposed development that included drilling eight borings and advancing four cone penetration tests (CPTs). The reports addressed geologic-seismic hazards and correctly concluded that hazards associated with surface fault rupture do not exist at the Project Site. The 2011 Feffer geotechnical investigation report was included as Appendix D of the project's Draft Environmental Impact Report (DEIR).

2.2. Parsons Fault Study

During circulation of the project DEIR for public comment, Metropolitan Transportation Authority (METRO) published the Century City Area Fault Investigation Report dated October 14, 2011 prepared by Parsons Brinckerhoff (Parsons). The Parsons report summarized the results of a wide-spread subsurface investigation performed for the purpose of evaluating faults associated with the West Beverly Hills Lineament (WBHL) and the Santa Monica Fault Zone (SMFZ) that may impact the proposed Westside Subway Extension Project.

The subsurface investigation included continuous-core borings, cone penetration tests (CPTs), and geophysical surveys; however, trenching and soil age-dating was not performed. Based on Parsons' interpretation of the subsurface data, faults associated with the SMFZ were identified north and west of the Project Site. The study also identified an approximately 800-foot-wide zone of northerly trending faults that are postulated to be active and define the WBHL. These faults were considered active based solely on the interpreted offset of geologic units at depth and the presumed association with the active NIFZ located several miles to the south. Two WBHL faults identified in the Parsons study are postulated to traverse the 10000 Santa Monica site as indicated on Figure 5, Parsons Fault Map.

2.3. GeoDesign Study

In response to public comments regarding the newly identified "active" faults in the Century City area, GeoDesign, Inc. (GeoDesign) performed an independent analysis of the Parsons subsurface data to evaluate the existence and activity levels of the newly postulated faults. The GeoDesign analysis included correlation of the pertinent Parsons boring and CPT data and concluded that the data does not support the findings that active faults are present at the Project Site.

Based on the results of the GeoDesign evaluation (GeoDesign, 2011), the City of Los Angeles provided a conditional approval of the FEIR for the proposed tentative tract map requiring that a site-specific fault investigation be performed.

2.4. Beverly Hills High School Fault Study

Other geologic studies were performed to specifically address Parsons' postulated active faults in the Century City area. Leighton Consulting, Inc. (Leighton) performed detailed studies for Beverly Hills Unified School District to evaluate the presence and activity levels of these faults at Beverly Hills High School and Rodeo Elementary School.

At Beverly Hills High School, located adjacent to and south of the Project Site, Leighton excavated and logged four exploratory trenches, drilled 21 continuous core borings and performed 12 CPTs to evaluate the presence and age of the Parsons faults postulated to exist at the high school site. Leighton retained Earth Consultants International (ECI) and Soil Tectonics to provide soil stratigraphic age estimates. The soils were analyzed in two trenches in the central portion of the campus and one boring (CB-13) located in the alley between Beverly Hills High School and the 10000 Santa Monica site. The results of Soil Tectonics evaluation corroborated those of ECI and, as summarized in the Leighton report, concluded that the majority of the campus is located on an "older geomorphically stable alluvial fan surface" and soils exposed at the surface of this fan surface are estimated to have a minimum age of between 70 and 100 ka (Leighton, 2012).

The results of Leighton's investigation indicate the WBHL faults proposed by Parsons do not exist and there is no evidence of active faults at the Beverly Hills High School site. Given that the WBHL is postulated to extend in a northerly direction from the Newport-Inglewood Fault Zone, this indicates that no active faults extend from the high school site toward the Project Site. The locations of the Leighton explorations and the postulated active faults on the campus are provided on Figure 5.

2.5. Kenney GeoScience Study

Kenney GeoScience (Kenney) was retained as part of the Beverly Hills Unified School District investigative team acting as an overview consultant for the fault investigation. In addition to the overview role, Kenney performed geomorphic, structural, and stratigraphic analyses to "establish a regional geologic context in which to evaluate the site-specific data being generated" as a result of the recent geologic studies being performed in the Century City area. The Kenney investigation was a study of the stratigraphy, geomorphology, and pedochronology of the region that evaluated the tectonic regime and the location and activity levels of suspected faults in the area. The preliminary conclusions of the Kenney study, as they relate to the 10000 Santa Monica site, indicate that the Parsons WBHL faults either do not exist in the study area or are not active.

3. PURPOSE AND SCOPE

The purpose of our investigation was to satisfy the following condition of approval for the project tentative tract map.

> *Prior to issuance of any permits or the recordation of the tentative tract map, a detailed site investigation for the possible active faulting shall be submitted to the Grading Division for review and approval. It is suggested that the exploration plan be provided to the Grading Division for comments prior to commencing any exploration.*

The scope of our investigation included a document review, field exploration, soil stratigraphic analyses, relative age determinations, and preparation of this report. The document review included the technical reports for the previously discussed Parsons fault study, the Leighton fault study at Beverly Hills High School, and the Kenney GeoScience regional geologic study. A complete list of the documents reviewed as part of this study is presented in the *List of References* section of this report.

Our field exploration included excavation of one continuous exploratory trench across the postulated traces of the two north-south trending faults proposed at the Project Site by Parsons. After excavation, the trench was cleaned of smeared soil and logged. Upon completion of logging, geologists from the City of Los Angeles Department of Building and Safety and the California Geological Survey visited the Project Site to observe the sediments exposed in the trench and confirm our results. A description of our exploration program is presented in Section 7.0 of this report.

Logging of the trench was performed by geologists from Feffer and Geocon in conjunction with Mr. Gary Butler of Rincon Geoscience. Soil stratigraphic analyses and relative age determinations were performed by Mr. John Helms, of High Desert Consulting, Inc. The results of the soil-age analysis are presented in Appendix A.

4. FAULT ACTIVITY CRITERIA

The criteria used in our investigation to evaluate fault activity are the same criteria used by the California Geological Survey (CGS) that defines an active fault one that has had surface displacement within Holocene time (about the last 11,000 years). These criteria for defining an active fault are based on standards developed by the CGS (Bryant and Hart, 2007) for the Alquist-Priolo Earthquake Fault Zoning Program. Faults that have not moved in the last 11,000 years are not considered active.

In general, the activity rating of a fault is determined by establishing the age of the youngest materials displaced by the fault. If datable material is present, an absolute age can sometimes be established; if no datable material exists, then only a relative age can be assigned to movement on the fault. For faults that have evidence of movement in the last 11,000 years, to be included in an Alquist-Priolo fault zone, these faults must demonstrate evidence of being "sufficiently active and well-defined".

As indicted in CGS Special Publication 42:

- A fault is deemed "sufficiently active" if there is evidence of Holocene surface displacement along one or more of its segments or branches. Holocene surface displacement may be directly observable or inferred and does not need to be present everywhere along a fault to qualify a fault for zoning.

- A fault is considered "well-defined" if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The fault may be identified by direct observation or by indirect methods. The critical consideration is that the fault or some part of it can be located in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

5. GEOLOGIC SETTING

The Project Site is located in the Century City area on the northern edge of the uplifted and dissected Cheviot Hills. The sediments exposed in the area consist of Pleistocene age alluvial and fluvial sediments at the ground surface underlain by Pleistocene age marine sediments of the San Pedro Formation at depth. Holocene age material is present locally in young drainages and in the present day Benedict Canyon drainage that defines the eastern boundary of the Cheviot Hills.

The Cheviot Hills are located near the intersection of the Santa Monica Fault Zone and the NIFZ/WBHL. Figure 4 illustrates the generally accepted pre-2011 (pre-Parsons fault study) location of these faults zones.

The faulting associated with these two fault zones is complex and poorly understood due to the lack of subsurface data and intense urbanization of the area. Until the Parsons study, and cited recent investigations in the Beverly Hills/Century City area, there has been limited subsurface data to provide a clear understanding of Quaternary faulting associated with these fault zones.

Uplift in the Cheviot Hills has been thought to be related mainly to faulting. However, the recent study by Kenney (2012) proposes that deformation and uplift of the hills may be a result of folding, not faulting. Based on interpretation of topographic contours, Kenney interpreted the hills to be an antiformal structure and the eastern limb may extend across the WBHL and east of Benedict Canyon Wash (Kenney, 2012).

Kenney's tectonic model for the Cheviot Hills and surrounding area postulates that the deformation and uplift of the hills has been on-going since the late Pleistocene. South of Santa Monica Boulevard, Kenney proposes that the hills have been uplifted along a north-south axis parallel to the WBHL and Benedict Canyon Wash. The model suggests that the Ancient Benedict Canyon Wash flowed to the southwest and had sufficient stream power to erode the Cheviot Hills during uplift. Channel incision and the subsequent infilling ceased about 40,000 to 50,000 years ago and resulted in an eastward lateral migration of the Benedict Canyon drainage to its present-day course (Kenney, 2012).

6. NEWPORT-INGLEWOOD FAULT ZONE / WEST BEVERLY HILLS LINEAMENT

The Newport-Inglewood Fault Zone (NIFZ) is a known active feature that is well defined in the Baldwin Hills and toward the southeast to the Newport Beach area where the fault extends offshore. The NIFZ is a left-lateral strike-slip fault. This means that the majority of movement along the fault as a result of an earthquake event is horizontal. However, based on our prior fault investigations along the NIFZ and documented historic movement, a component of vertical offset during an earthquake event is also typical.

The WBHL is a linear geomorphic feature suspected to be a fault by some geologists and either a fold scarp or actually nonexistent by others. WBHL has been postulated to constitute the northern extension of the NIFZ. However, Alquist-Priolo Earthquake Fault Zones have not been established for this fault because of lack of evidence for being "sufficiently active and well-defined". The current thinking in the technical community is that the Newport-Inglewood Fault Zone (NIFZ) is active. It has been proposed that the WBHL is the northerly extension of the NIFZ however, until the Parsons study, there has been little to no subsurface data to confirm the suspected WBHL faults location or activity level

The Parsons fault study provided additional subsurface information to fill in some of the data gaps along the northern terminus of the Newport-Inglewood Fault Zone. As previously discussed, the Parsons study identified a broad zone of northerly-trending faults in the Century City area, reported to be active based on their assumed relationship with the Newport-Inglewood Fault Zone. However, the faults interpreted by Parsons were not identified in the shallow subsurface and did not clearly offset the near-surface Pleistocene age or Holocene age soils, raising questions regarding their "active" designation.

The results of the recent fault study by Leighton concluded that the north-south trending WBHL faults mapped by Parsons do not exist at the high school site. Leighton found no evidence that faulting associated with the WBHL has occurred for at least 70,000 to 100,000 years and perhaps more than 500,000 years.

Also, the results of the Kenney study (2012) indicate that the "Parsons (2011) proposed West Beverly Hills Lineament – Newport Inglewood Fault Zone do not exist in the study area." This conclusion is based on analysis of the data generated by Leighton as part of the fault study at Beverly Hills High School and geomorphic analyses that indicate that geomorphic evidence for faulting associated with the WBHL does not exist.

Kenney's conclusion is consistent with the Leighton study and the results of this study that indicate that the WBHL faults identified by Parsons do not exist.

7. FIELD INVESTIGATION

The field investigation was performed by members of our team including geologists from Feffer Geological Consulting (including field logging by Rincon Geoscience), and Geocon West. The field investigation began on June 18, 2012 and was completed July 20, 2012.

One trench, approximately 308 feet long, was excavated at the Project Site to depths between approximately 18 and 20 feet below the existing ground surface. The trench provided a continuous exposure of the subsurface materials within Parsons' postulated "zone of faulting" with no data gaps.

The location of the trench was based on the previously postulated fault locations and trends and the locations of deep fill materials, and existing pad foundations and concrete slabs remaining after the demolition of the pre-existing building at the Project Site. The trench excavation is oriented perpendicular to the postulated fault traces, traversed the two postulated fault locations, and shadowed the tower footprint as indicated on Figure 6, Trench Location Plan.

The trench was excavated with a track-mounted excavator equipped with a 4-foot-wide bucket. The trench excavation was stepped in four benches that were approximately five feet in both width and height.

Detailed logging of the trench walls was performed at a scale of 1 inch equals 5 feet. Lateral stationing as well as top and bottom of the trench and bench elevations were surveyed for accuracy. Horizontal string lines (vertical reference datum) were established across the entire trench for each bench.

The surface of the natural sediments exposed on both trench walls was cleaned of smeared earth material and closely examined for indications of faulting. These indications could include offset geologic units, contacts, or laminations (bedding), tectonically disturbed or deformed clay layers, clay gouge, soil- or clay-filled fractures, fissures, or striae on surfaces. Distinct geologic units were identified and delineated by nails and flagging on the south trench wall and the easterly 100 feet of the north trench wall.

Identification of distinct units was based on criteria that included lateral continuity, degree of soil development, color, lithology, fabric (i.e. fining upward sequences), texture, and degree of weathering. The contacts (lithologic and pedogenic) between the designated units, locations of fractures, and unique features exposed in the trench walls were logged in the field.

After the trench was logged, geologists from the City of Los Angeles Department of Building and Safety and the California Geological Survey visited the Project Site to observe the sediments exposed in the trench and confirm our results.

The trench log and detailed description of the geologic units observed in the trench are summarized below and detailed on Figure 7, Trench Log. Select photographs of the trench excavation and unique features exposed in the trench are included in Appendix B. A complete photographic log of the trench is presented in Appendix C.

8. SUBSURFACE CONDITIONS

8.1. General Geologic Units

The geologic units exposed in the trench are Pleistocene age alluvial sediments. These sediments are designated as the Older Benedict Canyon Wash Deposits (OBCWD) as described by Kenney (2012).

The primary stratigraphy consists of a series of stacked fining upward sequences with varying degrees of strong soil development. These sediments are laterally continuous, except where locally eroded by stream action and subsequently infilled. The overall stratigraphic section is gently inclined to the east.

The sediments were divided into 10 distinctive units for the purposes of logging. The units logged in the trench were defined based on primary stratigraphy and correlated well with the stacked buried argillic soil horizons identified in the project soil stratigraphy and relative age study (discussed in Section 9).

We consider the geologic units observed at the Project Site to represent the youngest (or the upper) section of the OBCWD. However, for the purposes of this report, the primary geologic units observed are divided into two units: OBCWD and Paleochannel Deposits.

These primary geologic units are described in detail on the trench log and summarized below.

8.2. Paleochannel Deposits

The paleochannel deposits are comprised of two distinct units representing at least two scour and fill sequences. These deposits are present approximately between Stations 2+20 and 2+90. Based on soil-age dating analysis, this depositional sequence has an estimated minimum age of 30 ka and represents four stacked, truncated and buried argillic soil horizons. Parent materials are mostly preserved at the base of the mapped units and are thought to be debris flows and younger alluvial deposits.

The younger unit, interpreted as a stream terrace deposit (Unit 1), is characterized by fine- to coarse-grained interfingering sand and gravel beds. The lower portion of this unit is well bedded fine- to coarse-grained sand and gravel, friable, and highly oxidized. The basal contact is mostly distinct and abrupt defined by scour zones eroding Unit 2 below.

The older unit, interpreted as a debris flow (Unit 2), fills the majority of the channel and is characterized by predominantly fine- to medium-grained silty sand with randomly oriented gravel clasts distributed throughout the unit. The debris flow is massive and except at the base where there are localized gravel beds concentrated in scour zones.

8.3. Older Benedict Canyon Wash Deposits

The Older Benedict Canyon Wash Deposits are comprised of eight units defined by primary stratigraphy and distinct and laterally continuous contacts. These deposits are present along the entire trench exposure. Based on soil-age dating analysis, this depositional sequence has an estimated minimum age of 60 ka and represents at least five stacked, truncated and buried argillic soil horizons. Parent materials are mostly preserved at the base of the mapped units and are thought to be stream terrace deposits.

The primary stratigraphy of the Older Benedict Canyon Wash Deposits consist of predominantly fine- to medium grained sand with varying amounts of silt and gravel at the base with an increase in silt and clay content near the top. The stratigraphic units range from locally well-bedded to massive. Gravel clasts are mostly subangular to subrounded Santa Monica Slate and diatomaceous siltstone that is thought to have originated from the Santa Monica Mountains and transported downstream in the Ancient Benedict Canyon Wash.

Varying degrees of oxidation are present in these deposits and localized carbonate nodules and caliche stringers are common. Buried soils with moderate to strong ped development, secondary clay films on ped faces, and pinhole to 1/16-inch voids are present at the top of most of the mapped units. Most basal contacts are sharp and defined by scour zones eroding the unit below.

The degree of soil development on the parent materials, characteristics of the buried soil horizons, and estimated age of the units are described in detail in Appendix A. A detailed description of each unit is presented on Figure 7, Log of Trench. As indicated on Figure 7, there are no offsets within the observed deposits and no evidence of faulting.

8.4. Fractures

Near-vertical discontinuous fractures were widespread throughout the trench exposure. The fractures ranged from closed to 1/16-inch wide and were locally filled with secondary carbonate materials thought to be a result of post-depositional leaching from groundwater. Many of the fractures exhibited staining along the fracture surface and extending outward up to an inch on either side. This staining was typically greenish-gray (Gley 1 5/1) and believed to be associated with a past anaerobic condition.

The fractures were vertically and laterally discontinuous and were observed to be present in most of the stratigraphic units but did not typically extend the vertical height of the trench or laterally across the trench. Most fractures were confined to Unit 5 (estimated minimum age 83 ka) or older deposits. Only one fracture was observed in Unit 4 (estimated minimum age 60 ka) at approximately Station 0+20. The observed fracture orientation ranges from N10E to N13W and dips from 78 degrees to vertical.

To rule out a fault origin, each fracture was thoroughly cleaned and closely evaluated to confirm that the fractures did not exhibit features that could be indicative of a fault origin such as offset geologic contacts across the fracture or shearing. Careful evaluation of each fracture confirmed that no offset of geologic contacts across the fractures occurred and that shearing was not observed. Based on the absence of offset contacts or shearing and the widespread lateral and vertical discontinuous nature of the fractures, we conclude these features are not related to faulting. We interpret the fractures observed in the trench exposures to be post-depositional secondary features likely related to ground shaking.

Prevalent fractures observed in the trench are indicated on Figure 7 and photographs of representative fractures are included as Figures B8 and B9 in Appendix B.

9. SOIL STRATIGRAPHY AND RELATIVE AGE ESTIMATES

9.1. General

The main line of evidence for evaluating the presence or absence of faulting at the Project Site is the continuity of the primary stratigraphy. An additional line of evidence is the continuity and age of identified soil horizons across the Project Site.

As previously discussed, the California Geological Survey as specified in the Alquist-Priolo Earthquake Fault Zoning Act, defines an active fault as those that have had surface displacement within Holocene time (about the last 11,000 years). Therefore, it is important to establish the relative age of the sediments at the Project Site, particularly if they are suspected to be affected by faulting, to establish the age of the potential faults.

Absolute age-dating techniques, such as radiocarbon dating, are the most desirable methods to estimate the relative age of the sediments for evaluating fault activity. When absolute age dating methods cannot be used (i.e. due to the absence of carbon for sampling and testing), relative age-dating methods can be used to estimate the minimum age of sediments based on the degree of soil development.

Mr. John Helms of High Desert Consulting, Inc. was retained to assess the relative age of the sediments encountered at the Project Site based on soil stratigraphy, the degree of weathering of the parent material, and the degree of soil development. Three soil profiles (stratigraphic sections) were evaluated using several techniques to estimate the age of the soils exposed in the trench. The location of the three soil profiles are at approximately Stations 0+45, 1+90, and 2+70 as indicated on Figure 7.

As previously described, the soils observed in the trench are Pleistocene age and have developed in alluvial environments. These alluvial deposits consist of a series of stacked, truncated, and buried argillic soil horizons. The buried soils typically have 10YR colors with a moderate amount of secondary (pedogenic) clay. Structure is typically moderately strong subangular to angular blocky and very hard. Clay films are abundant and moderately thick. Most of the buried soils contain strong mottling (oxidation) and gleying (reduction) that increases with depth and overprints and masks some of the original soil properties.

The following summarizes general characteristics pertinent to each evaluated soil profile.

9.2. Soil Profile 1

The soil profile at Station 0+46 consists of five buried soils estimated to be 208 to 345 ka. Most of the age resides within the lowest two soils (buried soils 4 and 5). The upper five soils (surface soil and buried soils 1 through 4) within this profile correlate well to Soil Profile 2 at Station 1+90. The lowest portion of buried soil 4 is continuous across the entire trench exposure and correlates with the lowest portion of buried soil 5 in Soil Profile 2 and the lowest portion of buried soil 6 in Soil Profile 3.

9.3. Soil Profile 2

The soil profile at Station 1+90 consists of five buried soils estimated to be 168 to 315 ka. Most of the age resides within the lowest soil (buried soil 5). The five buried soils correlate well to the surface and the first four buried soils within Soil Profile 1. The lowest portion of buried soil 5 is continuous across the trench exposure and correlates with the lowest portion of buried soil 4 in Soil Profile 1 and the lowest portion of buried soil 6 in Soil Profile 3.

9.4. Soil Profile 3

The soil profile at Station 2+70 consists of six buried soils estimated to be 153 to 265 ka. Most of the age resides within the lowest soil (buried soil 6). The surface soil plus the first five buried soils within this profile represent the channel infill (Trench Units 1 and 2) and do not directly correlate to the OBCWD observed at Soil Profile 1 and Soil Profile 2. The channel infill soils have a relative age estimate of between 83 and 165 ka. The lowest portion of the buried soil 6 is continuous across the trench exposure and correlates with the lowest portion of buried soil 5 in Soil Profile 2 and the lowest portion of buried soil 4 in Soil Profile 1.

The following table shows the correlation between the soil horizons and the logged geologic units and the estimated relative age.

Trench Log Unit –Soil Profile Correlation

Trench Log Unit	Soil Profile	Soil Horizon	Age (ka)
1	3	surface soil, buried soil 1	30 - 60
2	3	buried soil 2, 3, and 4	68 - 135
4	1	surface soil	60 - 140
	2	surface soil, buried soil 1	
5	1	buried soil 1 and 2	83 - 185
	2	buried soil 2 and 3	
6	1	buried soil 3	98 - 215
	2	buried soil 4	
7	1	buried soil 4 (upper portion)	138 - 245
	2	buried soil 5 (upper portion)	
	3	buried soil 5	
8	1	buried soil 4 (lower portion)	153 - 245
	2	buried soil 5 (lower portion)	
	3	buried soil 5	
9	1	buried soil 4 (lower portion)	168 - 315
10	1	buried soil 5	208 - 345

Based on the soil analysis, five to six distinct buried soil horizons were identified that are laterally continuous in the western and central portions of the Project Site. In the eastern portion of the Project Site, the lateral continuity of the soils is disrupted due to the infilling of an ancient channel scour but continue across the channel at the same thickness and projected inclination. The lower portions of buried soils 4 (Soil Profile 1), buried soil 5 (Soil Profile 2) and buried soil 6 (Soil Profile 3) corresponding to primary stratigraphic Unit 8 on Figure 7 can be mapped across the trench. This soil horizon is estimated to be a minimum age of 153 ka.

The detailed stratigraphic analysis and relative age determinations and soil correlations are presented in Appendix A.

10. DATA INTERPRETATION

The geologic units exposed in the trench are Pleistocene age alluvial sediments that represent the youngest or the upper section of the Older Benedict Canyon Wash Deposits (OBCWD). The primary stratigraphy consists of a series of stacked fining upward sequences with varying degrees of strong soil development.

The stratigraphic sequence at the Project Site is suggestive of successive episodes of deposition in an alluvial environment that was undergoing uplift at the time of deposition. The stacked buried soil horizons suggest enough time elapsed between episodes of deposition to allow soil development at the surface.

The overall stratigraphic section dips gently to the east. This uniform inclination to the east is consistent with Kenney's model that suggests that the Cheviot Hills are folded into a monoclonal sequence. The sediments exposed in the trench are clearly folded in a manner consistent with Kenny's structural model.

The primary stratigraphic units logged in the trench correlate well with soil horizons identified as part of the Helms soil age-dating study. Based on the results of our soil-dating analysis (Helms, 2012), the OBCWD at the Project Site are estimated to be between a minimum of 30 and 60 ka and the entire stratigraphic section is estimated to be between 208 and 345 ka. This age correlates well with the estimated 40 ka age of the 275T fan-terrace surface identified by Kenney (2012) on which the Project Site is located. The estimated ages also correlate well with soil ages reported by Leighton (2012).

The alluvial deposits are laterally continuous across the trench except in a localized area where the upper five geologic units have been locally truncated/eroded by an ancient channel (approximately between Stations 2+20 and 2+90). The area of channel erosion was subsequently in-filled by fine-grained debris flows and later sand and gravel deposits that have an estimated minimum age of 30 ka.

The alluvial units eroded by the ancient channel are present on both sides of the channel and there is no evidence of faulting or displacement of these units (i.e. change in unit inclination or thickening or thinning of units across the channel; shearing; lateral or vertical offset of units). There is also no evidence of faulting within the paleochannel deposits. In addition, as indicated on Figure 7, the contact between Units 7 and 8 are continuous beneath the channel and across the entire trench exposure and are not affected by faulting.

No faults or fault features suggestive of faulting were observed at the Project Site during our investigation. The continuity of the geologic units exposed at the base of the trench clearly rules out the presence of faulting within the depth explored.

11. CONCLUSIONS

Based on the results of our investigation, we conclude that active faults are not present at the Project Site. If faults are present at depths below our exploration, these faults would not be considered active based on the minimum age of the sediments (>100 ka) exposed at the base of the trench.

The following summarizes our conclusions:

1. No evidence of faulting was observed at the Project Site,

2. The sediments at the Project Site are Pleistocene age (minimum age of 30 to 60 ka),

3. The WBHL faults identified by Parsons are not present at the Project Site,

4. The Project Site is considered free of hazards associated with surface fault rupture.

We can document that stratigraphic units estimated to be a minimum age of 100 ka are exposed at the bottom of the trench, extend continuously throughout the length of the trench and below the channel, and are not offset by faulting. These laterally continuous units at the base of the trench clearly rule out the presence of faulting within the depth explored.

Based on the estimated minimum age of the geologic units exposed in the trench, faults, if present at the Project Site below the depth explored, would not be considered active as they would be in excess of 100,000 years old.

Based on the results of our investigation, we conclude that active faults associated with the NIFZ/WBHL are not present at the Project Site. Our conclusions are consistent with the conclusions of the Leighton study (2012) and the Kenney study (20112) that indicates that the WBHL faults identified by Parsons do not exist in the study area.

Based on our findings, no restrictions on future development of the Project Site are necessary with respect to the hazard of surface fault rupture, beyond the standard seismic engineering requirements for all buildings in California.

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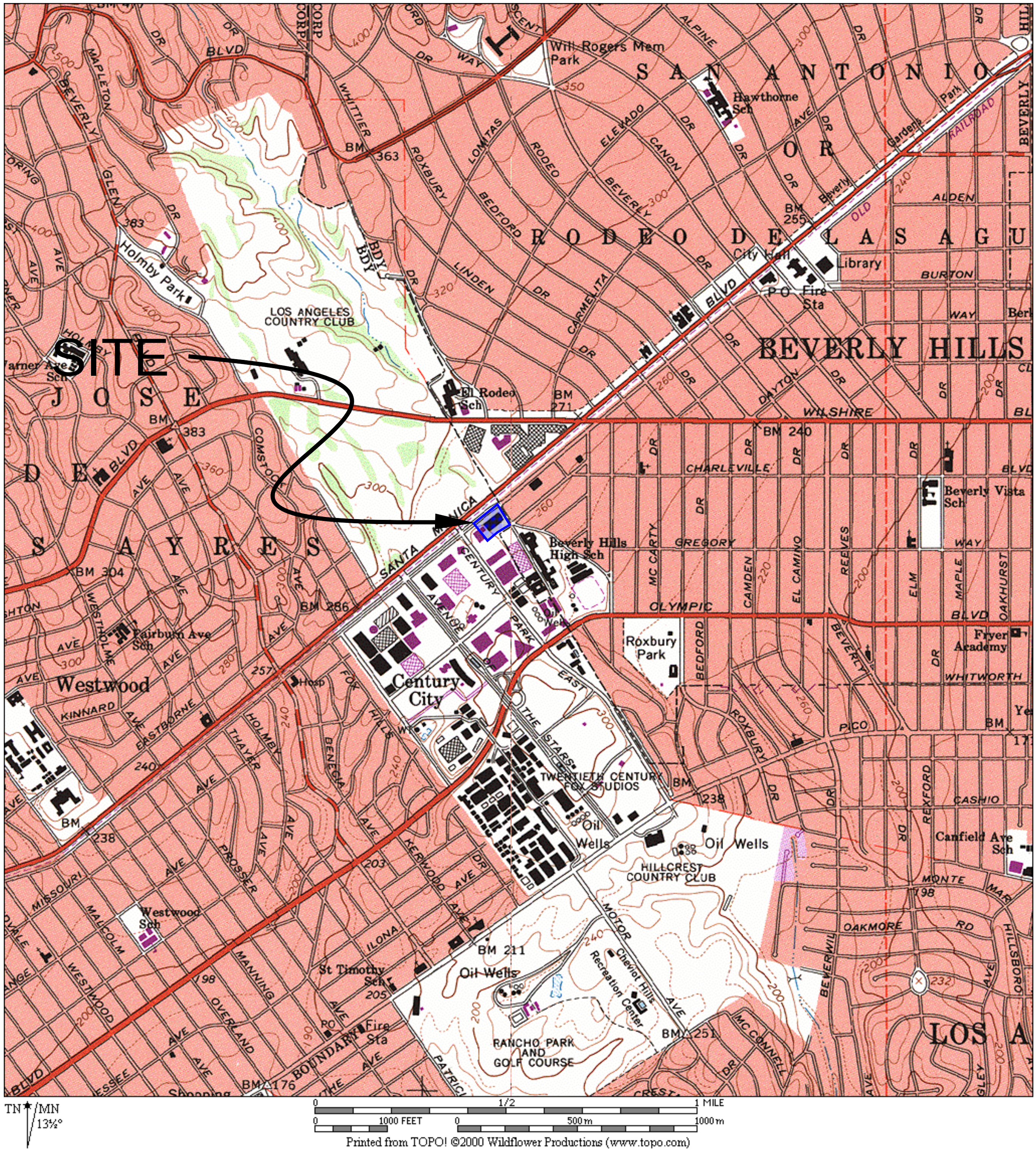

REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, BEVERLY HILLS, CA QUADRANGLE

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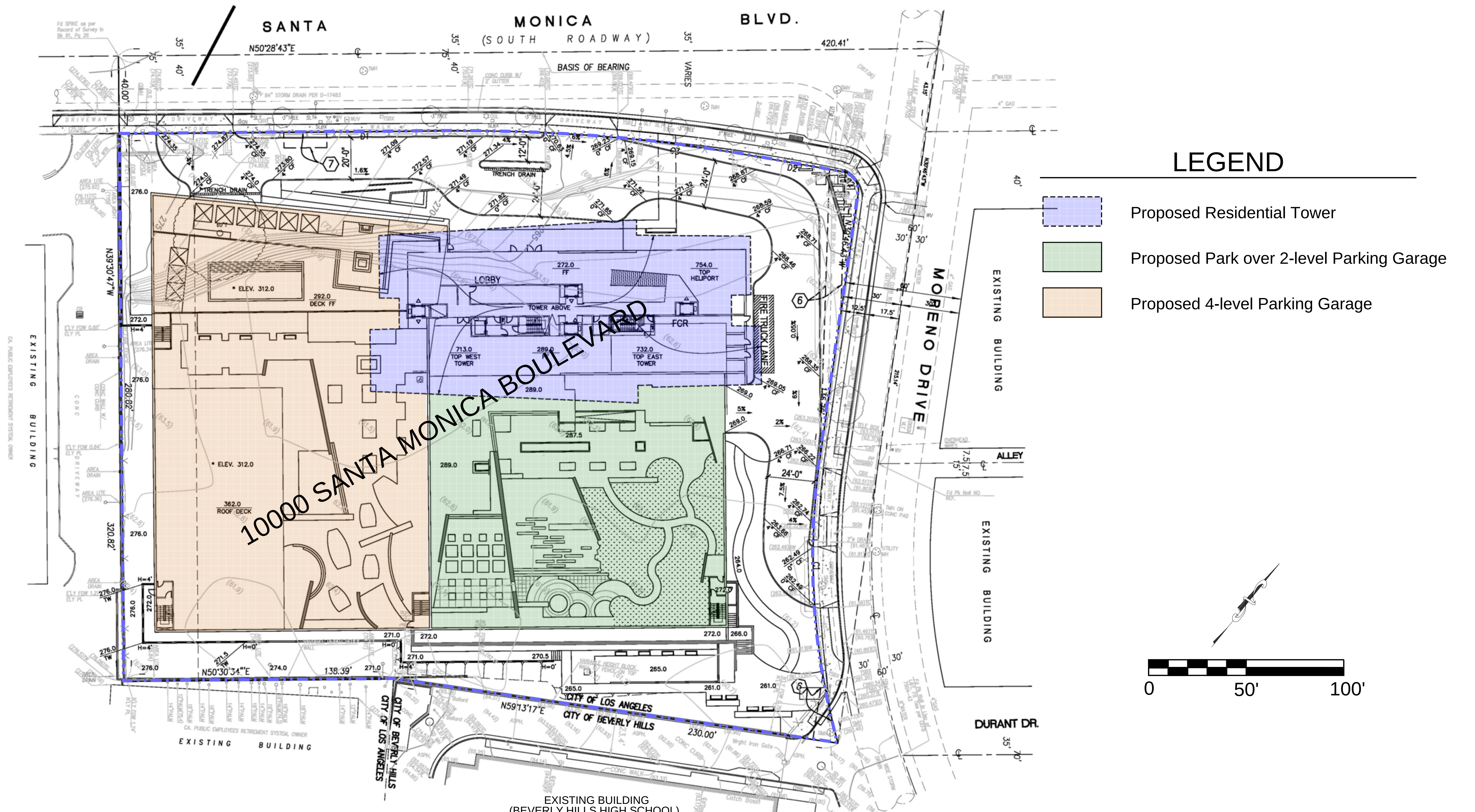
VICINITY MAP

FAULT RUPTURE HAZARD INVESTIGATION
10000 SANTA MONICA BOULEVARD
LOS ANGELES, CALIFORNIA

AUG. 20, 2012	PROJECT NO. A8928-06-01	FIG. 1



PLAN BY: S.E.C Civil Engineers, Inc.

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SITE PLAN		
FAULT RUPTURE HAZARD INVESTIGATION 10000 SANTA MONICA BOULEVARD LOS ANGELES, CALIFORNIA		
AUG. 20, 2012	PROJECT NO. A8928-06-01	FIG. 2

REFERENCE: U.S.G.S., 1928, TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, BEVERLY HILLS, CA QUADRANGLE

GEOCON WEST, INC.

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HISTORICAL TOPOGRAPHIC MAP

FAULT RUPTURE HAZARD INVESTIGATION

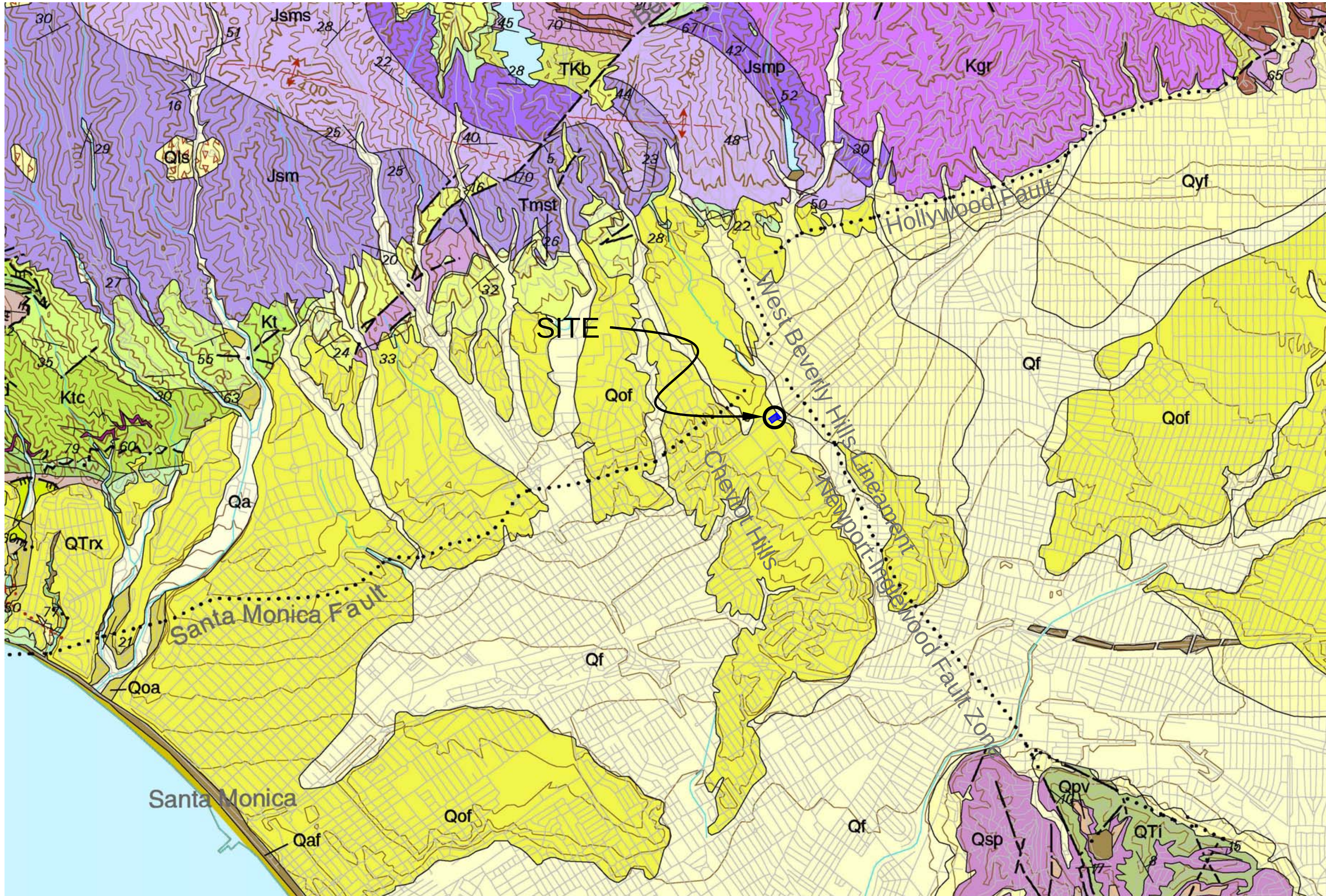
10000 SANTA MONICA BOULEVARD

LOS ANGELES, CALIFORNIA

AUG. 20, 2012	PROJECT NO. A8928-06-01	FIG. 3

GEOLOGIC UNITS

Qaf - Artificial fill (late Holocene)
Qa - Alluvium, undifferentiated (late Holocene)
Qf - Alluvial Fan deposits (Holocene)
Qls - Landslide deposits (Holocene & late Pleistocene)
Qyf - Young alluvial fan deposits, undivided (Holocene to late Pleistocene)
Qpv - Palos Verdes Sand (late? Pleistocene)
Qoa - Old alluvium, undivided (late to middle Pleistocene)
Qof - Old alluvial-fan deposits, undivided (late to middle Pleistocene)
Qsp - San Pedro formation (early Pleistocene)
QTi - Inglewood Formation (early Pleistocene to to late Pliocene)
QTrx - Sedimentary rocks of the Pacific Palisades area (early Pleistocene to late Pliocene)
Tp - Pico Formation (Pliocene)
Tmst - Modelo Formation, siltstone (late Miocene)
TKb - Sedimentary rocks in the Beverly Hills area (early Tertiary to late Cretaceous)
Kt - Tuna Canyon Formation, undivided (late Cretaceous)
Ktc - Tuna Canyon Formation, informal member c (late Cretaceous)
Kgr - Granitic rocks (late Cretaceuos)
Jsm - Santa Monica Slate, individed (late Jurassic)
Jsms - Santa Monica Slate, spotted slate (late Jurassic)
Jsmp - Santa Monica Slate, phyllite (late Jurassic)



Reference: Yerkes, R. F., Campbell, R. H., 2005, Preliminary Geologic Map of the Los Angeles 30' x 60' Quadrangle, Southern California

LEGEND

Contact—Solid where accuracy of location ranges from well located to approximately located; dashed where very poorly located or inferred, dotted where concealed, queried where location or existence uncertain. No line shown for scratch contacts used to identify unreconciled quadrangle boundaries

Fault—Solid where accurately located, dashed where approximately located, dotted where concealed, queried where location or existence uncertain. Includes strike slip, normal, reverse, oblique, and unspecified slip

0 5000' 10000'

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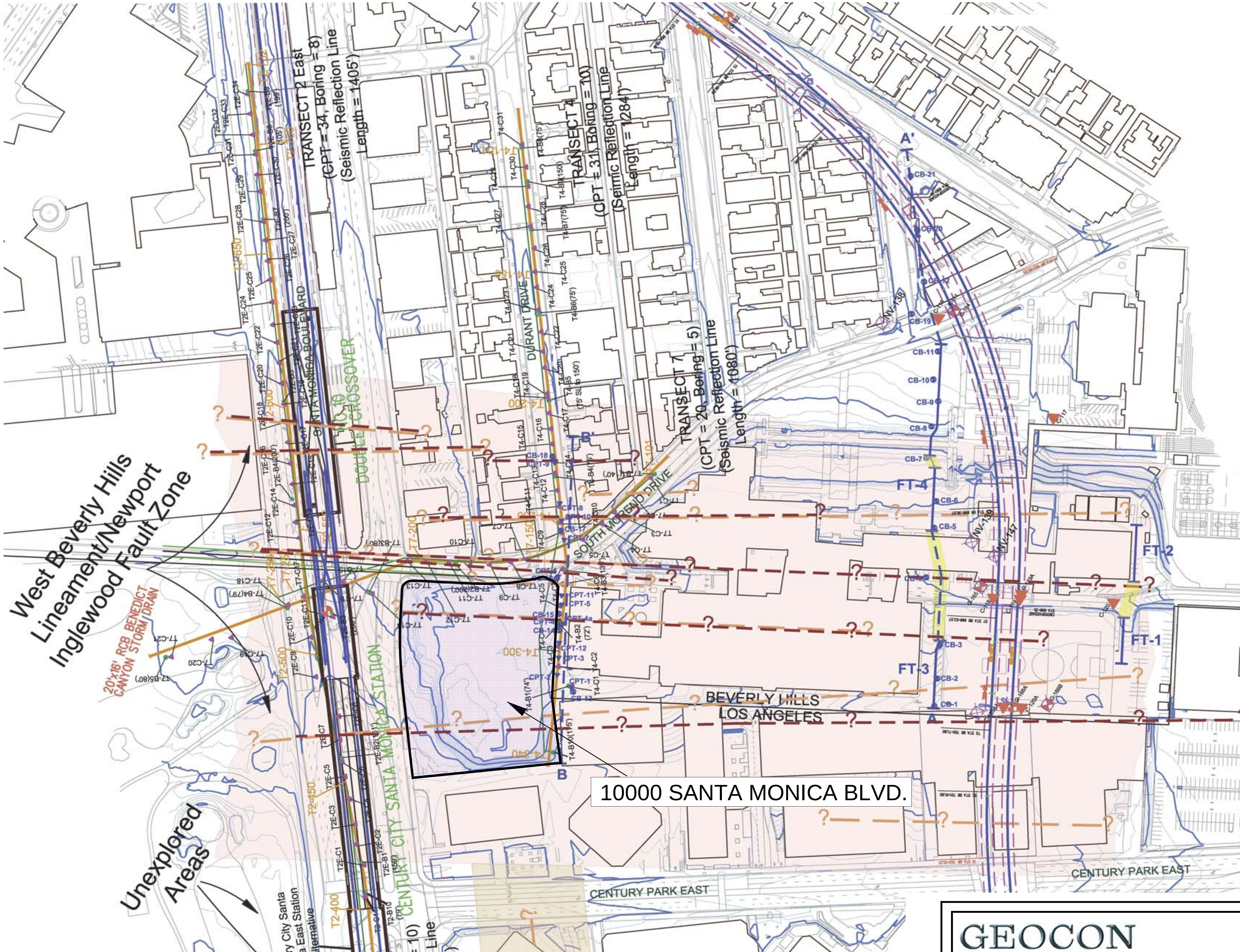
REGIONAL GEOLOGIC MAP

FAULT RUPTURE HAZARD INVESTIGATION
10000 SANTA MONICA BOULEVARD
LOS ANGELES, CALIFORNIA

AUG. 20, 2012	PROJECT NO. A8928-06-01	FIG. 4



EXPLANATION

Fault Investigation:

- Transect Profile Line
- T7-101 — P-Wave Seismic Reflection Line with Shot Point Number (Shown every 50 feet)
- T8-C15 — CPT Sounding Location
- T8-B5 (80') — Continuous Core Boring Location and Total Depth Drilled
- Approximate Zone of Faulting
- ? — Fault Location, Queried Where Uncertain, Oct. 14, 2011 Metro Report
- ? — Fault Location, Queried Where Uncertain, Refined based on New Leighton Data, current Report

Geotechnical Soil Gas Investigation:

- G-206 — Trotary-Wash Boring Location
- C-127 — CPT Sounding Location
- S-115 — Sonic Core Location
- 71-A711174 — Boring Location (LeRoy Crandall, 1964; 1967; 1969; 1971; 1984)

Leighton Fault Investigation:

- CB-21 — Continuous Core Boring Location
- CPT-19 — CPT Sounding Location
- Trench Location
- Cross-Section Location
- Gap between Leighton Trenches

Fault Investigation:

- Centerline of Tracks
- Cross Passages (Approximate)
- Alternative Station and Cross-Over Outline

Note: Missing CPT's and Borings on all Transects were not drilled.

0 200' 400'

Reference: Parsons Brinkerhoft, 2012, Response to Leighton Consulting Report, Westside Subway Extension Project, Contract No. PS-4350-2000.

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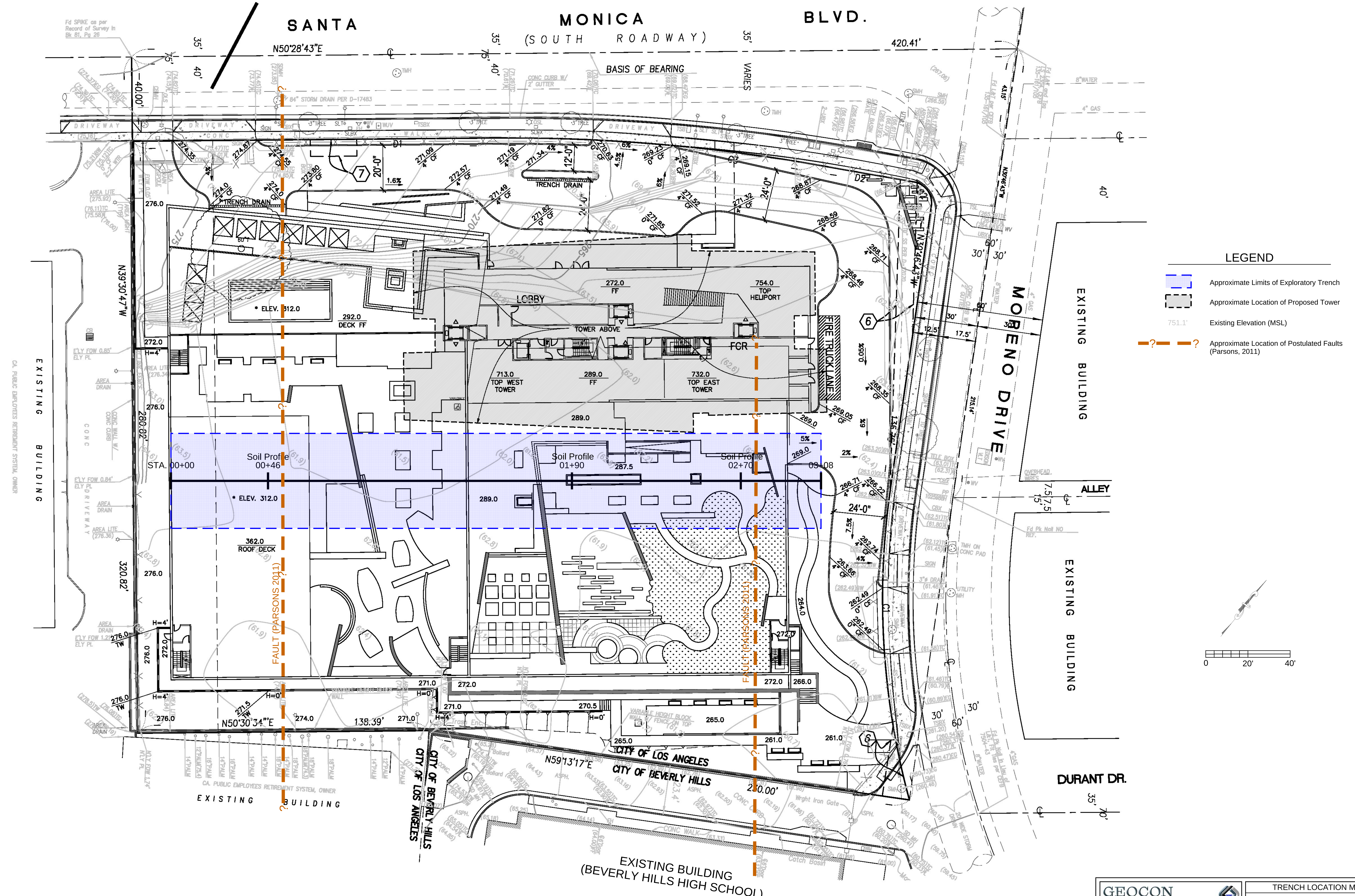
PARSONS FAULT MAP

FAULT RUPTURE HAZARD INVESTIGATION
10000 SANTA MONICA BOULEVARD
LOS ANGELES, CALIFORNIA

AUG. 20, 2012	PROJECT NO. A8928-06-01	FIG. 5



PLAN BY: S.E.C Civil Engineers, Inc.

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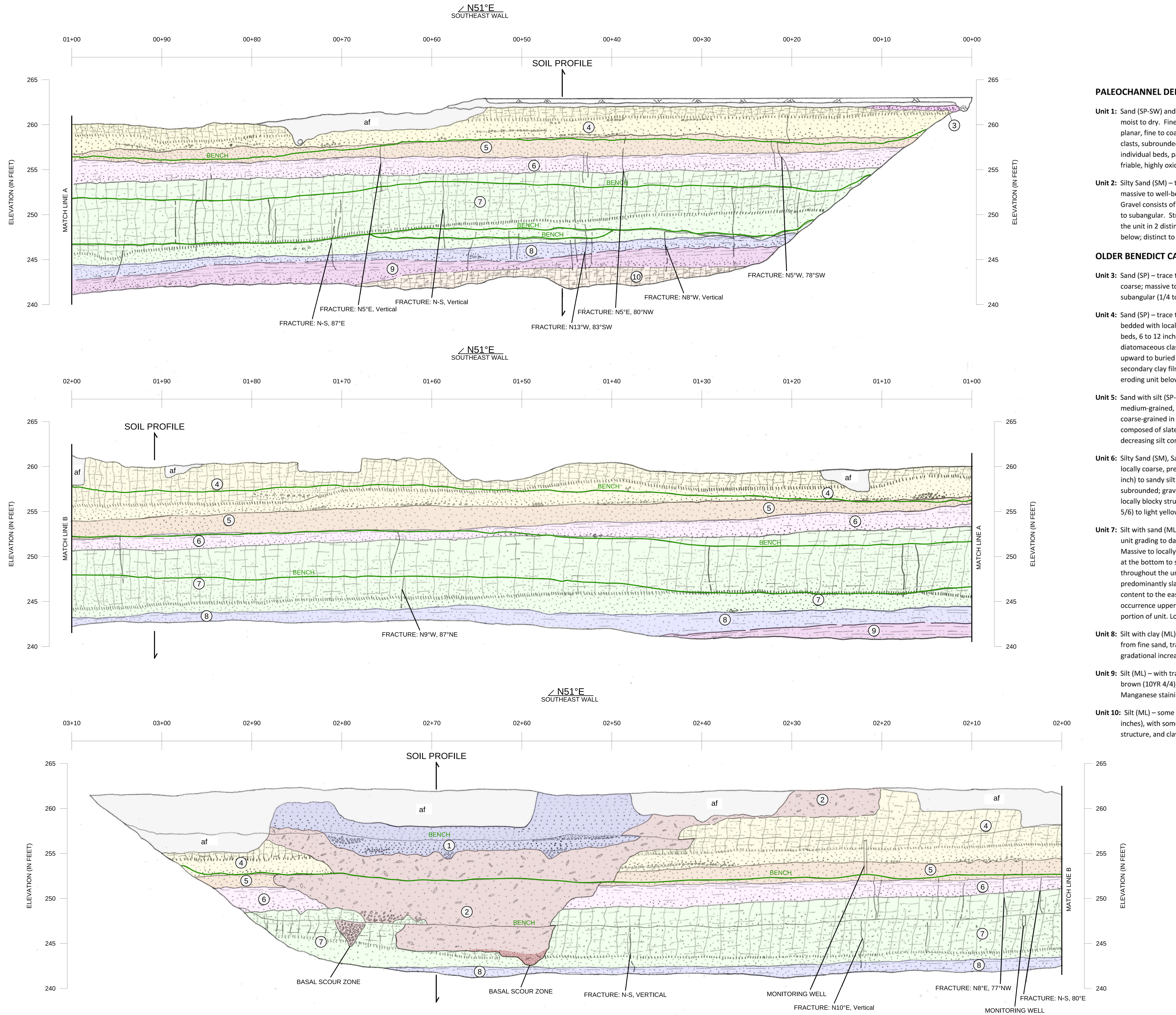
TRENCH LOCATION MAP

FAULT RUPTURE HAZARD INVESTIGATION
10000 SANTA MONICA BOULEVARD
LOS ANGELES, CALIFORNIA

AUG. 20, 2012 | PROJECT NO. A8928-06-01 | FIG. 6



GEOLOGIC UNITS

PALEOCHANNEL DEPOSITS

Unit 1: Sand (SP-SW) and Gravel (GP) –trace silt, with gravel, dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4), slightly moist to dry. Fine- to medium-grained, locally coarse-grained, massive to well-bedded; bedding defined by interfingering, planar, fine to coarse beds (at least 2 fining upward sequences). Gravel is predominantly slate, some diatomaceous siltstone clasts, subrounded to subangular (to 2 inches, few to 4 inches). Clasts locally imbricated and concentrated at the base of individual beds, particularly between Station 2+54 and 2+82. Lower portion of unit is well bedded fine to coarse sand and gravel, friable, highly oxidized. Basal contact is mostly distinct and abrupt defined by scour zones eroding unit below.

Unit 2: Silty Sand (SM) – trace to some silt and gravel, light brownish gray (10YR 6/2), slightly moist to moist. Fine- to medium-grained, massive to well-bedded (lower portion of unit). Varying amounts of gravel, randomly oriented and scattered through the unit. Gravel consists of predominantly slate and some diatomaceous siltstone; size and shape is variable (1/4 to 2 inches), subrounded to subangular. Strong oxidation in vertical, patchy pattern (yellowish brown - 10YR 5/6). Concentrations of gravel at the base of the unit in 2 distinct scour zones between Stations 2+56 and 2+63 and 2+74 and 2+81. Contact sharp in scour zones with unit below; distinct to gradational at channel margins.

OLDER BENEDICT CANYON WASH DEPOSITS

Unit 3: Sand (SP) – trace to some silt and gravel, yellowish brown (10YR 5/4), slightly moist to dry. Fine- to medium-grained, trace coarse; massive to weakly bedded, friable. Gravel is predominantly diatomaceous siltstone, minor slate, subrounded to subangular (1/4 to 1½ inches). Sharp erosional contact with unit below.

Unit 4: Sand (SP) – trace to some silt, grayish brown (2.5Y 5/2) to brown (10YR 5/3), slightly moist to dry. Fine- to coarse-grained, well bedded with localized zones of massive fine-grained sand and silt, friable. Basal unit is predominantly planar sand and gravel beds, 6 to 12 inches thick, with subrounded slate clasts, few diatomaceous siltstone clasts; some localized concentrations of diatomaceous clasts; highly oxidized. Two to three fining upward sequences characterized by basal sand and gravel grading upward to buried soil composed of predominantly silt and clay with some very fine sand; moderate to strong ped development, secondary clay films on ped faces, pinhole to 1/16-inch voids. Basal contact is sharp, locally undulating defined by scour zones eroding unit below.

Unit 5: Sand with silt (SP-SM) – trace gravel, light brownish gray (2.5Y 6/2) and light olive brown (2.5Y 5/6), slightly moist. Fine- to medium-grained, locally coarse; massive to well-bedded. Fining upward sequence; predominantly fine-grained; medium- to coarse-grained in localized, well-defined sand and gravel beds grading upward to silty sand, sandy silt, and silt with clay. Gravel composed of slate (up to 1/2 inch; locally up to 1 inch), sub-rounded to subangular; laterally increasing sand gravel content and decreasing silt content to the east. Locally highly oxidized, vertical caliche stringers. Lower contact distinct with unit below.

Unit 6: Silty Sand (SM), Sand (SP) – varying amounts of silt, light brownish gray (2.5Y 6/2), slightly moist. Fine- to medium- grained; locally coarse, predominantly massive; locally bedded. Vertically grades from silty sand to sand with pebbles and gravel (to 1/4 inch) to sandy silt and silt with clay. Gravel composed predominantly of slate and diatomaceous siltstone, angular to subrounded; gravel content increasing to the east. Some caliche nodules and vertical stringers; weakly developed ped faces, locally blocky structure, and pinhole to 1/4 inch voids in upper portion of unit. Locally strong oxidation: yellowish brown (10YR 5/6) to light yellowish brown (2.5Y 6/4). Sharp contact with unit below.

Unit 7: Silt with sand (ML) to sand with silt (SP-SM) –light yellowish brown (10YR 6/4) to grayish brown (10YR 5/2) in upper portion of unit grading to dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) in the lower portion of unit, slightly moist. Massive to locally weakly bedded (east of Station 2+25). Fining upward sequence, grades from sand to sand with silt and gravel at the bottom to silt with varying amounts of fine sand at the top. Gravel is randomly oriented (less than 1/4 inch) and scattered throughout the unit except where present in localized fine to coarse-grained sand and gravel. Gravel composed of predominantly slate, diatomaceous siltstone, and fine-grained sandstone, subrounded to subangular. Laterally increasing sand content to the east. Manganese staining, caliche stringers and nodules common. Pinhole to 1/16 inch voids, increasing in occurrence upper portion of unit. Well-developed peds, prismatic structure, clay films on ped surfaces prevalent in upper portion of unit. Lower contact is narrowly gradational and locally undulating.

Unit 8: Silt with clay (ML) to Sand (SP) – dark yellowish brown (10YR 4/4), moist. Fine-grained; massive. Fining upward sequence; grades from fine sand, trace silt and clay at the bottom to predominantly silt with clay, trace to some fine sand at the top. Lateral gradational increase in sand content east of Station 1+15.

Unit 9: Silt (ML) – with trace to some sand, some gravel, trace clay, strongly mottled dark grayish brown (10YR 4/2) to dark yellowish brown (10YR 4/4), moist. Sand is fine-grained. Gravel is predominantly slate (1/4 to 1/2 inch; locally to 2 inches), subangular. Manganese staining prevalent. Contact narrowly gradational with unit below.

Unit 10: Silt (ML) – some clay and gravel, brown (10YR 4/3), moist; massive. Gravel is predominantly slate (1/4 to 1/2 inch; locally to 2 inches), with some quartzite and diatomaceous siltstone clasts, subrounded to subangular . Well-developed ped faces, prismatic structure, and clay films on ped surfaces prevalent.

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LOG OF TRENCH

FAULT RUPTURE HAZARD INVESTIGATION
10000 SANTA MONICA BOULEVARD
LOS ANGELES, CALIFORNIA

AUG. 20, 2012	PROJECT NO. A8928-06-01	FIG. 7

APPENDIX A

SOIL STRATIGRAPHY STUDY AND RELATIVE AGE DETERMINATIONS

Soil Stratigraphy Study And Relative Age Determinations For A Fault Rupture Hazard Assessment At 10000 Santa Monica Boulevard, Los Angeles, California

Prepared by:

High Desert Consulting, Inc. / John Helms, CEG
40344 Wood Court, Palmdale, California 93551
Voice & FAX (661)718-3646

Submitted to:

Ms. Susan Kirkgard
GEOCON, Inc.
3303 North San Fernando Boulevard, Suite 100
Burbank, CA 91504

August 17, 2012

John Helms, CEG

40344 Wood Court, Palmdale, CA 93551;(661) 206-5860

Ms. Susan Kirkgard
GEOCON Inc.
3303 North San Fernando Boulevard, Suite 100
Burbank, CA 91504

August 17, 2012

Subject: **Soil Stratigraphy Study And Relative Age Determinations For A Fault Rupture Hazard Assessment At 10000 Santa Monica Boulevard, Los Angeles, California.**

Dear Ms. Kirkgard:

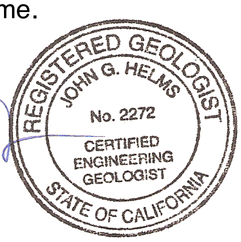
I am pleased to present to you this soil stratigraphic study and relative-age determinations to be used with your fault rupture hazard assessment at 10000 Santa Monica Boulevard, Los Angeles, California. This information presents relative age estimates for the deposits in three locations along a single trench exposure.

Geocon retained John Helms CEG to describe the exposed soil stratigraphy and to assign relative age dates for the deposits identified across the site. Soil descriptions are used to calculate various soil development indices (or SDIs). The SDI values were then compared to the SDI values from similar described soils with known ages to estimate age ranges for the soils understudy.

The attached report classifies each described soil profile, identifies stratigraphic relationships, defines soil chronosequences, and estimates relative age for each soil profile described across the study area. Calculated SDI's show strong correlations to the SDI values of other published, described, and dated soil profiles with similar parent materials. Age estimates range from 83 to 165 ka for the youngest stratigraphic section studied. This deposit is confined to the channel in-filling along the eastern portion of the study area. The oldest stratigraphic section studied for this project ranges in relative age from approximately 208 to 345 ka and is located at the western end of the trench exposure. Please see Table 4 in the attached report for a summary listing of all of the determined relative ages at the study site.

Thank you for this opportunity to be of service. Should you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,



John Helms, CEG 2272

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Tables

Soil Stratigraphy Study And Relative Age Estimates For A Fault Rupture Hazard Assessment At 10000 Santa Monica Boulevard, Los Angeles, California.

Introduction

Three soil profiles have been studied for geomorphic characteristics and relative degrees of weathering to estimate deposit relative-ages. The relative age estimates are based on index value comparisons with other published and dated soil profile descriptions. The comparative soils are from areas with a similar climate and similar parent material to this study area. The estimated relative ages in this report will be used by Geocon to assess the recency and recurrence of faulting across the study area. Alluvial units are assessed chronostratigraphically across a single trench exposure that spans a majority of the project site area. In this study, the soil stratigraphy is defined with soil field description data, and no laboratory data. This study identifies the soil stratigraphy and estimates the relative age of 3 soil profiles. The trench exposure is located across an graded alluvial fan surface.

For the Quaternary geologist, a soil can be defined as a natural body that consists of horizons of organic and/or mineral constituents which differ from it's parent material in some way (Birkland, 1984). A chronosequence is a group of soils for which all soil forming factors (such as topography, parent material, vegetation, and climate) except time is relatively equal (Jenny, 1941). Recent geologic studies in the coastal region of southern California provide age constraints for several deposits and geomorphic surfaces ranging in age from middle Pleistocene to recent (McFadden, 1982; Rockwell, 1988; and WLA, 1998). Often it has proven difficult to date older deposits due to changes in past climatic regimes. Studies on the impacts of glacial to interglacial climatic changes on soil development in specific regions (McFadden, 1982; Birkland, 1984; McFadden, 1988) indicate that soil development has occurred throughout the Quaternary.

This study is concerned with a section of alluvium along the southern range front of the Santa Monica Mountains, which is within the Transverse Ranges Geomorphic Province. A series of stacked and truncated argillic soil subsurface horizons within all of the stratigraphic sections studied indicates that the modified ground surface across the entire study area is old. Ages range from 15 to 30 ka along the eastern portion of the site and from 30 to 70 ka across the central and western portions of the site. The old alluvium is characterized by clay rich, very hard, fine- to medium-grained sand with strong angular blocky ped structure. The soils encountered in this study classify as alfisols that relative age estimates range from 15 to 30 ka at the surface soil in profile 3 (station 270 feet) to 208 to 345 ka at the lowest buried soil in profile 1 (station 46 feet). Soil relative age estimates have broad ranges, dependant upon the pool of comparative data used. The soils across the study area fall into a great group classification (Soil Conservation Service, 2000) of Typic Palexeralfs and Haploxeralfs. Soil profile locations are indicated on the trench logs and geologic map provided with the fault rupture hazard report.

Materials and Methods

Three soil profiles from a single excavator trench were described, sampled, classified, and quantified within the study area. The soils were described in the field, using guidelines set by the Soil Survey Staff (1991 and 1999). Soil horizons were sampled as to prevent contamination from adjacent horizons (Soil Survey Staff, 1991). Sample sizes varied according to the gravel content of the soil horizon. Soil horizons thicker than 2 feet were sampled on a 1-foot interval.

Soil profile field description values quantify soil properties that are used to develop a soil development index (SDI) value as outlined by Harden (1982). Points are assigned to descriptive data for each of several observed soil properties, such as dry color, moist color, texture, structure, dry, moist, and wet consistence, clay film content, and calcium carbonate stage level, for every horizon in a profile relative to the horizon's thickness, and normalized to a common depth. The maturity of a soil profile is gauged through data collected from active wash deposits (or raw alluvium).

Table 1.1 through Table 3.1 lists the soil description for each studied surface in longhand format. Table 1.2 through Table 3.2 lists the soil using soil conservation service notation and shows the SDI calculations. These tables show the calculated SDI values, the soil profile description, and the normalization values for raw alluvium. SDI values are calculated by assigning point values to described soil properties. The points are summed for each soil horizon and divided by the total number of descriptive properties used. This equals the mean horizon index value (HI). HI values are multiplied by the corresponding soil horizon thickness. The SDI value equals the sum of the normalized horizon indices. The maximum horizon index (MHI) is the value of the horizon with the largest summed descriptive value. MHI is independent of horizon thickness, and is usually the diagnostic subsurface soil horizon for most soil profiles. Tables 1.2 through Table 3.2 list all of the determined HI, SDI, and MHI values for the soils under study.

SDI values have shown significant correlations to soil age in many recent studies (Harden, 1981; Rockwell *et al.*, 1985; Reheis *et al.*, 1990; Rockwell *et al.*, 1994). The soils described in this study are compared to soils described and dated by McFadden (1982 and 1987) in San Bernardino County near Mission Creek, by Rockwell (1988) in the Ventura River basin, and by William Lettis and Associates, Inc. (1998) in West Hollywood. SDI values are calibrated to a common depth of 7 feet.

The changes in the subsurface pedogenic properties of the alfisols soil order allows for relative age determinations by emphasizing specific soil properties (such as color and clay film content) that are most diagnostic. Soil properties that express themselves well through time are most often used in the assessment of soil relative ages through a specific soil property index such as the color or clay film index. MHI is a comparison of a soil pedons master (or diagnostic) subsurface horizon (typically an argillic or cambic horizon). Independent of horizon thickness, the MHI directly compares the properties of the soil profiles strongest soil horizon. The color index (Rockwell *et al.,* 1985, 1994) is used to quantify observed colors (in Mussel notation) of each profile in order to compare relative degrees of reddening. The color index is simply the summation of an entire profile's horizon index values for dry colors. The clay film index (Rockwell *et al.,* 1985, 1994) is used to quantify field descriptions of this soil property in order to compare relative profile maturity. The clay film index is simply the summation of an entire soil profile's horizon index values for clay films.

SOIL RELATIVE AGE METHODS

Soil relative ages are calculated and compared independently for each soil profile described. The three soil profiles are located across different alluvial surfaces that differ in relative age, facies of deposition, and degrees of preservation. A series of stacked, buried, and truncated hard, clayey soils with advanced pedogenic structure and illuvial clays characterize all of the soil profiles on this project site.

All of the soil profiles described have a surface age implied by estimating the time of inception for the exposed surficial soil. All of the soils within this study area also contain a stacked or buried series of soils. In this case, a deposit age assessment is obtained by identifying and isolating the different parent materials (or deposits). Then comparing a set of abridged calculated indices to an additional suite of similar soils that have been radiometrically dated yields the equivalent to a surface age estimate. Such burial relationships are common along the southern Santa Monica Mountains range front; especially where soils developed into alluvial fan deposits and buries or locally truncates soils that have developed previously in older alluvial fan sediments. A cumlic soil profile estimated age can assess landform age, and has potential to assess rates of erosion, rates of landform evolution, and rates of tectonic activity across the study area.

Each described soil profile has an SDI value, which is used to estimate the soil relative age. Cumuli relative age estimates for a stacked or buried soil profile are specifically referred to as "deposit ages". The relative age estimate for the surface profile or modern soil is referred to as the "surface age". All of the relative age estimates given are considered minimum ages given that an unknown amount of erosion has occurred after the formation of and before the burial of each truncated soil studied.

DISCUSSION AND RESULTS

This section is broken up by each individual soil profile described. Each section contains a brief write up with tables designated for each soil profile described. The attached Tables 1.1 through 3.1 present the soil profile descriptions in longhand format. Figures 1 through 3 are soil pit illustrations that show the nature of the soil horizon boundaries, physical characteristics of the soil, and views of the related surface morphology. Tables 1.2 through 3.2 present the results of the calculated SDI values. Table 4 is a summary of the soil relative age estimates for each soil profile under study. Table 5 is a compilation of the comparative data in a format that compares to the data generated for this study. Table 6 is a soil abbreviation key to be used in conjunction with the SDI calculation sheets. Table 7 lists the trench log unit relative ages.

Soil descriptions, SDI calculations, and relative age determinations follow for each of the soil profiles studied.

Soil Profile 1
Station 46 Feet

Soil profile 1 is located toward the western portion of the trench at station 46 feet. The soil profile lies across a graded (or stripped) surface that is geomorphically inactive. This soil profile consists of a series of stacked, truncated, and buried argillic soil horizons. Most of the soil horizons observed are well developed and are classified as mature Alfisol remnant soils. Parent materials for these soils consist chiefly of debris flow and/ or stream terrace deposits. This deposit has diagenic mottling (oxidation) and gleying (reduction) that increases at depth and overprints or masks some of the original soil properties (mainly soil color). The soil profile at station 46 contains a surface soil and five buried soils to a depth of approximately 20 feet below the ground surface. This is the oldest stratigraphic section encountered in the study area. A detailed soil description for this profile is listed in table 1.1, the calculated soil development indices for this soil profile and relative age estimates are listed in table 1.2, and the individual soil profile members are briefly described below.

The surface soil profile is classified as a truncated Palexeralf, and is characterized by AB/Bt1 – Bt2 – Cox horizonation. This soil has faint mottling and is slightly reduced. This deposit consists of a fining upwards sequence. Diagnostic properties observed within this soil includes a moderately thick clay and organic rich AB/Bt1 horizon that has common fine and few moderately thick clay films on ped faces and many thick lining pores. This horizon is hard to very hard, very fine-grained with moderately strong angular blocky structure. This grades to an argillic Bt2 subsurface horizon that contains common fine and few moderately thick clay films on ped faces, and is medium to coarse grained with moderately strong prismatic and angular blocky structure. The basal oxidized C-horizon for this surface soil is coarse grained and contains crude internal stratigraphy that forms a scoured contact with the underlying buried soil 1. A relative age estimate of 30 to 70 ka for the surface soil of profile 1 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile S-2 from the Mission Creek soil chronosequence (McFadden, 1988) and the less mature soil from profile Qt5b in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 1 is a severely truncated remnant Alfisol. This soil is characterized by 2Btb1 - 2Btb2/2BCb horizonation. This soil has faint mottling and is weakly reduced. The deposit consists of an fining upwards sequence, and is internally massive and sandy. Diagnostic properties observed within this soil include an argillic 2Btb1 subsurface horizon that has few fine and moderately thick clay films on ped faces, few thick lining pores, and common moderately thick coating clasts. This soil horizon is hard, fine-grained with weak angular blocky structure. This grades to an transitional or argillic 2Btb2/2BCb subsurface horizon that contains very few fine clay films on ped faces, few moderately thick lining pores, and common moderately thick coating clasts. This basal horizon is medium to coarse grained with moderately strong angular blocky structure, and forms a scoured contact with the underlying buried soil 2. A relative age estimate of 15 to 30 ka for buried soil 1 of profile 1 was obtained by comparing the observed clay film development and soil consistence values to more mature soils from profile Qt5-b and the less mature soils from profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 2 is a very thin, weakly developed and truncated remnant Alfisol. This soil is characterized by 3Btb1 - 3BCb horizonation. This soil has weak to strong mottling and is moderately reduced. The deposit consists of a fining upwards sequence. Diagnostic properties observed within this soil include a truncated argillic 3Btb1 subsurface horizon that has few fine clay films on ped faces and few moderately thick lining pores, and is hard, fine-grained with weak angular blocky structure. This grades to an transitional 3BCb subsurface horizon that is medium grained with weak sub angular blocky structure. This basal horizon is internally massive and forms a scoured contact with the underlying buried soil 3. A relative age estimate of 8 to 15 ka for buried soil 2 of profile 1 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil from profile Qt4 and the less mature soil from profile Qt3 in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 3 is a severely truncated remnant Alfisol. This soil is characterized by 4Btb1 – 4Btb2 - 4BCb1 – 4BCb2 horizonation. This soil has weak to strong mottling and is weakly to moderately reduced. The deposit consists of a strong fining upwards sequence. Diagnostic properties observed within this soil include a truncated argillic 4Btb1 subsurface horizon that has few fine and very few moderately thick clay films on ped faces and common moderately thick lining pores, and is very hard, fine-grained with weak to moderately strong angular blocky structure. This grades to an lower argillic 4Bt2b subsurface horizon that has common fine and few moderately thick clay films on ped faces and common moderately thick lining pores, and is hard to very hard, very fine-grained with weak sub angular blocky structure. This grades to a sequence of transitional 4BC1b and 4BC2b subsurface horizons that are sandy and medium grained with weak sub angular blocky structure. This basal horizon sequence is internally massive and forms a scoured contact with the underlying buried soil 4. A relative age estimate of 15 to 30 ka buried soil 3 of profile 1 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil from profile Qt5-b and the less mature soils from profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 4 is a lightly truncated and thick Alfisol remnant within the trench exposure. This soil is characterized by 5ABb/5Btb1 - 5Btb2 – 5Btb3 – 5Btb4/5BCb1 – 5BCb2 – 5BCb3 horizonation. This soil has strong mottling and is moderately strong to strongly reduced. This deposit consists of a fining upwards sequence. Diagnostic properties observed within this soil include a truncated organic rich transitional or argillic 5ABb/5Btb1 subsurface horizon that has many fine and common moderately thick clay films on ped faces and common moderately thick lining pores. This soil is very to extremely hard, fine- to medium grained with moderately strong prismatic and angular blocky structure. This grades to an approximately 6 foot thick sequence of argillic 5Btb2 – 5Btb3 – 5Btb4/5BCb1 subsurface horizons that have common fine and few moderately thick clay films on ped faces and common moderately thick lining pores, and are hard to very hard, very fine to fine-grained with weak to moderately strong angular blocky structure. This grades into a set of transitional 5BCb2 and 5BCb3 subsurface horizons that are sandy and fine to coarse-grained with weak sub angular to angular blocky structure. These basal horizons are internally massive and form a scoured contact into the underlying buried soil 5. A relative age estimate of 70 to 100 ka for buried soil 4 of profile 1 was obtained by comparing the observed clay film development and soil consistence values to the less mature soil profile S-2 in the Mission Creek soil chronosequence (McFadden, 1988) and the more mature soil profile Qof1 in the West Hollywood soil chronosequence (WLA, 1999).

Buried soil 5 is the lowest buried soil observed within this trench exposure, and is possibly the top portion of a lightly truncated Alfisol. This soil is characterized by 6ABb/6Btb1 – 6Btb2 horizonation. This soil has weak to strong mottling, and is strongly reduced. The deposit is massive and dips beneath the trench exposure toward the east. Diagnostic properties observed within this soil include a truncated transitional or argillic 6AB/6Btb1 subsurface horizon that has common fine and moderately thick clay films on ped faces and common fine coating clasts. This soil horizon is slightly hard, fine-grained with weak angular blocky structure. This grades to an lower argillic 6Bt2b subsurface horizon that has common moderately thick and few thick clay films on ped faces and few thick bridging sand grains. This mature subsurface horizon is very to extremely hard, medium-grained with moderately strong to strong angular blocky structure. A relative age estimate of 70 to 100 ka for buried soil 5 of profile 1 was obtained by comparing the observed clay film development and soil consistence values to the less mature soil profile S-2 in the Mission Creek soil chronosequence (McFadden, 1988) and the more mature soil profile Qof1 in the West Hollywood soil chronosequence (WLA, 1999).

In conclusion, the entire stratigraphic section for profile 1 at station 46 feet is estimated to be 208 to 345 ka. Most of this age resides within the lowest two soils (buried soil 4 and 5) of this exposure. The upper five soils (surface soil plus buried soils 1 through 4) within this profile correlate well to the stratigraphic section for profile 2 at station 190. The lowest portion of buried soil number 4 is continuous across the entire trench exposure.

FIGURE 1
Soil Profile 1 at Station 46 feet

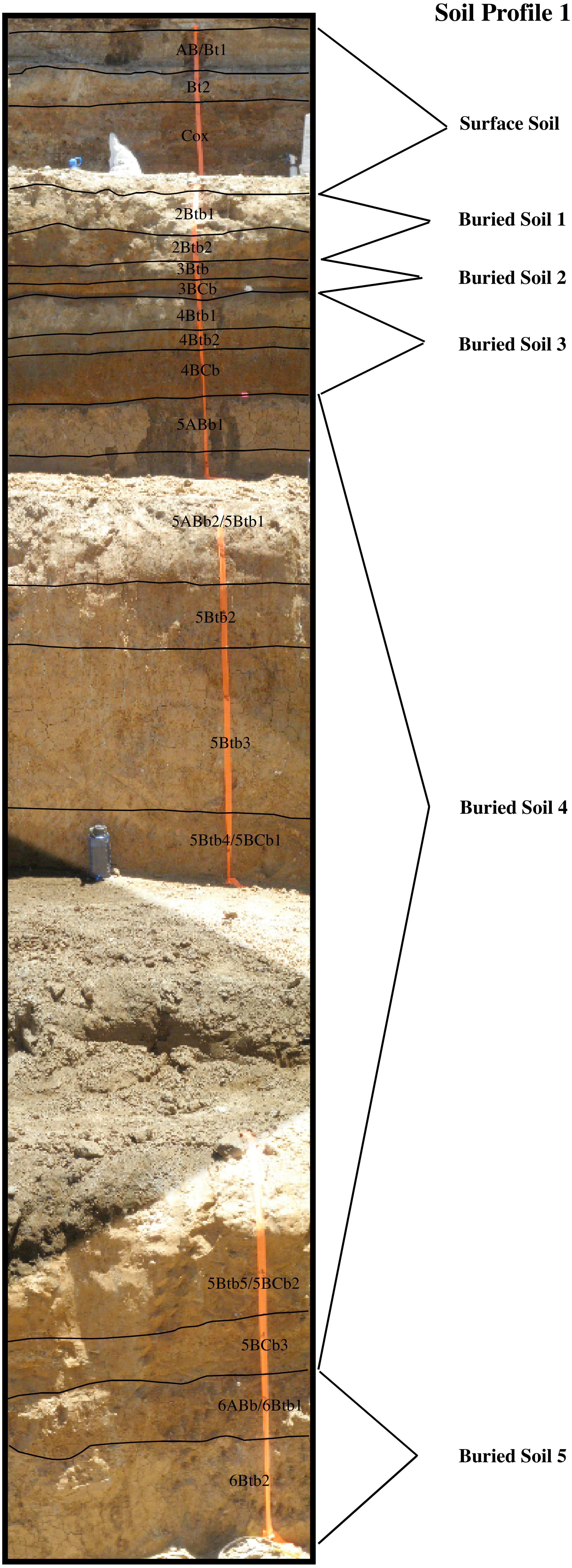

TABLE 1.1 Soil Profile – 1, Station 46 feet.

Geocon Inc.'s Fault Rupture Hazard Study at 10000 Santa Monica Boulevard, Los Angeles, California.

Soil Classification: Truncated and stacked Alfisols
Geomorphic Surface: Alluvial Fan Remnant
Parent Material: Benedict Canyon Alluvium
Vegetation: Urban
Described By: John Helms
Date Described: 6/26/12
Exposure Type: Excavator Trench

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet
Af	0 -1.1	1.1	Concrete slab, base material, and artificial fill; not described.
AB / Bt1 trun	1.1 – 2.0	1.9	Pale brown (10YR 6/3 d; 10YR 4/2 m); silty clay; moderately strong fine and medium sub angular and angular blocky; hard to very hard, very firm, moderately to very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10 4/3 m) clay films common thin and few moderately thick on ped faces, and common thick lining pores; very fine-grained very well sorted sand, slight organics; 0 - 5 % fine sub rounded and rounded gravel; few medium pores; calcium carbonate stage 1, few fine nodules and faint coatings on few ped faces; localized strong MnO webbing common on ped faces; few fine faint brownish yellow (10YR 6/6 d; 10YR 4/6 m) mottles, weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; clear wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet (Cont.)
Bt2 / BC1	2.0 – 2.6	0.6	Light yellowish brown (10YR 6/4 d; 10YR 4/3 m); loam; weak to moderately strong fine and medium prismatic and angular blocky; hard, friable to firm, moderately sticky, moderately plastic; pale brown (10YR 6/3 d; 10YR 4/2 m) clay films few thin on ped faces, common moderately thick lining pores, and common thin coating clasts; medium-grained moderately well sorted sand, slightly well oxidized; 0 - 5% fine rounded and sub rounded gravel; few medium pores; calcium carbonate stage 1-, few very fine and fine nodules and faint coatings on few ped faces; common fine faint yellowish brown (10YR 5/6 d; 10YR 3/4 m) mottles, weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational wavy boundary to:
BC2 / Cox	2.6 – 4.05	1.45	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); loamy sand; single grained to weak very fine sub angular blocky; loose to soft, very friable, non-sticky, non-plastic; clay stains on clasts; coarse-grained poorly sorted sand, slightly oxidized; 10 - 25% fine rounded and sub rounded gravel; crudely stratified scour deposit, truncates underlying deposit; abrupt wavy boundary to:
2Btb1	4.05 – 5.25	1.2	Brown to yellowish brown (7.5 to 10YR 5/4 d; 7.5 to 10YR 3/3 m); sandy loam to loam; weak fine and medium angular and sub angular blocky; hard, friable, slightly sticky, non-plastic; brown (7.5YR 4/4 d; 7.5YR 3/3 m) clay films few thin and very few moderately thick on ped faces, common moderately thick lining pores, and common moderately thick coating clasts; fine-grained well sorted sand, moderately well oxidized; 5 - 10% fine rounded gravel; common coarse faint, brown (7.5YR 5/4 d; 7.5YR 4/3 m) mottles; weak pale brown (10YR 6/3d; 10YR 4/2 m) gleying; gradational wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet (Cont.)
2Btb2 / 2BCb	5.25– 5.65	0.4	Pale brown (10YR 6/3 d; 10YR 4/3 m); loam; weak to moderately strong fine and medium sub angular and angular blocky; hard to very hard, friable, moderately sticky, slightly to moderately plastic; light yellowish brown (10YR 6/4 d; 10YR 5/4 m) clay films very few thin on ped faces, common thin lining pores, and common thin coating clasts; medium-grained moderately well sorted sand, slightly oxidized; 0 - 5% fine rounded and sub rounded gravel; few coarse moderately strong, strong brown (10Y6/6 d; 10YR 5/4 m) mottles; weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; internally massive scour deposit, truncates underlying deposit; clear wavy boundary to:
3Btb1 trun	5.65– 5.95	0.3	Light yellowish brown (10YR 6/4 d; 10YR 4/3 m); silty loam; weak fine sub angular blocky; hard, firm, slightly to moderately sticky, moderately plastic; light pale brown (10YR 6/3 d; 10YR 4/3 m) clay films few thin on ped faces, common thin lining pores; very fine-grained very well sorted sand, slightly oxidized; 0 - 3% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine nodules and veinlets; common coarse, strong, brown to strong brown (7.5YR 5-6/6 d; 7.5YR 4/4 m) mottles, and moderate light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational wavy boundary to:
3BCb	5.95 – 6.15	0.2	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); sandy loam to loamy sand; single grained to weak very fine sub angular; slightly hard to hard, friable, non- to slightly sticky, non-plastic; clay films few very thin on ped faces and few stains coating clasts; medium-grained moderately well sorted sand, slightly oxidized; 5 - 10% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine nodules and faint coatings on few ped faces; common fine MnO nodules; few to common coarse, faint, brown to strong brown (7.5YR 5-6/6 d; 7.5YR 4/4 m) mottles; slight light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; internally massive scour deposit, truncates underlying deposit; abrupt wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet (Cont.)
4Btb1 trun	6.15 – 6.6	o.45	Pale brown (10YR 6/3 d; 10YR 4/2 m); silty clay loam to clay loam; weak to moderately strong fine and medium sub angular and angular blocky; very hard, very firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 5/3 m) clay films few thin and very few moderately thick on ped faces, common moderately thick lining pores; fine-grained well sorted sand; 0 - 3% fine rounded gravel; common fine and few medium pores; common coarse faint, reddish yellow (7.5YR 6/6 d; 7.5YR 4/6 m) mottles, and moderately strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational wavy boundary to:
4Btb2	6.6 – 6.85	0.25	Light yellowish brown (10YR 6/4 d; 10YR 4/3 m); silty clay; massive to weak fine sub angular blocky; hard to very hard, very firm, very sticky, very plastic; brownish yellow (10YR 6/6 d; 10YR 5/4 m) clay films common thin and few moderately thick on ped faces, common moderately thick lining pores; very fine-grained very well sorted sand, slightly oxidized; 0 - 3% fine rounded gravel; few fine and medium pores; common fine strong, strong brown (7.5YR 5/6 d; 7.5YR 4/4 m) mottles; weak light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational wavy boundary to:
4BCb1	6.85– 7.55	0.7	Pale brown (10YR 6/3 d; 10YR 4/2 m); sandy loam; single-grained to weak fine sub angular blocky; slightly hard, friable, slightly sticky, non- to slightly plastic; brownish yellow (10YR 6/6 d; 10YR 4/4 m) clay films very few thin on ped faces and very few stains on clasts; medium to coarse-grained moderately well sorted sand; 0 - 5% fine rounded gravel; common coarse faint, brownish yellow (10YR 6/6 d; 10YR 5/4 m) mottles; slight light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; crudely stratified scour deposit; abrupt smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet (Cont.)
4BCb2	7.55- 8.45	0.9	Grayish brown (10YR 5/2 d; 10YR 3/2 m); sandy clay loam; moderately strong fine and medium prismatic and angular blocky; very to extremely hard, very firm, very sticky, very plastic; pale to light yellowish brown (10YR 6/3-4 d; 10YR 4/3-4 m) clay films many thin and common moderately thick on ped faces; fine to medium-grained moderately well sorted sand, slight organics; 0 - 3% fine rounded gravel; common fine pores; calcium carbonate stage 1--, very few fine nodules; few to common fine weak, brownish yellow (10YR 6/6 d; 10YR 5/4 m) mottles; strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; internally massive scour deposit, truncates underlying deposit; abrupt wavy boundary to:
5ABb1 / 5Btb1	8.45- 9.85	1.4	Brown (10YR 5/3 d; 10YR 3/2 m); silty clay; massive to weak very fine and fine sub angular and angular blocky; hard, firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, and common moderately thick lining pores; very fine-grained very well sorted sand, slight organics; 0 - 3% fine rounded gravel; few fine and medium pores; fine MnO webbings on few ped faces; common fine strong, reddish yellow (7.5YR 6/6 d; 7.5YR 5/6 m) mottles; moderate, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational smooth boundary to:
5Btb2	9.85- 10.75	0.9	Light yellowish brown (10YR 6/4 d; 10YR 4/3 m); loam to clay loam; weak to moderately strong fine angular blocky; hard to very hard, friable to firm, moderately to very sticky, very plastic; dark yellowish brown (10YR 4/6 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, and common moderately thick lining pores; fine-grained well sorted sand, slightly oxidized; 0 - 3% fine rounded gravel; few fine pores; calcium carbonate stage 1-, few fine nodules, and faint coatings on few ped faces; common strong coarse, reddish yellow (7.5YR 6/6-8 d; 7.5YR 4/6 m) mottles; moderate, light gray (10YR 7/2 d; 10YR 4/1 m) gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet (Cont.)
5Btb3	10.75-12.95	2.2	Light yellowish brown (10YR 6/4 d; 10YR 4/3 m); clay loam; moderately strong fine and medium angular blocky; very hard, friable to firm, very sticky, very plastic; brownish yellow(10YR 6/6 d; 10YR 4/6 m) clay films common thin and few moderately thick on ped faces, and common moderately thick lining pores; fine-grained well sorted sand, slightly oxidized; 0 - 3% fine rounded gravel; very few fine pores; calcium carbonate stage 1-, few fine nodules; common strong coarse, strong brown (7.5YR 5/8 d; 7.5YR 4/6 m) mottles; strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; clear wavy boundary to:
5Btb4 / 5BCb1	12.95-16.05	3.1	Pale brown (10YR 6/3 d; 10YR 4/3 m); loam to clay loam; massive to weak fine angular and sub angular blocky; hard to very hard, friable to firm, moderately to very sticky, moderately plastic; dark yellowish brown (10YR 4/6 d; 10YR 4/4 m) clay films few to common thin and very few moderately thick on ped faces; fine-grained well sorted sand; 0 - 5% fine rounded gravel; few fine and very few medium pores; calcium carbonate stage 1, common fine and few medium nodules, few fine MnO nodules; common coarse faint, reddish yellow (7.5YR 6/6 d; 7.5YR 5/4 m) mottles, and strong, light gray (10YR 7/2 d; 10YR 5/2 m) gleying; gradational wavy boundary to:
5Btb5 / 5BCb2	16.05-17.65	1.5	Light yellowish brown (10YR 6/4 d; 10YR 4/4 m); sandy loam; weak fine and medium sub angular blocky; slightly hard, very friable, slightly sticky, non-plastic; dark yellowish brown (10YR 4/4-6 d; 10YR 4/4 m) clay films very few thin on ped faces and few clay stains on clasts; fine-grained well sorted sand, slightly oxidized; 0 - 5% fine rounded gravel; few fine MnO nodules; common coarse strong, reddish yellow (7.5YR 6/6 d; 7.5YR 5/4 m) mottles, and strong, light gray (10YR 7/2 d; 10YR 5/1 m) gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 46 feet (Cont.)
5BCb3	17.65-18.25	0.6	Yellowish brown (10YR 5/4 d; 10YR 4/3-4 m); loamy sand to sandy loam; single grained to weak fine sub angular blocky; soft, very friable, slightly sticky, non-plastic; very few clay stains on clasts; fine-grained well sorted sand, slightly oxidized; 0 - 5% fine rounded gravel; calcium carbonate stage 1-, few fine nodules and faint coatings on few ped faces, very few fine MnO nodules; common moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/4 m) mottles, and strong, light gray (10YR 7/2 d; 10YR 5/1 m) gleying; internally massive scour deposit, truncates underlying deposit; abrupt wavy boundary to:
6ABb / 6Btb1 trun	18.25-19.0	0.75	Brown to yellowish brown (10YR 5/3-4 d; 10YR 4/2 m); loam to silty clay loam; weak fine and medium angular and sub angular blocky; slightly hard, firm, moderately to very sticky, moderately plastic; light brown (7.5YR 6/4 d; 7.5YR 4/4 m) clay films common fine and moderately thick on ped faces, and common fine coating clasts; fine-grained well sorted sand; 5 - 10% fine rounded and sub rounded gravel; few fine MnO nodules and common webbing on ped faces; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and strong, light gray (10YR 7/1 d; 10YR 5/1 m) gleying; clear wavy boundary to:
6Btb2	19.0-20.3+	1.3+	Yellowish brown (10YR 5/4 d; 10YR 4/4 m); clay loam; moderately strong to strong fine and medium angular and sub angular blocky; very to extremely hard, very firm, very sticky, very plastic; light brown (7.5YR 6/4 d; 7.5YR 4/4 m) clay films common moderately thick and few thick on ped faces, and few thick bridging sand grains; medium-grained moderately well sorted sand, slightly oxidized; 5 - 10% fine rounded and sub rounded gravel; very few fine MnO nodules and webbing on few ped faces; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and strong, light gray (10YR 7/1 d; 10YR 5/1 m) gleying; undetermined lower boundary.

TABLE 1.2 - Soil Development Index Calculation Sheet
Soil Profile - 1 at Station 46 Feet

Unit	Thickness (Feet)	Color				Texture		Structure		Consistence				Clay Films		Horizon Values	Mean Hor. Values
		Dry		Moist						Dry		Wet					
Raw Alluvium	*3*	*2.5Y 7/2*	*X/10*	*10YR 6/3*	*X/10*	*s*	*X/5*	*sg*	*X/6*	*lo*	*X/5*	*so*	*X/6*	*0*	*X/15*		
Profile 1																	
AB / Bt1 trun	0.9	10YR 6/3	0.2	10Y R 4/2	0	sic	0.8	2 abk sbk	0.67	h-vh	0.70	s-vs, p	0.75	3kpo, 2fpf, 1dpf	0.8	0.56	0.50
Bt2 / BC1	0.6	10YR 6/4	0.3	10YR 4/3	0	l	0.6	1 pr, 2 abk	0.67	h	0.6	s, p	0.67	3dpo, 1fpf, 2fcl	0.667	0.50	0.30
BC2 / Cox	1.45	10YR 5/4	0.3	10YR 4/3	0	ls	0.2	1 abk	0.50	lo-so	0.1	so, po	0.00	v1vncl	0.133	0.18	0.26
2Btb1	1.2	10-7.5YR 5/4	0.35	10-7.5YR 3/3	0.05	sl-l	0.5	1 abk sbk	0.50	h	0.6	ss, po	0.17	1kpo, 2dpo, 1fpf, v1dpf,	0.733	0.41	0.50
2Btb2 / 2BCb	0.4	10YR 6/3	0.2	10YR 4/3	0	l	0.6	1-2 abk	0.67	h-vh	0.7	s, ps-p	0.58	v1fppf, 1dpo, 2fpo, 2fcl	0.577	0.48	0.19
3Btb1 trun	0.3	10YR 6/4	0.3	10YR 4/3	0	sil	0.8	1 sbk	0.33	h	0.6	ss-s, p	0.58	1fpf, 2fpo	0.383	0.43	0.13
3BCb	0.2	10YR 5/4	0.3	10YR 3/3	0	l-sl	0.5	1 abk	0.5	sh-h	0.5	so-ss, po	0.08	v1fpf, 1vncl	0.3	0.31	0.06
4Btb1 trun	0.45	10YR 6/3	0.2	10YR 4/2	0	cl-scl	0.8	1-2 sbk abk	0.58	vh	0.8	vs, vp	1	1fpf, v1dpf, 2dpo	0.55	0.56	0.25
4Btb2	0.25	10YR 6/4	0.3	10YR 4/3	0	sic	0.8	1 sbk	0.33	h-vh	0.7	vs, vp	1	2fpf, 1dpf, 2dpo	0.65	0.54	0.14
4BCb1	0.7	10YR 6/3	0.2	10YR 4/2	0	sl	0.4	1 sbk	0.33	sh	0.4	ss, po-ps	0.25	v1fpf, v1vncl	0.283	0.27	0.19
4BCb2	0.9	10YR 5/2	0.1	10YR 3/2	0	cl	0.8	2 pr abk	0.83	vh-eh	0.9	vs, vp	1	3fpf, 2dpf	0.667	0.61	0.55
5ABb/ 5Btb1 trun	1.4	10YR 5/3	0.2	10YR 3/2	0	sic	0.8	1 abk sbk	0.50	h	0.6	vs, vp	1	**2fpf, 1dpf, 2dpo**	**0.65**	0.54	0.75
5Btb2	0.9	10YR 6/4	0.3	10YR 4/3	0	l-cl	0.7	1-2 abk	0.58	h-vh	0.7	s-vs, vp	0.92	**2fpf, 1dpf, 2dpo**	**0.65**	0.55	0.50
5Btb3	2.2	10YR 6/4	0.3	10YR 4/3	0	cl	0.8	2 pr abk	0.83	vh	0.8	vs, vp	1	2fpf, 1dpf, 1kpo	0.75	0.64	1.41
5Btb4 / 5BCb1	3.1	10YR 6/3	0.2	10YR 4/3	0	l-cl	0.7	1 abk sbk	0.50	h-vh	0.7	s-vs, p	0.92	**1-2fpf, v1dpf**	**0.45**	0.50	1.54
5Btb5 / 5BCb2	1.5	10YR 6/4	0.3	10YR 4/4	0	sl	0.4	1 sbk	0.33	sh	0.4	ss, po	0.17	**v1fpf, 1vncl**	0.233	0.26	0.39
5BCb3	0.6	10YR 5/4	0.3	10YR 4/3-4	0.05	ls-sl	0.5	1 sbk	0.33	so	0.2	ss, po	0.17	**n1nvpf**	**0.2**	0.25	0.15
6ABb / 6Btb1 trun	0.75	10YR 5/3-4	0.25	10YR 4/2	0	l-sicl	0.7	1 abk sbk	0.50	sh	0.4	s-vs, p	0.75	2dpf, 2fpf, 2fcl	0.617	0.46	0.34
6Btb2	1.5	10YR 5/4	0.3	10YR 4/4	0	cl	0.8	2 abk sbk	0.67	vh-eh	0.9	vs, vp	1	1kpf, 1kbr, 2dpf	0.833	0.64	0.97

INDEX VALUES AND DETERMINED AGES (ka)

Soil Member	MHI	Mean Soil Index	SDI @ 7 feet	Color Index	Clay Film Index	Soil Age Estimate ka	Section Age Estimate ka
Surface Soil	**0.56**	**1.06**	**2.52**	**0.8**	**1.60**	**30 - 70**	**30 - 70**
Buried Soil 1	**0.48**	**0.69**	**3.01**	**0.55**	**1.31**	**15 - 30**	**45 - 100**
Buried Soil 2	**0.43**	**0.19**	**2.67**	**0.6**	**0.68**	**8 - 15**	53 - 115
Buried Soil 3	**0.61**	**1.13**	**3.43**	**0.8**	**2.15**	**15 - 30**	68 - 145
Buried Soil 4	**0.64**	**4.73**	**3.42**	**1.6**	**2.93**	**70 - 100**	138 - 245
Buried Soil 5	**0.64**	**1.31**	**4.07**	**0.55**	**1.45**	**70 - 100**	208 - 345

Soil Profile 2
Station 190 Feet

Soil profile 2 is located near the center of the trench at station 190 feet. The soil profile lies across a graded (or stripped) surface that is geomorphically inactive. Similar to soil profile 1, this soil profile consists of a series of stacked, truncated, and buried argillic soil horizons. Most of the soil horizons observed are well developed and are classified as Alfisol soils. Parent materials for these soils consist chiefly of debris flow and/ or stream terrace deposits. This deposit has mottling and gleying that increases at depth and overprints or masks some of the original soil properties (mainly soil color). The soil profile at station 190 contains a surface soil and five buried soils to a depth of approximately 17 feet below the ground surface. This stratigraphic section tracks the section described at station 46, except a new surface soil in this locality buries the surface soil that is encountered at station 46. Additionally, the soil exposed at the base of the exposure at station 46 is below the trench exposure at station 190 feet. This soil profile contains the oldest surficial deposits across the entire study area. A detailed soil description for this profile is listed in table 2.1, the calculated soil development indices for this soil profile and relative age estimates are listed in table 2.2, and the individual soil profile members are briefly described below.

The surface soil profile is classified as a severely truncated Alfisol, and is characterized by a remnant Bt horizon. This soil is well oxidized and displays 7.5YR mixed soil color hues. The deposit is massive and fine-grained, and may be stacked over buried soil 1. Diagnostic properties observed within this soil are an argillic Bt subsurface horizon that contains many fine and common moderately thick clay films on ped faces and common thick lining pores. This soil horizon is very fine grained with moderately strong angular blocky structure and a clear contact with the underlying buried soil 1. A relative age estimate of 15 to 30 ka for this surface soil in profile 2 was obtained by comparing the observed clay film development and soil consistence values to more the mature soil profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 1 correlates well to the surface soil that was described at station 46 feet, and is classified as a lightly truncated Palexeralf. The horizonation is characterized by a 2ABb/2Btb1 – 2Btb2 – 2Btb3 – 2Btb4/2BCoxb1 – 2Btb5/2BCoxb2 sequence. This soil has faint to moderately strong mottles and is weakly reduced. The deposit consists of a fining upwards sequence. Diagnostic properties observed within this soil include a moderately thick clay and organic rich transitional or argillic 2ABb/2Btb1 horizon that has few fine and very few moderately thick clay films on ped faces, common moderately thick lining pores, and few moderately thick coating clasts. This soil horizon is hard to very hard, very fine-grained with moderately strong angular blocky structure. This grades to a set of argillic Bt subsurface horizons 2Btb2 – 2Btb3 that contain common fine and few to common moderately thick clay films on ped faces and common moderately thick lining pores, and is very fine to fine grained with moderately strong angular blocky structure. This grades into a set of basal oxidized transitional BC horizons 2Btb4/2BCoxb1 – 2Btb5/2BCoxb2 that are fine to medium grained with weak angular blocky structure. These lower two horizons locally contain crude internal stratigraphy that forms a scoured contact with the underlying buried soil 2. A relative age estimate of 30 to 70 ka for buried soil 1 in profile 2 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile S-2 in the Mission Creek soil chronosequence (McFadden, 1988) and the less mature soil profile Qt5b in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 2 correlates well to the buried soil 1 that was described at station 46 feet, and is an severely truncated Alfisol remnant. This soil is characterized by 3Btb1 - 3Btb2/3BCb horizonation. This soil has faint to moderately strong mottling and is weakly reduced. The deposit consists of a thin fining upwards sequence. Diagnostic properties observed within this soil include an argillic 3Btb1 subsurface horizon that has common fine and few moderately thick clay films on ped faces and common moderately thick lining pores. This horizon is hard, very fine-grained with weak angular blocky structure. This grades to an transitional or argillic 3Btb2/3BCb subsurface horizon that contains very few fine clay films on ped faces and coating clasts, and is coarse grained with weak sub angular blocky structure. This basal horizon is crudely bedded and forms a scoured contact with the underlying buried soil 3. A relative age estimate of 15 to 30 ka for buried soil 2 in profile 2 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 3 correlates to the buried soil 2 that was described at station 46 feet. This soil is a very thin, weakly developed, and severely truncated remnant Alfisol. This soil is characterized by a 4BCoxb horizon. This soil has weak mottling and is moderately reduced. The deposit is massive and sandy. Diagnostic properties observed within this soil include a transitional 4BCoxb subsurface horizon that is fine grained with weak angular blocky structure. This basal horizon is internally massive and forms a scoured contact with the underlying buried soil 4. A relative age estimate of 8 to 15 ka for buried soil 3 in profile 2 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt4 and the less mature soil profile Qt3 in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 4 correlates to the buried soil 3 that was described at station 46 feet. This soil is also a thin and truncated remnant Alfisol that is characterized by 5ABb/5Btb1 – 5Btb2/5BCb horizonation. This soil has moderately strong to strong mottling and is moderately reduced. The deposit consists of a massive to very subtle fining upwards sequence and is overall fine grained. Diagnostic properties observed within this soil include a truncated transitional or argillic subsurface horizon 5ABb/5Btb1 that has common fine and few moderately thick clay films on ped faces and common moderately thick lining pores. This soil horizon is hard, fine-grained with weak angular blocky structure. This grades to a lower transitional or argillic 5Btb2/5BCb subsurface horizon that has few fine clay films on ped faces and common fine lining pores, and is massive, fine grained with weak angular blocky structure. Locally this basal horizon is crudely stratified and forms a scoured contact with the underlying buried soil 5. A relative age estimate of 15 to 30 ka for buried soil 4 profile 2 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 5 correlates well to the buried soil 4 that was described at station 46 feet, and is a well-developed truncated Alfisol remnant. This soil is characterized by 6Btb1 - 6Btb2

– 6Btb3 – 6Btb4/6BCb1 – 6Btb5/6BCb2 horizonation. This soil has moderately strong to strong mottling and is weakly to moderately reduced. This deposit consists of a fining upwards sequence. Diagnostic properties observed within this soil includes a severely truncated argillic 6Btb1 - 6Btb2 – 6Btb3 subsurface horizon sequence that has common fine and few moderately thick clay films on ped faces and common moderately thick lining pores. These horizons are very to extremely hard, very fine grained with weak to moderately strong angular blocky structure. This grades into a sequence of transitional or weaker argillic 6Btb4/6BCb1 – 6Btb5/6BCb2 subsurface horizons that have very few to few fine clay films on ped faces and few fine lining pores, and are fine-grained with weak sub angular to angular blocky structure. These basal horizons are internally massive and are continuous across the entire trench exposure. A relative age estimate of 70 to 100 ka for buried soil 5 in profile 2 was obtained by comparing the observed clay film development and soil consistence values to the less mature soil profile S-2 in the Mission Creek soil chronosequence (McFadden, 1988) and the more mature soil profile Qof1 in the West Hollywood soil chronosequence (WLA, 1999).

In conclusion, the entire stratigraphic section profile 2 at station 190 feet is estimated to be 168 to 315 ka. Most of this age resides within the lowest soil (buried soil 5) of this exposure. All five of the buried soils within this profile correlate well to the surface and first four buried soils within soil profile 1 at station 46. The lowest portion of buried soil number 5 in soil profile 2 is continuous across the entire trench exposure.

FIGURE 2
Soil Profile 2 at Station 190 feet

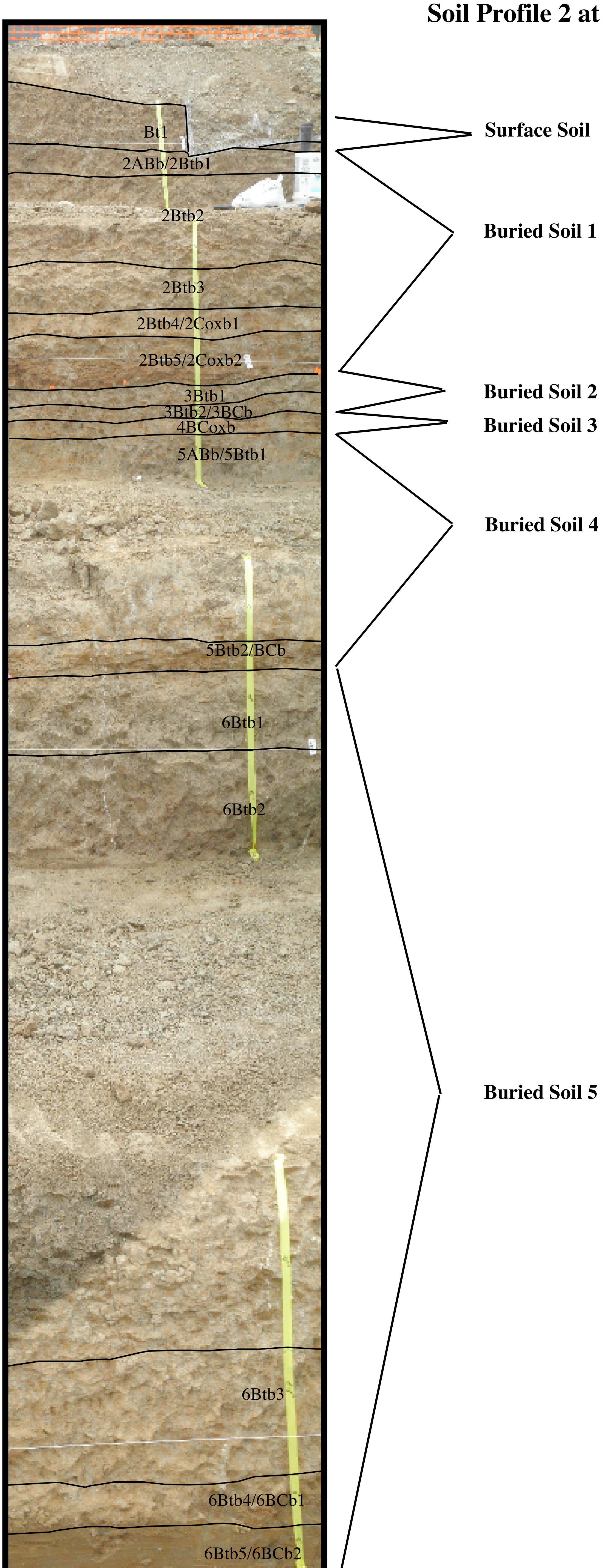

TABLE 2.1 Soil Profile – 2, Station 190 feet. Geocon Inc.'s Fault Rupture Hazard Study at 10000 Santa Monica Boulevard, Los Angeles, California.

Soil Classification: Series of stacked and truncated Alfisols
Geomorphic Surface: Alluvial Fan Remnant
Parent Material: Benedict Canyon Alluvium
Vegetation: Urban
Described By: John Helms
Date Described: 7/6/12
Exposure Type: Excavator Trench

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 190 feet
Bt trun	0 – 1.2	1.2	Brown (7.5YR 5/4 d; 7.5YR 3/2 m); clay loam; moderately strong medium and coarse angular and sub angular blocky; very hard, firm, very sticky, very plastic; light brown (7.5YR 6/4 d; 7.5YR 4/3 m) clay films many thin and common moderately thick on ped faces and common thick lining pores; very fine-grained very well sorted sand, moderately well oxidized; 0 - 5% fine rounded and sub rounded gravel; few fine and very few medium pores; localized MnO webbing on very few ped faces; common faint coarse reddish yellow (7.5YR 6/6 d; 7.5YR 5/6 m) mottles, weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; on-lapping soil unit; clear wavy boundary to:
2ABb / 2Btb1 trun	1.2 – 1.8	0.6	Brown (10YR 5/3 d; 10YR 3/2-3 m); loam to clay loam; weak fine and medium sub angular and angular blocky; hard to very hard, friable to firm, very sticky, moderately to very plastic; brown (7.5YR 5/4 d; 7.5YR 4/3 m) and light yellowish brown (10YR 6/4 d; 10 4/4 m) clay films few thin and very few moderately thick on ped faces, few moderately thick coating clasts, and common moderately thick lining pores; fine-grained well sorted sand, slight organics; 0 - 3 % fine rounded gravel; common fine and few medium pores; localized MnO webbing on very few ped faces; few to common fine faint reddish yellow (7.5YR 6/6 d; 7.5YR 5/6 m) mottles, weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 190 feet (Cont.)
2Btb2	1.8 – 3.6	1.8	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); loam; weak to moderately strong fine and medium angular and sub angular blocky; slightly hard to hard, friable, slightly to moderately sticky, slightly plastic; yellowish brown (10YR 5/6 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces and common moderately thick lining pores; fine-grained well sorted sand, slightly well oxidized; 0 - 5% fine rounded gravel; common fine and few medium pores; calcium carbonate stage 1-, common very fine nodules and faint coatings on few ped faces; very few fine faint strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational wavy boundary to:
2Btb3	3.6 – 4.4	0.8	Pale brown (10YR 6/3 d; 10YR 4/3 m); clay loam to silty clay; moderately strong fine and medium angular blocky; hard to very hard, very firm, very sticky, very plastic; brownish yellow (10YR 6/6 d; 10YR 4/6 m) clay films common thin, common moderately thick, few thick on ped faces, common moderately thick coating clasts; very fine-grained very well sorted sand; 0 - 3% fine rounded gravel; localized MnO webbing on few ped faces, few coarse moderately strong, reddish yellow (7.5YR 6/6 d; 7.5YR 4/6 m) mottles, localized moderate light gray (10YR 7/2d; 10YR 5/2 m) gleying; clear wavy boundary to:
2Btb4 / 2Coxb1	4.4 – 5.0	0.6	Brown (10YR 5/4 d; 10YR 4/3 m); sandy loam; massive to weak fine and medium angular and sub angular blocky; slightly hard to hard, very friable, slightly sticky, non-plastic; yellowish brown (10YR 5/6 d; 10YR 4/6 m) clay films few thin on ped faces, clay stains on clasts; fine-grained well sorted sand, slightly oxidized; 0 - 3% fine rounded gravel; calcium carbonate stage 1-, faint coatings on few ped faces and lining pores; localized fine MnO coatings on gravel and webbing on ped faces; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, strong light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; abrupt wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 190 feet (Cont.)
2Btb5 / 2Coxb2	5.3 – 6.1	0.8	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); sandy loam; massive to weak very fine and fine sub angular and angular blocky; soft to slightly hard, friable, non- to slightly sticky, non-plastic; yellowish brown (10YR 5/6 d; 10YR 4/4 m) clay films very few thin on ped faces, common stains and few thin coating clasts; medium-grained moderately well sorted sand, slightly oxidized; 10 - 25% fine rounded and sub rounded gravel; localized fine MnO coatings on gravel and webbing on ped faces; common coarse faint, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, moderate light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; crudely stratified scour deposit, truncates underlying deposit; abrupt wavy boundary to:
3Btb1 trun	6.1 – 6.45	0.35	Pale brown (10YR 6/3 d; 10YR 4/2 m); silty clay loam; weak fine and medium angular and sub angular blocky; hard, very firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, common moderately thick lining pores; very fine-grained very well sorted sand; 0 - 3% fine rounded gravel; few fine and medium pores; calcium carbonate stage 1-, few fine and very fine nodules and lining pores; few fine MnO nodules; few fine moderately strong reddish to brownish yellow (7.5-10YR 6/6 d; 7.5-10YR 4/6 m) mottles, and strong light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational wavy boundary to:
3Btb2 / 3BCb	6.45 – 6.7	0.25	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); sandy loam; single grained to weak very fine sub angular and angular blocky; soft, very friable, slightly sticky, non-plastic; yellowish brown (10YR 5/6 d; 10YR 4/4 m) clay films few thin and common stains coating clasts; coarse-grained poorly sorted sand, slightly oxidized; 10 - 25% fine rounded and sub rounded gravel; common fine MnO coatings on gravel and webbing on ped faces; very few fine faint mottles; slight grayish brown(10YR 5/2d; 10YR 4/2 m) gleying; crudely stratified scour deposit, truncates underlying deposit; clear wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 190 feet (Cont.)
4BCoxb trun	6.7 – 7.05	o.35	Pale brown (10YR 6/3 d; 10YR 5/2 m); loam; massive to weak fine angular and sub angular blocky; hard, friable, moderately sticky, moderately plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films very few to few thin and stains on ped faces; fine-grained well sorted sand; 0 - 5% fine rounded gravel; calcium carbonate stage 1, few to common fine and medium nodules and faint coatings on few ped faces; common coarse faint, reddish yellow (7.5YR 6/6 d; 7.5YR 4/4 m) mottles; moderate, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; massive scour deposit, truncates underlying deposit; gradational wavy boundary to:
5ABb / 5Btb1 trun	7.05– 9.05	2.0	Light brownish gray (10YR 6/2 d; 10YR 4/2 m); silty clay loam; weak fine and medium sub angular and angular blocky; hard, firm, moderately to very sticky, very plastic; yellowish brown (10YR 5/4 d; 10YR 4/3 m) clay films common thin and few moderately thick on ped faces, common moderately thick lining pores; fine-grained well sorted sand; 0 - 3% fine rounded gravel; few to common fine and medium pores; calcium carbonate stage 1, few to common fine and very fine nodules and faint coatings on few ped faces; few very fine MnO nodules; common coarse moderately strong, strong to yellowish brown (10-7.5YR 5/6 d; 10-7.5YR 4/4 m) mottles, and moderately strong, light gray (10YR 7/2 d; 10YR 5/2 m) gleying; gradational wavy boundary to:
5Btb2 / 5BCb	9.05– 9.35	0.3	Pale brown (10YR 6/3 d; 10YR 4/2 m); clay loam; massive to weak fine and medium sub angular and angular blocky; very hard, firm, very sticky, very plastic; yellowish brown (10YR 5/4 d; 10YR 4/3 m) clay films few on ped faces, common thin lining pores; fine-grained well sorted sand; 0 - 5% fine sub rounded and rounded gravel; few fine and medium pores; calcium carbonate stage 1, common very fine and fine nodules, faint coatings on few ped faces and lining pores; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/4 m) mottles, and strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; crudely stratified scour deposit, truncates underlying deposit; clear wavy boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 190 feet (Cont.)
6Btb1 trun	9.35–10.45	1.1	Brown (10YR 5/3 d; 10YR 4/2 m); clay to silty clay; moderately strong fine and medium prismatic and angular blocky; very hard, very firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, and common moderately thick lining pores; very fine-grained very well sorted sand; 0 - 3% fine rounded gravel; few medium pores; calcium carbonate stage 1-, few very fine and fine nodules; few fine moderately strong, reddish yellow (7.5YR 6/6 d; 7.5YR 4/4 m) mottles; slight, grayish brown (10YR 5/2 d; 10YR 4/2 m) gleying; gradational wavy boundary to:
6Btb2	10.45-14.15	3.7	Brown (10YR 5/3 d; 10YR 4/2 m); clay to silty clay; weak to moderately strong fine and medium prismatic and angular blocky; very to extremely hard, very firm, very sticky, very plastic; brown (7.5YR 5/4 d; 7.5YR 4/4 m) clay films few thin and common moderately thick on ped faces, and few thick lining pores; very fine-grained very well sorted sand; 0 - 3% fine rounded gravel; few medium pores; calcium carbonate stage 1, common fine nodules, faint coatings on few ped faces, and lining pores, strong MnO webbings on few ped faces; common medium moderately strong, reddish yellow (7.5YR 6/6 d; 7.5YR 5/6 m) mottles; slight, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational wavy boundary to:
6Btb3	14.15-15.85	1.7	Light yellowish brown (10YR 6/4 d; 10YR 5/3 m); clay to silty clay; moderately strong fine and medium angular blocky; very hard, very firm, very sticky, very plastic; brownish yellow (10YR 6/6 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, and common moderately thick lining pores; very fine-grained very well sorted sand, slightly well oxidized; 0 - 3% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine nodules, and common faint coatings on ped faces; common strong coarse, strong brown (7.5YR 5/8 d; 7.5YR 4/4 m) mottles; moderate, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 190 feet (Cont.)
6Btb4 / 6BCb1	15.85-16.7	0.85	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); loam to silty clay loam; weak fine and medium angular and sub angular blocky; slightly hard, firm, moderately to very sticky, very plastic; brownish yellow (10YR 6/6 d; 10YR 4/4 m) clay films very few thin on ped faces, and few fine lining pores; very fine-grained very well sorted sand, slightly oxidized; 0 - 3% fine rounded gravel; few medium pores; calcium carbonate stage 1--, very few fine and very fine nodules, weak MnO stains on few ped faces; common coarse strong, reddish yellow (7.5YR 6/6 d; 7.5YR 5/6 m) mottles, and strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational smooth boundary to:
6Btb5 / 6BCb2	16.7 - 17.3+	0.6+	Brown (10YR 5/3 d; 10YR 4/2 m); silty clay loam; massive to weak fine and medium angular and sub angular blocky; hard, firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films very few thin on ped faces, and few fine lining pores; very fine-grained very well sorted sand; no gravel; very few medium pores; calcium carbonate stage 1--, very few fine nodules; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and moderate, light gray (10YR 7/2 d; 10YR 4/2 m) gleying; undetermined lower boundary.

TABLE 2.2 - Soil Development Index Calculation Sheet
Soil Profile - 2 at Station 190 Feet

Unit	Thickness	Color				Texture		Structure		Consistence				Clay Films		Horizon	Mean Hor.
	(Feet)	Dry		Moist						Dry		Wet				Values	Values
Raw Alluvium	*3*	*2.5Y 7/2*	*X/10*	*10YR 6/3*	*X/10*	*s*	*X/5*	*sg*	*X/6*	*lo*	*X/5*	*so*	*X/6*	*0*	*X/15*		
Profile 2																	
Bt trun	1.2	7.5YR 5/4	0.4	7.5YR 3/2	0.1	cl	0.67	2 abk sbk	0.67	vh	0.80	vs, vp	1.00	3fpf, 2dpf, 2dpo	0.767	0.63	0.76
2ABb / 2Btb1 trun	0.6	10YR 5/3	0.2	10YR 3/2	0	l-cl	0.58	1 abk sbk	0.50	h-vh	0.7	vs, p-vp	0.92	1fpf, v1dpf, 2dpo, 1dcl	0.733	0.52	0.31
2Btb2	1.8	10YR 5/4	0.3	10YR 4/3	0	l	0.5	1-2 sbk abk	0.58	sh-h	0.5	ss-s, ps	0.42	2fpf, 1dpf, 2dpo	0.65	0.42	0.76
2Btb3	0.8	10YR 6/3	0.2	10YR 4/2-3	0	cl-sic	0.75	2 abk	0.67	h-vh	0.7	vs, vp	1.00	1kpf, 2dpo, 2dpf, 2fpf	0.933	0.61	0.49
2Btb4 / 2Coxb1	0.6	10YR 5/4	0.3	10YR 4/3	0	sl	0.33	1 abk sbk	0.50	h-vh	0.7	ss, po	0.17	1fpf, 1vncl	0.333	0.33	0.20
2Btb5 / 2Coxb2	0.8	10YR 5/4	0.3	10YR 4/4	0.1	ls-sl	0.25	1 abk sbk	0.5	sh-h	0.5	so-ss, po	0.08	v1fpf, 1fcl	0.333	0.29	0.24
3Btb1 trun	0.35	10YR 6/3	0.2	10YR 4/2	0	sicl	0.83	1 abk sbk	0.5	sh	0.4	vs, vp	1.00	2fpf, 1dpf, 2dpo	0.65	0.51	0.18
3Btb2 / 3BCb	0.25	10YR 5/4	0.3	10YR 4/3	0	sl	0.33	1 abk sbk	0.50	so	0.2	vs, vp	1	v1fpf, 1fcl, 2vncl	0.45	0.40	0.10
4BCoxb trun	0.35	10YR 6/3	0.2	10YR 5/2	0	l	0.5	1 abk sbk	0.50	h	0.6	s, p	0.67	1fpf, 1vfpf	0.383	0.41	0.14
5ABb / 5Btb1 trun	2	10YR 6/2	0.1	10YR 4/2	0	sicl	0.83	1 abk sbk	0.50	h	0.6	s-vs, vp	0.92	2fpf, 1dpf, 2dpo	0.65	0.51	1.03
5Btb2 / 5BCb	0.3	10YR 6/3	0.2	10YR 4/2	0	cl	0.67	1 abk sbk	0.50	vh	0.8	vs, vp	1	1fpf, 2fpo	0.4	0.51	0.15
6Btb1 trun	1.1	10YR 5/3	0.2	10YR 4/2	0	c-sic	0.92	2 pr abk	0.83	vh	0.8	vs, vp	1	**2fpf, 1dpf, 2dpo**	0.65	0.63	0.69
6Btb2	3.7	10YR 5/3	0.2	10YR 4/2	0	c-sic	0.92	1-2 pr abk	0.75	vh-eh	0.9	vs, vp	1	**2fpf, 1dpf, 2dpo**	0.65	0.63	2.34
6Btb3	1.7	10YR 6/4	0.3	10YR 5/3	0	c-sic	0.92	2 abk	0.67	vh	0.8	vs, vp	1	2fpf, 1dpf, 1kpo	0.75	0.63	1.08
6Btb4 / 6BCb1	0.85	10YR 5/4	0.3	10YR 4/3	0	l-sicl	0.58	1 abk sbk	0.50	sh	0.4	s-vs, p	0.75	**v1fpf, 1fpo**	0.333	0.41	0.35
6Btb5 / 6BCb2	0.7	10YR 5/3	0.2	10YR 4/2	0	sicl	0.83	1 abk sbk	0.50	h	0.6	vs, vp	1	**v1fpf, 1fpo**	0.333	0.49	0.35

INDEX VALUES AND DETERMINED AGES (ka)

Soil Member	MHI	Mean Soil Index	SDI @ 7 feet	Color Index	Clay Film Index	Soil Age Estimate ka	Section Age Estimate ka
Surface Soil	**0.63**	**0.76**	**4.41**	**0.4**	**0.77**	**30 - 70**	**30 - 70**
Buried Soil 1	**0.61**	**1.99**	**3.03**	**1.3**	**2.98**	**30 - 70**	**60 - 140**
Buried Soil 2	**0.52**	**0.28**	**3.25**	**0.5**	**1.10**	**15 - 30**	**75 - 170**
Buried Soil 3	**0.41**	**0.14**	**2.85**	**0.2**	**0.38**	**8 - 15**	**83 - 185**
Buried Soil 4	**0.51**	**1.18**	**3.60**	**0.3**	**1.05**	**15 - 30**	**98 - 215**
Buried Soil 5	**0.63**	**4.80**	**4.17**	**1.2**	**2.72**	**70 - 100**	**168 - 315**

Soil Profile 3
Station 270 Feet

Soil profile 3 is located at the eastern end of the trench at station 270 feet. The soil profile lies across a graded (or stripped) surface that is geomorphically inactive. Similar to soil profiles 1 and 2, this soil profile consists of a series of stacked, truncated, and buried argillic soil horizons. Most of the soil horizons observed are well developed and are classified as mature Alfisol soils. These soils have developed within an in-filled channel or wash that had incised through the soils described in profiles 1 and 2 and then was subsequently backfilled with debris flow and wash deposits. This deposit has mottling and gleying at depth and overprints or masks some of the original soil properties (mainly soil color). The soil profile at station 270 contains a surface soil and six buried soils to a depth of approximately 20.5 feet below the ground surface. This stratigraphic section assesses the relative age of the channel infilling as observed at station 270 feet. The lowest buried and truncated soil within profile 3 correlates well to the subsurface soil horizons observed at the base of soil profile 2 at station 190 feet. A detailed soil description for this profile is listed in table 3.1, the calculated soil development indices for this soil profile and relative age estimates are listed in table 3.2, and the individual soil profile members are briefly described below.

The surface soil profile is classified as a thin, severely truncated, remnant Alfisol. This soil is well oxidized and displays 7.5YR mixed soil color hues. The deposit is massive and medium-grained, and has a scoured contact with the underlying buried soil 1. Diagnostic properties observed within this soil are an argillic Bt subsurface horizon that contains common fine and few moderately thick clay films on ped faces, and common moderately thick lining pores and coating clasts. This soil horizon is slightly hard with moderately strong angular blocky structure. This deposit forms a lightly scoured and clear contact with the underlying buried soil 1. A relative age estimate of 15 to 30 ka for the surface soil remnant in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 1 is classified as a truncated Palexeralf. The horizonation is characterized by a 2Btb1 – 2Btb2 – 2Btb3 argillic horizon sequence. This deposit is massive. Diagnostic properties observed within this soil include a set of argillic Bt subsurface horizons (2Btb1 – 2Btb2 – 2Btb3) that contains common fine and few to common moderately thick clay films on ped faces, few to common moderately thick lining pores, and common moderately thick coating clasts. This soil horizon is very fine to fine grained with weak angular blocky structure. The lower two argillic horizons locally contain crude internal stratigraphy that forms a scoured contact with the underlying buried soil 2. A relative age estimate of 15 to 30 ka for buried soil 1 in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 2 is a severely truncated Alfisol remnant. This soil is characterized by 3Btb argillic horizon. This soil has moderately strong mottling and is moderately reduced. The deposit is massive. Diagnostic properties observed within this soil include an argillic 3Btb subsurface horizon that has few fine and very few moderately thick clay films on ped faces and few moderately thick lining pores. This soil horizon is very to extremely hard, very fine-grained with weak angular blocky structure. This deposit forms a scoured contact with the underlying buried soil 3. A relative age estimate of 8 to 15 ka for buried soil 2 in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt4 and the less mature soil profile Qt3 in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 3 is a well-developed and truncated remnant Alfisol. This soil is characterized by a 4ABb1/4Btb1 – 4ABb2/4Btb2 – 4Btb3 horizonation. This soil has moderately strong mottling and is strongly reduced. The deposit is massive and fine-grained. Diagnostic properties observed within this soil include a truncated transitional or argillic subsurface horizon (4ABb1/4Btb1) that has many fine and common moderately thick clay films on ped faces and common moderately thick lining pores. This soil horizon is very hard, very fine-grained with weak angular blocky structure. This grades to a lower set of argillic (4ABb2/4Btb2 – 4Btb3) subsurface horizons that has few to common fine and few moderately thick clay films on ped faces and common moderately thick lining pores, and are massive and fine grained with weak angular blocky structure. The basal horizon of this soil is lightly scoured or stacked onto the underlying buried soil 4. A relative age estimate of 15 to 30 ka for buried soil 3 in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil from profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 4 is also a well-developed and truncated remnant Alfisol that is characterized by 5Btb1 – 5Btb2 – 5Btb3 horizonation. This soil has weak to moderately strong mottling and is weakly reduced. The deposit is massive and sandy. Diagnostic properties observed within this soil include a set of argillic subsurface horizons (5Btb1 – 5Btb2 – 5Btb3) that have common to many fine and few to common moderately thick clay films on ped faces and common moderately thick and few thick lining pores. This set of soil horizons are very hard to hard, fine-grained with weak angular blocky structure. The basal argillic horizon of this soil is massive, fine-grained, and is most likely stacked onto the underlying buried soil 5. A relative age estimate of 15 to 30 ka for buried soil 4 in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt5-b and the less mature soil profiles Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 5 is a thin and severely truncated remnant Alfisol that is characterized by 6ABb1 – 6Btb1 horizonation. This soil has moderately strong mottling and is weakly to moderately reduced. This deposit consists of a thin coarsening upwards sequence that is internally massive. Diagnostic properties observed within this soil include a truncated transitional or argillic subsurface horizon (6ABb1) that has few fine and very few moderately thick clay films on ped faces and few moderately thick lining pores. This soil horizon is slightly hard, fine-grained with weak angular blocky structure. This grades to a weak argillic (6Btb1) subsurface horizon that has few to common fine and few moderately thick clay films on ped faces and common thin coating clasts, and is hard and fine grained with weak angular blocky structure. The basal horizon of this soil is massive, fine-grained, and is scoured into the underlying buried soil 6. A relative age estimate of 15 to 30 ka for buried soil 5 in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the more mature soil profile Qt5-b and the less mature soil profile Qt4 and Qt5-a in the Ventura Basin soil chronosequence (Rockwell, 1988).

Buried soil 6 correlates well to the basal soil horizons contained within buried soil 5 that was described at station 190 feet and buried soil 4 that was described at station 46 feet. This soil is a severely truncated Alfisol remnant, and is characterized by 7Btb1 - 7Btb2/7BCb1 – 7Btb3/7BCb2 horizonation. This soil has moderately strong to strong mottling and is weakly to moderately reduced. This deposit is massive and fine-grained. Diagnostic properties observed within this soil includes a severely truncated argillic subsurface horizon (7Btb1) that has common fine and few moderately thick clay films on ped faces and is hard, medium grained with weak sub angular blocky structure. This grades into a sequence of transitional or weaker argillic 7Btb2/7BCb1 – 7BCb2 subsurface horizons that are medium to fine-grained with weak sub angular to angular blocky structure. These basal horizons are internally massive and are continuous across the entire trench exposure. A relative age estimate of 70 to 100 ka for buried soil 6 in profile 3 was obtained by comparing the observed clay film development and soil consistence values to the less mature soil profile S-2 in the Mission Creek soil chronosequence (McFadden, 1988) and the more mature soil profile Qof1 in the West Hollywood soil chronosequence (WLA, 1999).

In conclusion, the entire stratigraphic section profile 3 at station 270 feet is estimated to be 153 to 265 ka. Most of this age resides within the lowest soil (buried soil 6) of this exposure. The surface soil plus the first five buried soils within this profile represents the channel fill deposit, and these soils do not directly correlate to the soils described elsewhere within this trench exposure. The soils that infill the channel deposit have a relative age estimate of 83 – 165 ka. The lowest portion of buried soil number 6 is continuous across the entire trench exposure.

FIGURE 3
Soil Profile 3 at Station 270 feet

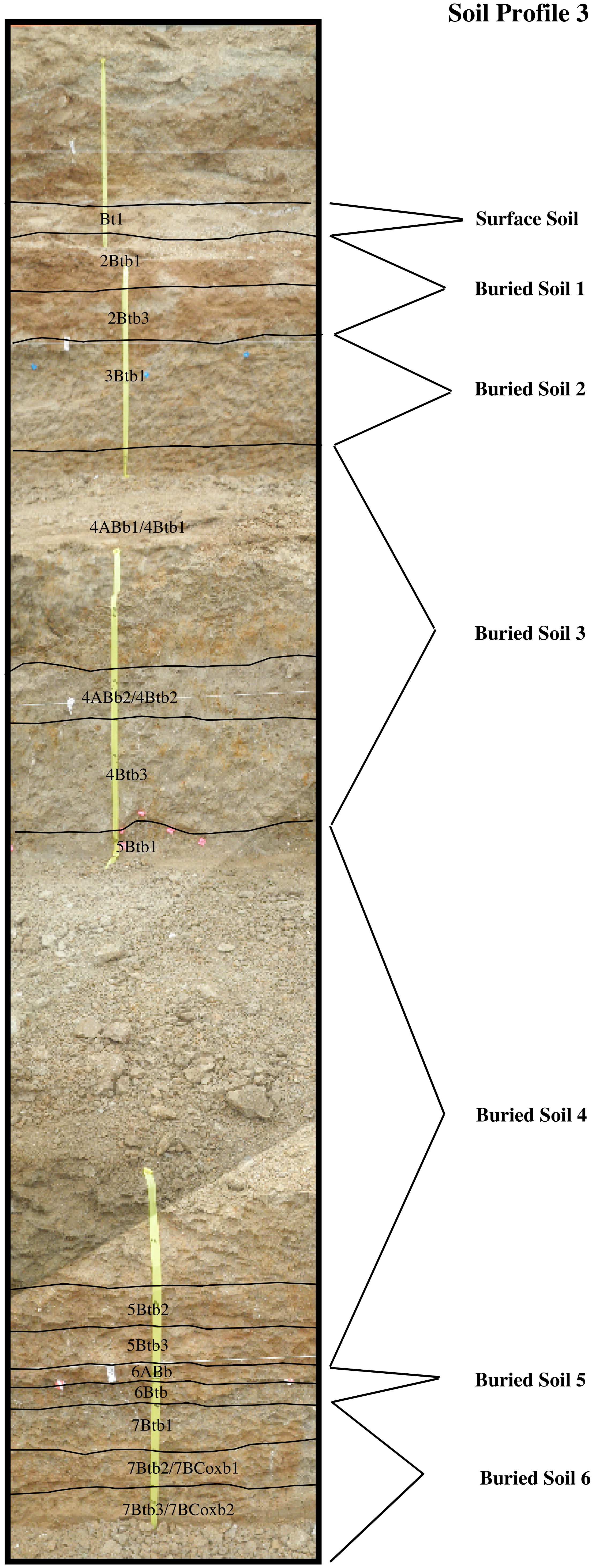

TABLE 3.1 Soil Profile – 3, Station 270 feet.
Geocon Inc.'s Fault Rupture Hazard Study at 10000 Santa Monica Boulevard, Los Angeles, California.

Soil Classification: Series of stacked and truncated Alfisols
Geomorphic Surface: Alluvial Fan Remnant
Parent Material: Benedict Canyon Alluvium
Vegetation: Urban
Described By: John Helms
Date Described: 7/2/12
Exposure Type: Excavator Trench

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 270 feet
Af	0 – 3.8	3.8	Artificial Fill – not described
Bt ox trun	3.8 – 4.3	0.5	Brown (7.5YR 5/4 d; 7.5YR 4/3 m); loam; massive to weak fine angular and medium sub angular blocky; slightly hard, friable, moderately sticky, slightly plastic; strong brown (7.5YR 4/6 d; 7.5YR 3/4m) clay films common thin and few moderately thick on ped faces, few moderately thick and common thin coating clasts, and common moderately thick lining pores; medium-grained moderately well sorted sand; 5 - 10% fine and medium rounded gravel; few medium pores, scour deposit, truncates underlying unit; clear smooth boundary to:
2Btb1 trun	4.3 – 4.7	0.4	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); silty clay loam to silty clay; weak fine angular and sub angular blocky; very hard, firm, very sticky, very plastic; brown (7.5YR 5/3 d; 7.5YR 4/3 m) clay films common thin on ped faces, few moderately thick lining pores; fine-grained well sorted sand, slightly well oxidized; 0 - 3% fine rounded gravel; very few fine and medium pores; very few fine faint strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, weak light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 270 feet (Cont.)
2Btb2	4.7 – 5.9	1.2	Dark yellowish brown (10YR 4/4 d; 10YR 3/3 m); loam; massive to weak very fine and fine angular and sub angular blocky; slightly hard, friable, slightly sticky, non- to slightly plastic; brown (7.5YR 5/4 d; 7.5YR 4/3 m) clay films common thin and moderately thick on ped faces, common thin coating clasts; fine-grained well sorted sand, slightly well oxidized; 10 - 25% fine rounded and sub rounded gravel; localized MnO stains on grains and webbing on very few ped faces, very few fine moderate strong brown (7.5YR 5/6 d; 7.5YR 4/4 m) mottles, localized moderate light gray (10YR 7/2d; 10YR 5/2 m) gleying; locally stratified with sand and pebble lenses; abrupt wavy boundary to:
2Btb3	5.9 – 6.9	1.0	Brown (7.5YR 5/4 d; 7.5YR 4/3 m); loam; single grained to weak very fine sub angular blocky; soft, very friable, non- to slightly sticky, non-plastic; brown (7.5YR 4/4 d; 7.5YR 3/3 m) clay films few to common thin and few moderately thick on ped faces, common thin and few moderately thick coating clasts, and few moderately thick bridging sand grains; coarse-grained poorly sorted sand, moderately well oxidized; 5 - 10% fine rounded gravel; localized MnO stains on grains; locally stratified with sand and pebble lenses; abrupt irregular boundary to:
3Btb1 trun	6.9 – 9.1	2.2	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); silty clay loam; weak fine and medium angular blocky; very hard to extremely hard, very firm, moderately to very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films few thin and very few moderately thick on ped faces, few moderately thick lining pores; very fine-grained very well sorted sand, slightly well oxidized; 0 - 3% fine rounded gravel; few very fine and fine pores; localized fine MnO webbing on ped faces; calcium carbonate stage 1-, faint coatings common on few ped faces; common coarse moderately strong reddish yellow (7.5YR 6/8 d; 7.5YR 5/6 m) mottles, moderate light brownish gray (10YR 6/2d; 10YR 4/2 m) gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 270 feet (Cont.)
4AB1 / 4Btb1 trun	9.1 – 11.7	2.6	Brown (10YR 5/3 d; 10YR 4/2 m); clay loam; massive to weak fine angular and sub angular blocky; very hard, very firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films many thin and common moderately thick on ped faces, common moderately thick lining pores; very fine-grained very well sorted sand; 0 - 3% fine rounded gravel; few very fine and fine pores; calcium carbonate stage 1-, few fine and very few medium nodules; common fine moderately strong reddish yellow (7.5YR 6/8 d; 7.5YR 5/6 m) mottles, and very weak gleying; clear wavy boundary to:
4AB2 / 4Btb2	11.7– 12.6	0.9	Grayish brown (10YR 5/2 d; 10YR 4/1 m); clay loam; massive to weak fine and medium angular blocky; very hard, firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films few thin and very few moderately thick on ped faces, few moderately thick lining pores; fine-grained well sorted sand, slight organics; 0 - 3% fine rounded gravel; few fine and medium pores; calcium carbonate stage 1-, very few very fine nodules and common lining pores; few fine moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/4 m) mottles, and strong, light gray (10YR 7/1 d; 10YR 5/1 m) gleying; gradational wavy boundary to:
4Btb3	12.6– 14.6	2.0	Light grayish brown (10YR 6/2 d; 10YR 4/1 m); clay loam; massive to weak fine and medium angular blocky; hard to very hard, firm, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, few moderately thick lining pores; fine-grained well sorted sand; 0 - 3% fine rounded gravel; few medium pores; calcium carbonate stage 1, few to common fine nodules; few to common medium moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/4 m) mottles, and strong, light gray (10YR 7/1 d; 10YR 5/1 m) gleying; abrupt irregular boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 270 feet (Cont.)
5Btb1 trun	14.6– 16.2	1.6	Brown to yellowish brown(10YR 5/3-4 d; 10YR 3/2 m); loam to clay loam; weak to moderately strong medium and coarse angular blocky; very hard, firm, very sticky, moderately to very plastic; brownish yellow (10YR 6/6 d; 10YR 5/6 m) clay films common thin, common moderately thick, and very few thick on ped faces, common moderately thick lining pores; fine-grained well sorted sand, slightly oxidized; 0 - 5% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine and very fine nodules and common lining pores; few fine to medium moderately strong, strong brown (7.5YR 5/8 d; 7.5YR 4/6 m) mottles, and weak, grayish brown (10YR 5/2 d; 10YR 4/2 m) gleying; gradational smooth boundary to:
5Btb2	16.2– 16.9	0.7	Yellowish brown (10YR 5/4 d; 10YR 3/3 m); loam; massive to weak fine angular blocky; hard, firm, moderately sticky, moderately plastic; brownish yellow (10YR 6/6 d; 10YR 5/6 m) clay films many thin and common moderately thick on ped faces, common moderately thick coating clasts and lining pores; fine-grained well sorted sand, slightly oxidized; 0 - 5% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine nodules and lining few pores; few to common fine to medium moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and weak, grayish brown (10YR 5/2 d; 10YR 4/2 m) gleying; gradational smooth boundary to:
5Btb3	16.9– 17.5	0.6	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); silty clay loam to silty clay; massive to weak fine and medium angular blocky; hard, very firm, very sticky, very plastic; yellowish brown (10YR 5/6 d; 10YR 4/6 m) clay films common thin and few moderately thick on ped faces, common fine and few moderately thick coating clasts and common moderately thick lining pores; very fine-grained very well sorted sand, slightly oxidized; 0 - 5% fine rounded gravel; few medium pores; calcium carbonate stage 1, common fine nodules, faint coatings on few ped faces, and lining few pores; few medium faint strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and very slight, gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 270 feet (Cont.)
6AB trun	17.5- 17.8	0.3	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); loam; massive to weak fine sub angular and angular blocky; slightly hard, friable, slightly to moderately sticky, slightly plastic; light yellowish brown (10YR 6/4 d; 10YR 4/4 m) clay films few thin and very few moderately thick on ped faces, few fine coating clasts and few moderately thick lining pores; fine-grained well sorted sand, slightly oxidized; 0 - 5% fine rounded gravel; common medium pores; calcium carbonate stage 1-, few very fine nodules; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and very slight, gleying; localized zones with few fine MnO nodules; gradational wavy boundary to:
6Btb1	17.8- 18.25	0.45	Brown to yellowish brown(10YR 5/3-4 d; 10YR 4/3 m); clay loam to silty clay loam; massive to weak fine and very fine angular blocky; hard, very firm, moderately to very sticky, very plastic; yellowish brown (10YR 5/4-6 d; 10YR 4/4 m) clay films common thin and few moderately thick on ped faces, few thin coating clasts; fine-grained well sorted sand; 0 - 5% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine and very fine nodules and common lining pores; common coarse moderately strong, strong brown (7.5YR 5/8 d; 7.5YR 4/6 m) mottles, and moderately strong, light gray (10YR 7/2 d; 10YR 4/2 m) gleying; localized zones with few fine MnO nodules; base of channel fill; abrupt wavy boundary to:
7Btb1 trun	18.25- 19.05	0.8	Brown (10YR 5/3 d; 10YR 4/2 m); clay loam to sandy clay loam; massive to weak fine sub angular blocky; hard, friable, very sticky, very plastic; light yellowish brown (10YR 6/4 d; 10YR 5/4 m) clay films few to common thin and very few moderately thick on ped faces; medium-grained moderately well sorted sand; 0 - 5% fine rounded gravel; few medium pores; calcium carbonate stage 1, few fine and very fine nodules and common lining pores; common coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and weak, grayish brown (10YR 5/2 d; 10YR 4-3/2 m) gleying; gradational smooth boundary to:

Horizon	Depth (ft)	Thickness (ft)	Description of T-1, Station 270 feet (Cont.)
7Btb2 / 7BCox1	19.05-19.75	0.7	Dark yellowish brown to brown (7.5-10YR 4/4 d; 7.5-10YR 4/3 m); loam; massive to weak very fine and fine sub angular blocky; hard, friable, moderately to slightly sticky, slightly plastic; yellowish brown (10YR 5/4 d; 10YR 4/4 m) clay films few thin on ped faces and few thin coating clasts; medium-grained moderately well sorted sand, moderately well oxidized; 0 - 3% fine rounded and sub rounded gravel; few fine and medium pores; calcium carbonate stage 1, few fine nodules and common lining pores; common very coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and moderately strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; gradational smooth boundary to:
7Btb3 / 7BCox2	19.75-20.65+	0.9+	Yellowish brown (10YR 5/4 d; 10YR 3/3 m); sandy clay loam to clay loam; massive to weak fine and medium angular blocky; hard, firm, very sticky, very plastic; brown (10YR 5/3 d; 10YR 4/3 m) clay films common thin and few to common moderately thick on ped faces; very fine-grained very well sorted sand, slightly oxidized; 0 - 3% fine rounded and sub rounded gravel; few fine and medium pores; calcium carbonate stage 1+, few to common very fine and fine nodules and common lining pores; common to many very coarse moderately strong, strong brown (7.5YR 5/6 d; 7.5YR 4/6 m) mottles, and moderately strong, light brownish gray (10YR 6/2 d; 10YR 4/2 m) gleying; undetermined lower boundary.

TABLE 3.2 - Soil Development Index Calculation Sheet
Soil Profile - 3, at Station 270 Feet

Unit	Thickness (Feet)	Color				Texture		Structure		Consistence				Clay Films		Horizon Values	Mean Hor. Values
		Dry		Moist						Dry		Wet					
Raw Alluvium	*3*	*2.5Y 7/2*	*X/10*	*10YR 6/3*	*X/10*	*s*	*X/6*	*sg*	*X/6*	*lo*	*X/5*	*so*	*X/6*	*0*	*X/15*		
Profile 3																	
Bt ox trun	0.5	7.5YR 5/4	0.4	7.5YR 4/3	0.1	l	0.5	1 abk sbk	0.50	sh	0.40	s, ps	0.50	2fpf, 1dpf, 2dpo, 2fcl	0.783	0.45	0.23
2Btb1 trun	0.4	10YR 5/4	0.3	10YR 4/3	0	sicl-sic	0.75	1 abk sbk	0.50	vh	0.8	vs, vp	1.00	2fpf, 2dpo	0.5	0.55	0.22
2Btb2	1.2	10YR 4/4	0.3	10YR 3/3	0	l	0.5	1 sbk	0.33	sh	0.4	ss, po-ps	0.25	1fpf, 1dpf, 2fcl	0.583	0.34	0.41
2Btb3	1	7.5YR 5/4	0.4	7.5YR 4/4	0.2	l	0.5	1 sbk	0.33	h	0.6	ss, po-ps	0.25	1-2fpf, 1dpf, 2fcl, 1dbr	0.733	0.43	0.43
3Btb1 trun	2.2	10YR 5/4	0.3	10YR 4/3	0	sicl	0.67	1 abk	0.50	vh-eh	0.9	s, vp	0.83	1fpf, v1dpf, 1dpo	0.55	0.54	1.18
4AB1 / 4Btb1 trun	2.6	10YR 5/3	0.2	10YR 4/2	0	cl	0.67	1 abk sbk	0.5	vh	0.8	vs, vp	1.00	3fpf, 2mkpf, 1mkpo	0.733	0.56	1.45
4AB2 / 4Btb2	0.9	10YR 5/2	0.1	10YR 4/1	0	cl	0.67	1 abk	0.5	vh	0.8	vs, vp	1.00	1fpf, v1dpf, 1dpo	0.55	0.52	0.47
4Btb3	2	10YR 6/2	0.1	10YR 4/1	0	cl	0.67	1 abk	0.50	h-vh	0.7	vs, vp	1	2fpf, 1dpf, 1dpo	0.633	0.51	1.03
5Btb1 trun ?	1.6	10YR 5/3-4	0.25	10YR 3/2	0	l-cl	0.58	1-2 abk sbk	0.58	vh	0.8	vs, p-vp	0.83	v1kpf, 2fpf, 2dpf, 2dpo	0.867	0.56	0.89
5Btb2	0.7	10YR 5/4	0.3	10YR 3/3	0	l	0.5	1 abk	0.50	h	0.6	s, p	0.67	2kpf, 3fpf, 2dpf, 2dpo	0.917	0.50	0.35
5Btb3	0.6	10YR 5/4	0.3	10YR 4/3	0	sicl-sic	0.75	1 abk	0.50	h	0.6	vs, vp	1	2fpf, 1dpf, 2dpo, 2fcl	0.783	0.56	0.34
6ABb trun	0.3	10YR 5/4	0.3	10YR 4/3	0	l	0.5	1 abk sbk	0.50	sh	0.4	ss-s, ps	0.42	**1fpf, v1dpf, 1dpo, 1fcl**	0.567	0.38	0.12
6Btb	0.45	10YR 5/3-4	0.25	10YR 4/3	0	cl-sicl	0.75	1 abk	0.50	h	0.6	s-vs,vp	0.83	**2fpf, 1dpf, 1fcl**	0.55	0.50	0.22
7Btb1 trun	0.8	10YR 5/3	0.3	10YR 4/2	0	scl-cl	0.75	1 sbk	0.33	h	0.6	vs, vp	1	1-2fpf, 1dpf, 2fcl, 1dbr	0.75	0.53	0.43
7Btb2 / 7BCox1	0.7	10-7.5YR 4/4	0.2	10-7.5YR 4/3	0.06	scl-cl	0.75	1 sbk	0.33	h	0.6	vs, vp	1	**1fpf, 1fcl**	0.35	0.47	0.33
7Btb3 / 7BCox2	0.9	10YR 5/4	0.3	10YR 3/3	0	scl-cl	0.76	1 abk	0.50	h	0.6	vs, vp	1	**2fpf, 1-2dpf**	0.483	0.52	0.47

INDEX VALUES AND DETERMINED AGES (ka)

Soil Member	MHI	Mean Soil Index	SDI @ 7 feet	Color Index	Clay Film Index	Soil Age Estimate ka	Section Age Estimate ka
Surface Soil	**0.45**	**0.23**	**3.18**	**0.4**	**0.78**	**15 - 30**	**15 - 30**
Buried Soil 1	**0.55**	**1.06**	**2.84**	**1**	**1.82**	**15 - 30**	**30 - 60**
Buried Soil 2	**0.56**	**1.18**	**3.75**	**0.3**	**0.55**	**8 - 15**	**38 - 75**
Buried Soil 3	**0.52**	**2.94**	**3.75**	**0.4**	**1.92**	**15 - 30**	**53 - 105**
Buried Soil 4	**0.56**	**1.58**	**3.81**	**0.85**	**2.57**	**15 - 30**	**68 - 135**
Buried Soil 5	**0.50**	**0.34**	**3.16**	**0.55**	**1.12**	**15 - 30**	**83 - 165**
Buried Soil 6	**0.53**	**1.22**	**3.57**	**0.8**	**1.58**	**70 - 100**	**153 - 265**

CONCLUSIONS

The soils observed across the study area are alfisols that have developed in alluvial environments. All three of the soil profiles consist of a series of stacked, truncated, and buried argillic soil horizons. The soil profiles across the western and central portions of the project site area are laterally continuous, and dip gently to the east. Lateral variability in soils across the eastern portion of the site is due to the infilling of an ancient channel scour. In this sedimentological environment surfaces that have been stable long enough to form a robust soil, can suddenly be buried by a new deposit, or scoured out (truncated) and possibly in-filled with younger material. The amount of erosion that has occurred with each truncated soil under study is unknown. Thus the relative age estimates given in this study are minimum ages.

The truncated and buried soils with argillic sub surface soil horizons are moderately well to strongly developed. The buried alfisol soils typically have 10 YR colors with a moderate amount of secondary (pedogenic) clay in a series of argillic (Bt) diagnostic subsurface horizons. Structure is typically moderately strong sub angular to angular blocky and very hard. Clay films are abundant and moderately thick. Most of the buried soils contain moderately strong to strong mottling (oxidation) and gleying (reduction) that increases at depth and overprints or masks some of the original soil properties (mainly soil color).

These soil relative age determinations are consistent with the general geologic and pedogenic observations of soils in southern California. Strongly developed, well horizonated, thick, and oxidized alfisols can be as much as 200 ka in age. Erosion tends to act as a rejuvenating aspect in soil development, by decreasing the strength of the soil development properties consequent age estimates are younger. In that past magnitudes and rates of erosion is difficult to assess the soil relative age estimates are utilized as minimum ages.

The soils exposed in trench exposure are Pleistocene in age. The stacked soils display soil horizons that have strong argillic horizon development. The stratigraphic section for profile 1 at station 46 feet is estimated to be 208 to 345 ka. Most of this age resides within the lowest two soils (buried soil 4 and 5) of this exposure. The upper five soils (surface soil plus buried soils 1 through 4) within this profile correlate well to the stratigraphic section for profile 2 at station 190.

The stratigraphic section profile 2 at station 190 feet is estimated to be 168 to 315 ka. Most of this age resides within the lowest soil (buried soil 5) in this exposure. All five of the buried soils within this profile correlate well to the surface and first four buried soils within soil profile 1 at station 46. The lowest portion of buried soil number 5 in soil profile 2 is continuous across the entire trench exposure.

The stratigraphic section profile 3 at station 270 feet is estimated to be 153 to 265 ka. Most of this age resides within the lowest soil (buried soil 6) of this exposure. The surface soil plus the first four and a portion of the fifth buried soils within this profile represents the channel fill deposit, and these soils do not directly correlate to the soils described elsewhere within this trench exposure. The soils that infill the channel deposit have a relative age estimate of 83 – 165 ka.

LIMITATIONS

The conclusions and recommendations presented herein are the results of an inherently limited scope. Specifically, the scope of services consisted of an assessment of relative age and did not participate in many mapping or logging activities at the site. The conclusions and recommendations contained in this report are professional opinions derived in accordance with current standards of professional practice. No warranty is expressed or implied.

This report has been prepared for the exclusive use of Geocon, Inc. and applies only to the Fault Rupture Hazard Study located at 10000 Santa Monica Boulevard. In the event that significant changes in the interpretations of this study to be made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed by John Helms, CEG, and the conclusions and recommendations of this report are verified in writing.

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Table 4. Soil Surface Relative-Age Estimates Summary Table

Profile Number	Soil Member	MHI Value	SDI Value	Clay Film	Age (ka)
1	Surface Soil	0.56	2.52	1.60	30 - 70
@sta 46	Buried Soil 1	0.48	3.01	1.31	45 - 100
	Buried Soil 2	0.43	2.67	0.68	53 - 115
	Buried Soil 3	0.61	3.43	2.15	68 - 145
	Buried Soil 4	0.64	3.42	2.93	138 - 245
	Buried Soil 5	0.64	4.07	1.45	208 - 345
2	Surface Soil	0.63	4.41	0.77	30 - 70
@sta 190	Buried Soil 1	0.61	3.03	2.98	60 - 140
	Buried Soil 2	0.52	3.25	1.10	75 - 170
	Buried Soil 3	0.41	2.85	0.38	83 - 185
	Buried Soil 4	0.51	3.60	1.05	98 - 215
	Buried Soil 5	0.63	4.17	2.72	168 - 315
3	Surface Soil	0.45	3.18	0.78	15 - 30
@sta 270	Buried Soil 1	0.55	2.84	1.82	30 - 60
	Buried Soil 2	0.56	3.75	0.55	38 - 75
	Buried Soil 3	0.52	3.75	1.92	53 - 105
	Buried Soil 4	0.56	3.81	2.57	68 - 135
	Buried Soil 5	0.50	3.16	1.12	83 - 165
	Buried Soil 6	0.53	3.57	1.58	153 - 265

Table 5. Comparison Soil Data Indices Value Summary

(McFadden) Mission Creek Soils	SDI At 7'	MHI	Reddening Index	Clay Film Index
S7 0-1000 yrbp	5.9	0.12	0	0
S5 4-13 ka	10.2	0.3	0.1	0
S4 13-70 ka	31.4	0.37	3.94	7.37
S2 70-250 ka	56.10	0.61	4.80	6.24
S2 250-700 ka	25.70	0.39	6.20	10.31

(Rockwell) Ventura River Basin Soils	SDI At 7'	MHI	Reddening Index	Clay Film Index
Qt3 4 - 8 ka	17	0.17	0.5	0
Qt4 10 -15 ka	27	0.43	2	4
Qt5a 15 – 20 ka	28	0.37	3.5	4.2
Qt5b 30 ka	32	0.46	5	7

(WLA) West Hollywood Buried Soils	SDI At 7'	MHI	Reddening Index	Clay Film Index
Qol1 100 ka	21.4	0.42	1.05	1.99
Qol2 100-300 ka	73.5	0.8	8.2	13.2

TABLE 6. Soil Field Description Abbreviation Key

Texture		Structure		Consistence: Dry		Consistence: Moist		Consistence: Wet		Clay Films		Calcium Carbonate (Pedogenic CaCO3)	
S	- sand	m	- massive	l	- loose	vfr	-very friable	so	non stickey	v1	veryfew	sl dis	slightly dissemenated
LS	- laomy sand	sg	- single grained	so	-soft	fr	-friable	ss	slightly stickey	1	few	I	slight coatings common on clast bottoms
SL	- sandy loam	**OR**		sh	-slightly hard	fi	-firm	s	moderately siteckey	2	common	II	moderately thick coatings on clast bottoms; few medium common fine nooduses
L	- loam	1	- weak	h	-hard	vfi	-very firm	vs	very stickey	3	continuous	III	thick coatings common on clast bottoms, common medium nodules, common fine pendants, many fine nodules
CL	- clay loam	2	- moderate	vh	-very hard			**AND**		**AND**		VI	many thick coatings on clasts bottoms common coarse pendants few clasts completely enveloped
SCL	- sandy clay loam	3	- strong	eh	-extremely hard			po	non plastci	vn	stains	V	many thick coatings on clasts bottoms, many coarse pendants common clasts completely enveloped- petrocalcic
C	- clay	**AND**						ps	slightly plastic	n	thin	V+	many thick coatings on clasts bottoms, many coarse pendants many clasts completely enveloped, completely disseminated in matrix - petrocalcic
Si	- silt	vf	- very fine					p	moderately plastic	mk	moderately thick		
SiL	- silt loam	f	- fine					vp	very plastic	k	thick		
SiCL	- silt clay loam	m	- medium							**AND**			
SiC	- silty clay	c	- coarse							cl	coating clasts		
		vc	- very coarse							pf	ped faces		
		AND								br	brodgeing sand grains		
		gr	- granular							po	lining pores		
		pl	- platty										
		pr	-prismatic										
		abk	-angular blockey										
		sbk	- sub angular blockey										

Table 7. Trench Log Unit Correlation Sheet

Trench Log Unit	Soil Profile	Soil Horizon	Age (ka)
1	3	surface soil, buried soil 1	30 - 60
2	3	buried soil 2, 3, and 4	68 - 135
4	1	surface soil	60 - 140
	2	surface soil, buried soil 1	
5	1	buried soil 1 and 2	83 - 185
	2	buried soil 2 and 3	
6	1	buried soil 3	98 - 215
	2	buried soil 4	
7	1	buried soil 4 (upper portion)	138 - 245
	2	buried soil 5 (upper portion)	
	3	buried soil 5	
8	1	buried soil 4 (lower portion)	153 - 245
	2	buried soil 5 (lower portion)	
	3	buried soil 5	
9	1	buried soil 4 (lower portion)	168 - 315
10	1	buried soil 5	208 - 345

APPENDIX B

FIELD INVESTIGATION PHOTOGRAPHS

Photo 1 – Trench Excavation Looking West

Photo 2 – Cleaning Southeast Trench Wall

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SITE PHOTOS 1 & 2		
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A8928-06-01	August 2012	Figure B1

Photo 3 – Trench Excavation Looking South

Photo 4 – Trench Excavation Looking Southeast

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SITE PHOTOS 3 & 4		
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Photo 5 – Trench Excavation Looking East-Southeast

Photo 6 – Trench Excavation Looking East

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SITE PHOTOS 5 & 6		
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Photo 7 – Continuity of Geologic Units-Western Portion of Trench

Photo 8 – Continuity of Geologic Units-Central Portion of Trench

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SITE PHOTOS 7 & 8		
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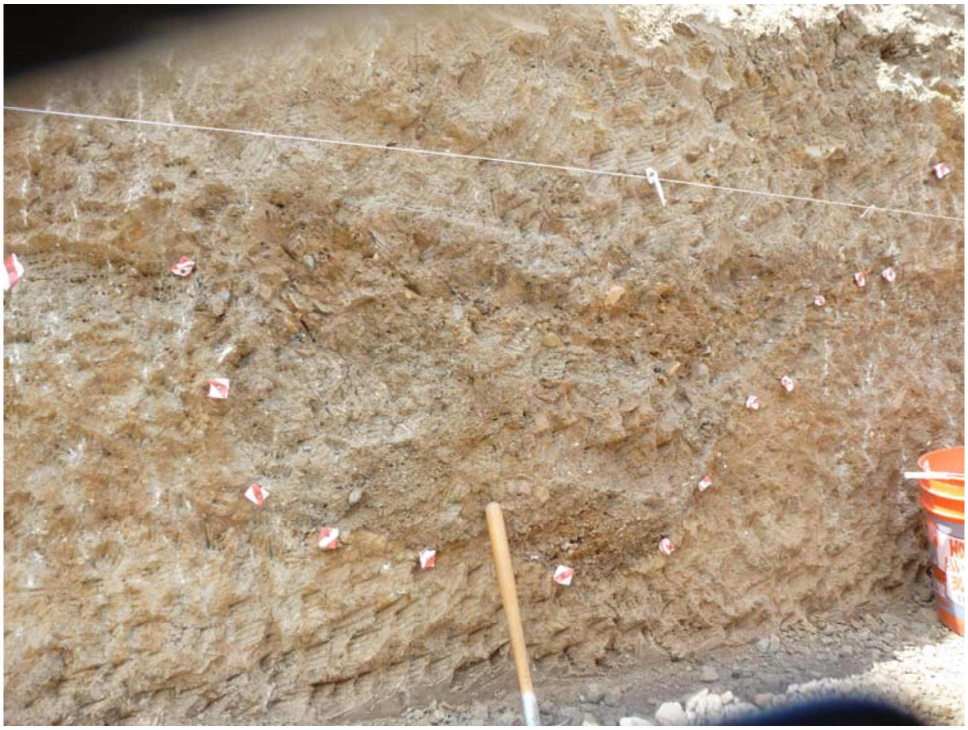

Photo 9 – Basal Scour and Fill – Station 2+65

Photo 10 – Basal Scour and Fill-Contact between Units 2 and 7

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SITE PHOTOS 9 & 10		
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A8928-06-01	August 2012	Figure B5

Photo 11 – Paleochannel Boundary-Southeast Trench Wall

Photo 12 – Basal Scour-Southeast Trench Wall

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SITE PHOTOS 11 & 12		
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Photo 13 – Soil Profile 1 – Station 0+46

Photo 14 – Soil Profile 1 –Station 0+46 (2nd Bench)

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SITE PHOTOS 13 & 14		
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A8928-06-01	August 2012	Figure B7

Photo 15 – Discontinuous Fractures – Station 1+00

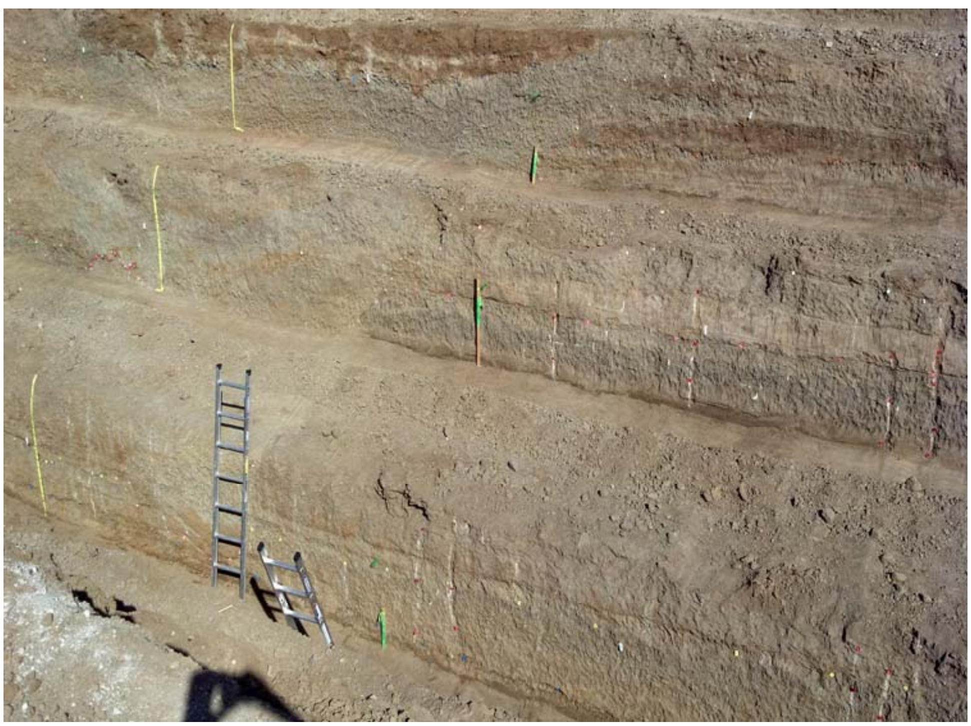

Photo 16 – Discontinuous Fractures – Station 2+30

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SITE PHOTOS 15 & 16		
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A8928-06-01	August 2012	Figure B8

Photo 17 – Discontinuous Fractures – Station 0+50

Photo 18 – Discontinuous Fractures – Station 0+90

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SITE PHOTOS 17 & 18		
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APPENDIX C

PHOTOGRAPHIC LOG OF TRENCH

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BENCH 1
Stations 0+00 to 0+10

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BENCH 1 **Stations 0+10 to 0+20**		
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BENCH 1 PHOTOS Stations 0+20 to 0+30		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 0+30 to 0+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C4

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BENCH 1 PHOTOS
Stations 0+40 to 0+50

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C5

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BENCH 1 PHOTOS **Stations 0+50 to 0+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C6

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BENCH 1 PHOTO **Stations 0+60 to 0+70**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C7

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BENCH 1 PHOTOS **Stations 0+70 to 0+80**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 0+80 to 0+90**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 0+90 to 1+00**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Station 1+00 to 1+10**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTO Station 1+10 to 1+20		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 1+20 to 1+30**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 1+30 to 1+40**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 1+40 to 1+50**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 1+50 to 1+60**		
10000 Santa Monica Boulevard Los Angeles, California		
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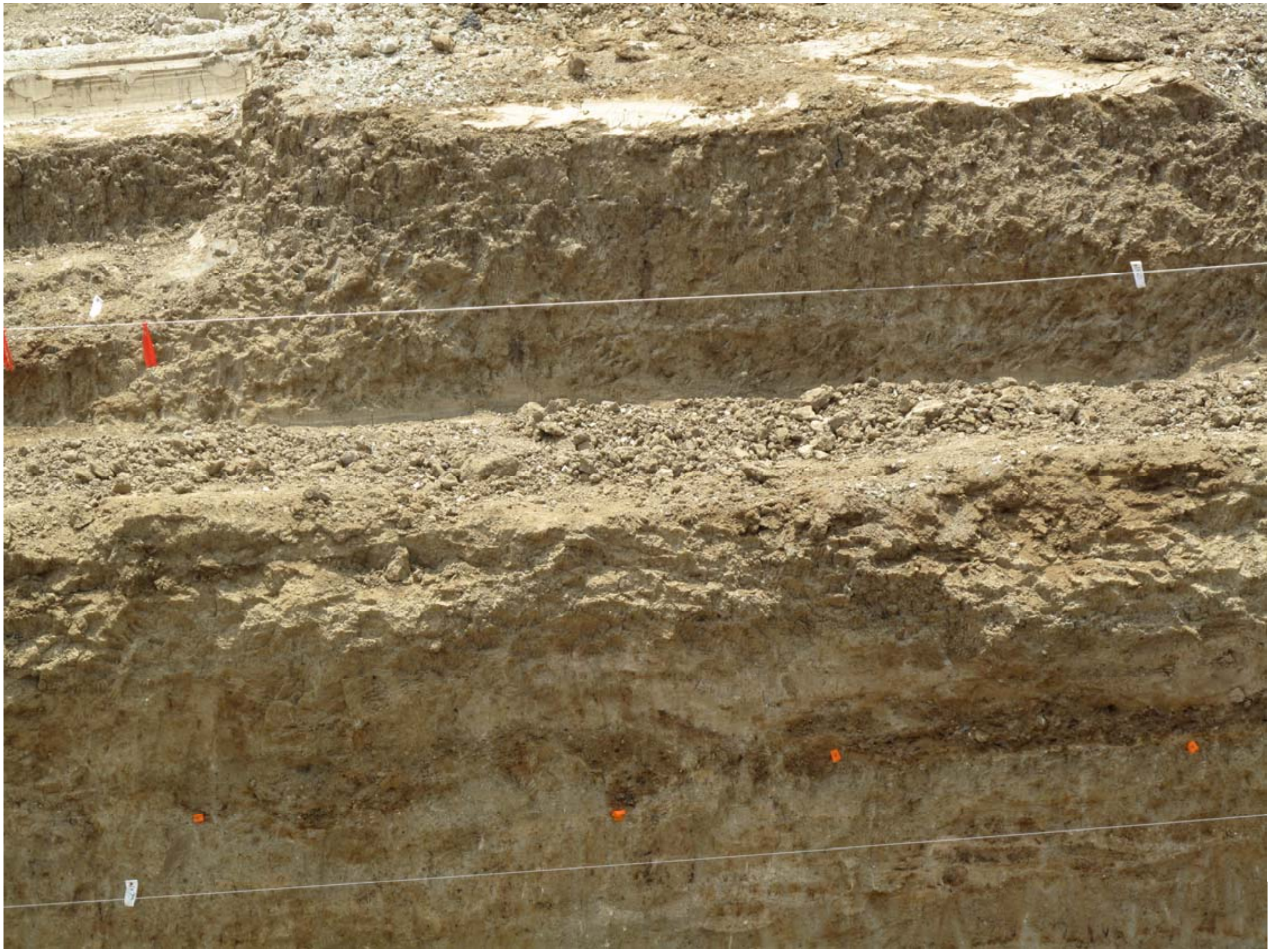

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BENCH 1 PHOTOS – Stations 1+60 to 1+70		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS Stations 1+70 to 1+80		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 1+80 to 1+90**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 1+90 to 2+00**		
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BENCH 1 PHOTOS **Stations 2+00 to 2+10**		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS Stations 2+10 to 2+20		
10000 Santa Monica Boulevard Los Angeles, California		
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BENCH 1 PHOTOS **Stations 2+20 to 2+30**		
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BENCH 1 PHOTOS **Stations 2+30 to 2+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C24

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BENCH 1 PHOTOS Stations 2+40 to 2+50		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C25

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BENCH 1 PHOTOS **Stations 2+50 to 2+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C26

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BENCH 1 PHOTOS **Stations 2+60 to 2+70**		
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A8928-06-01	August 2012	Figure C27

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BENCH 1 PHOTOS **Stations 2+70 to 2+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C28

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BENCH 1 PHOTOS **Stations 2+80 to 2+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C29

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BENCH 1 PHOTOS
Stations 2+90 to 3+00

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C30

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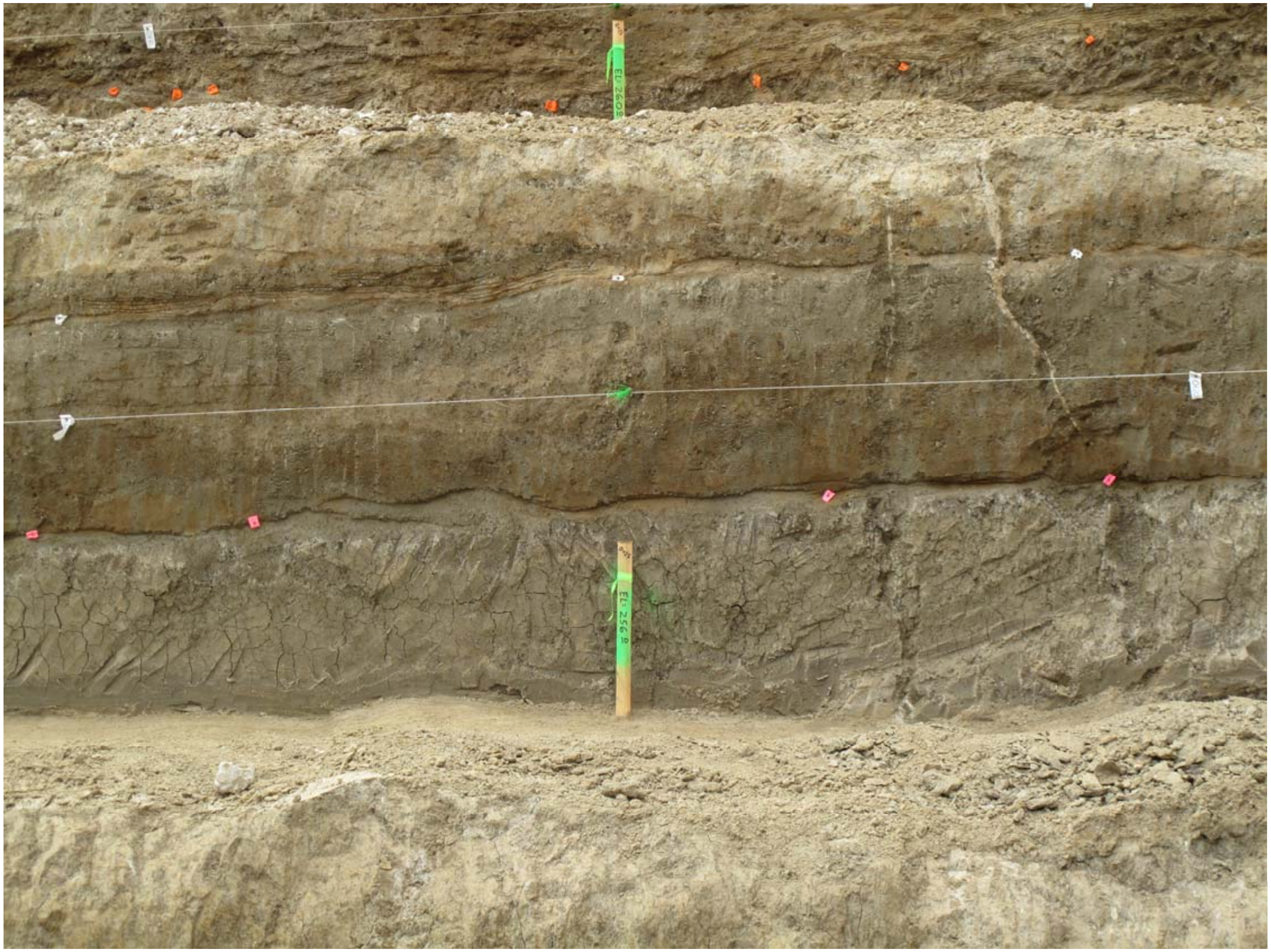
BENCH 2 PHOTOS **Stations 0+10 to 0+20**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C31



GEOCON
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GEOLOGICAL CONSULTING

BENCH 2 PHOTOS Stations 0+20 to 0+30		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C32

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 0+30 to 0+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C33

GEOCON
WEST, INC.

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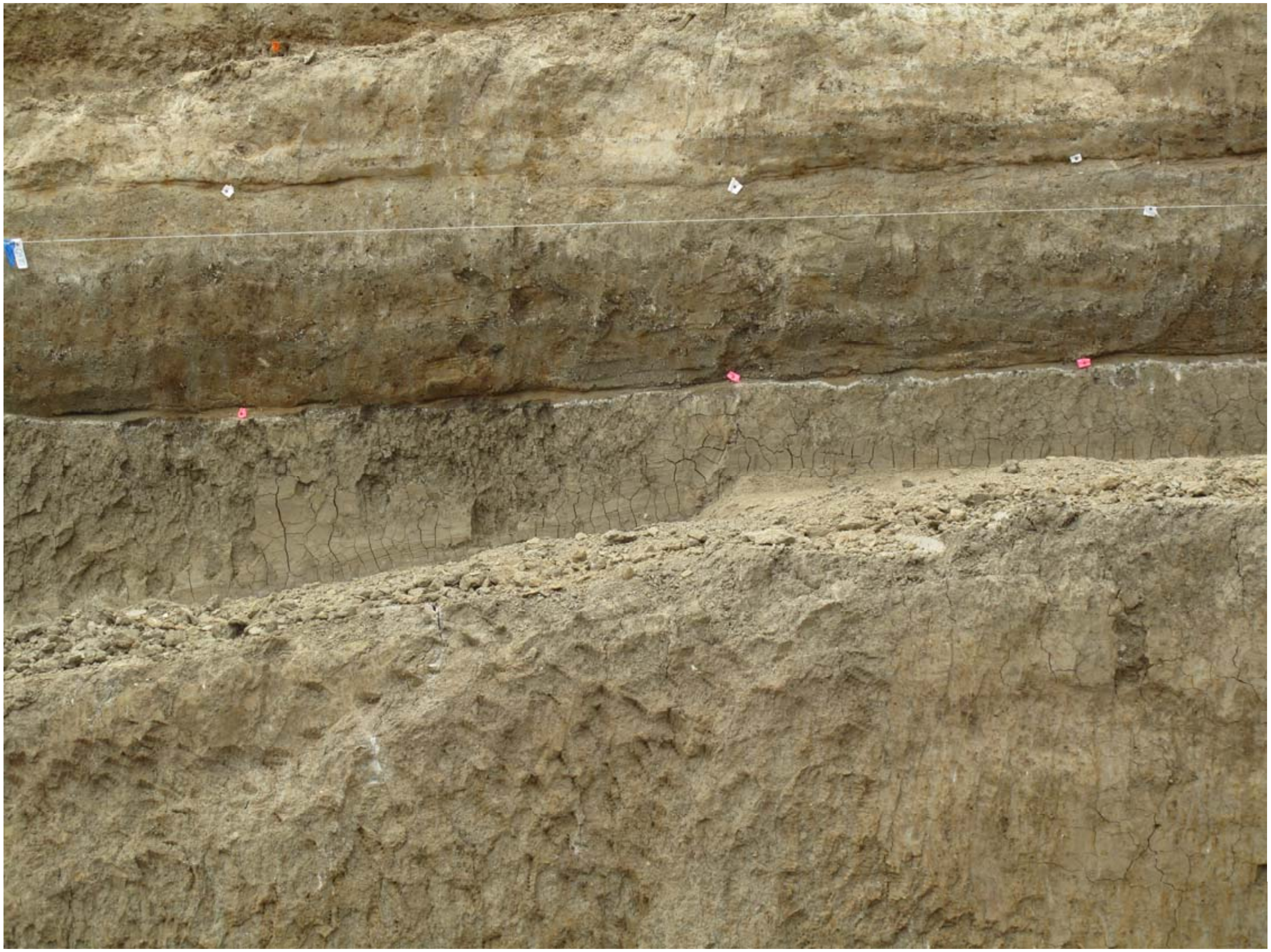
BENCH 2 PHOTOS **Stations 0+40 to 0+50**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C34

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 0+50 to 0+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C35



GEOCON WEST, INC.

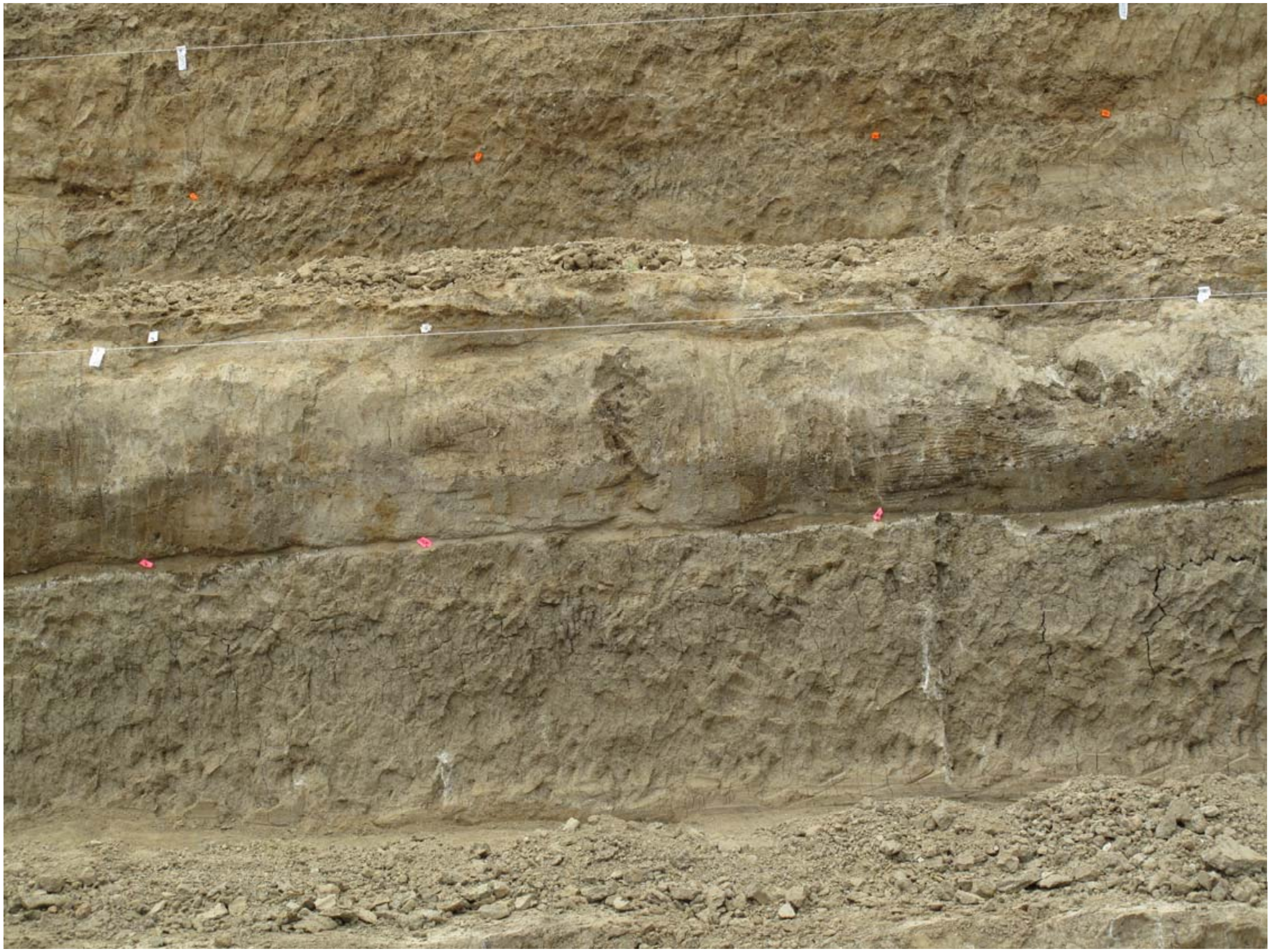
FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS Stations 0+60 to 0+70		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C36

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 0+70 to 0+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C37



GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 0+80 to 0+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C38

GEOCON
WEST, INC.

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BENCH 2 PHOTOS **Stations 0+90 to 1+00**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C39

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 1+00 to 1+10**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C40

GEOCON
WEST, INC.

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BENCH 2 PHOTOS **Stations 1+10 to 1+20**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C41

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 1+20 to 1+30**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C42

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 1+30 to 1+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C43

BENCH 2 PHOTOS
Stations 1+40 to 1+50

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C44

GEOCON
WEST, INC.

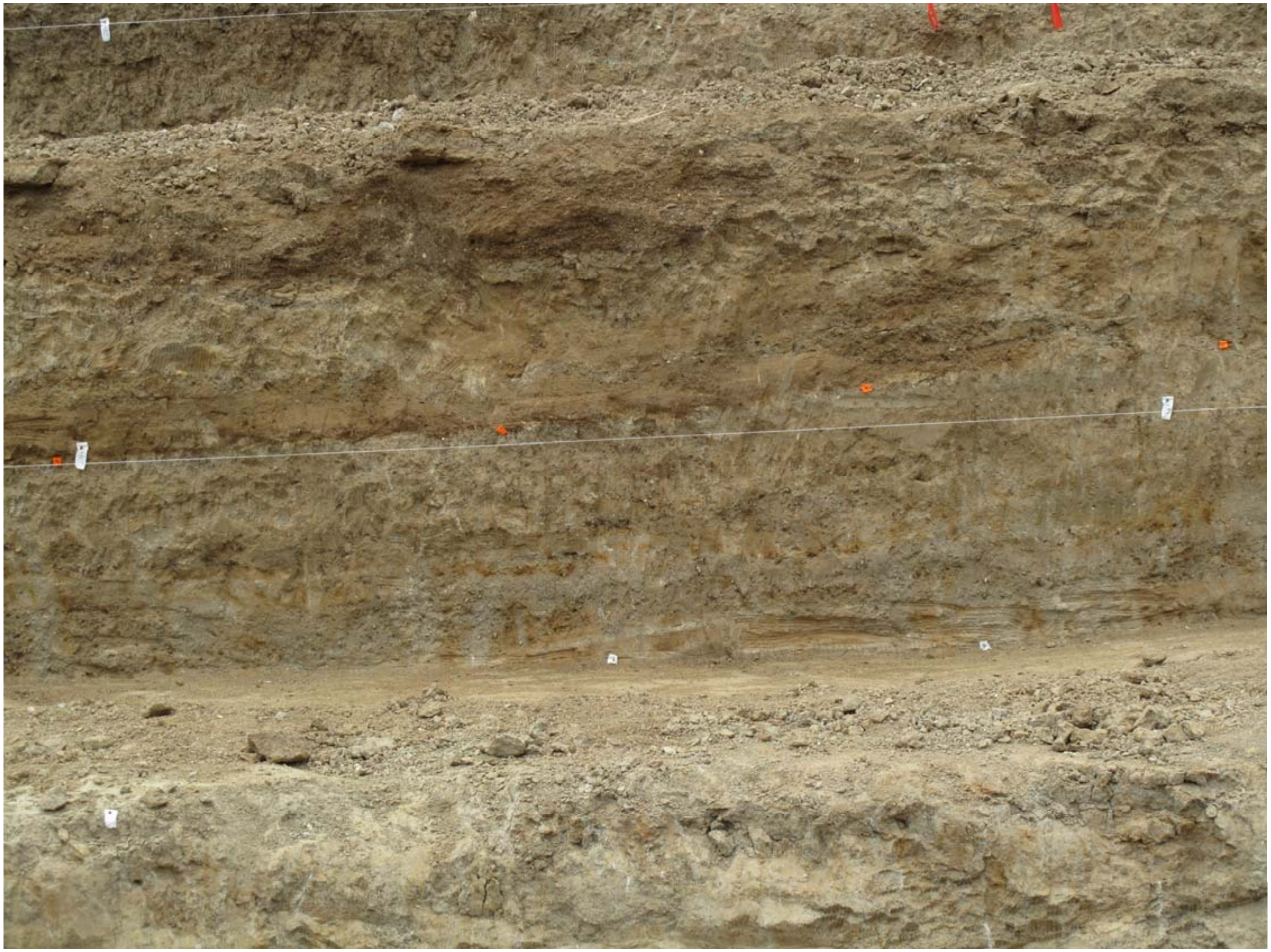
FEFFER
GEOLOGICAL CONSULTING

BENCH 2 PHOTOS Stations 1+50 to 1+60		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C45

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

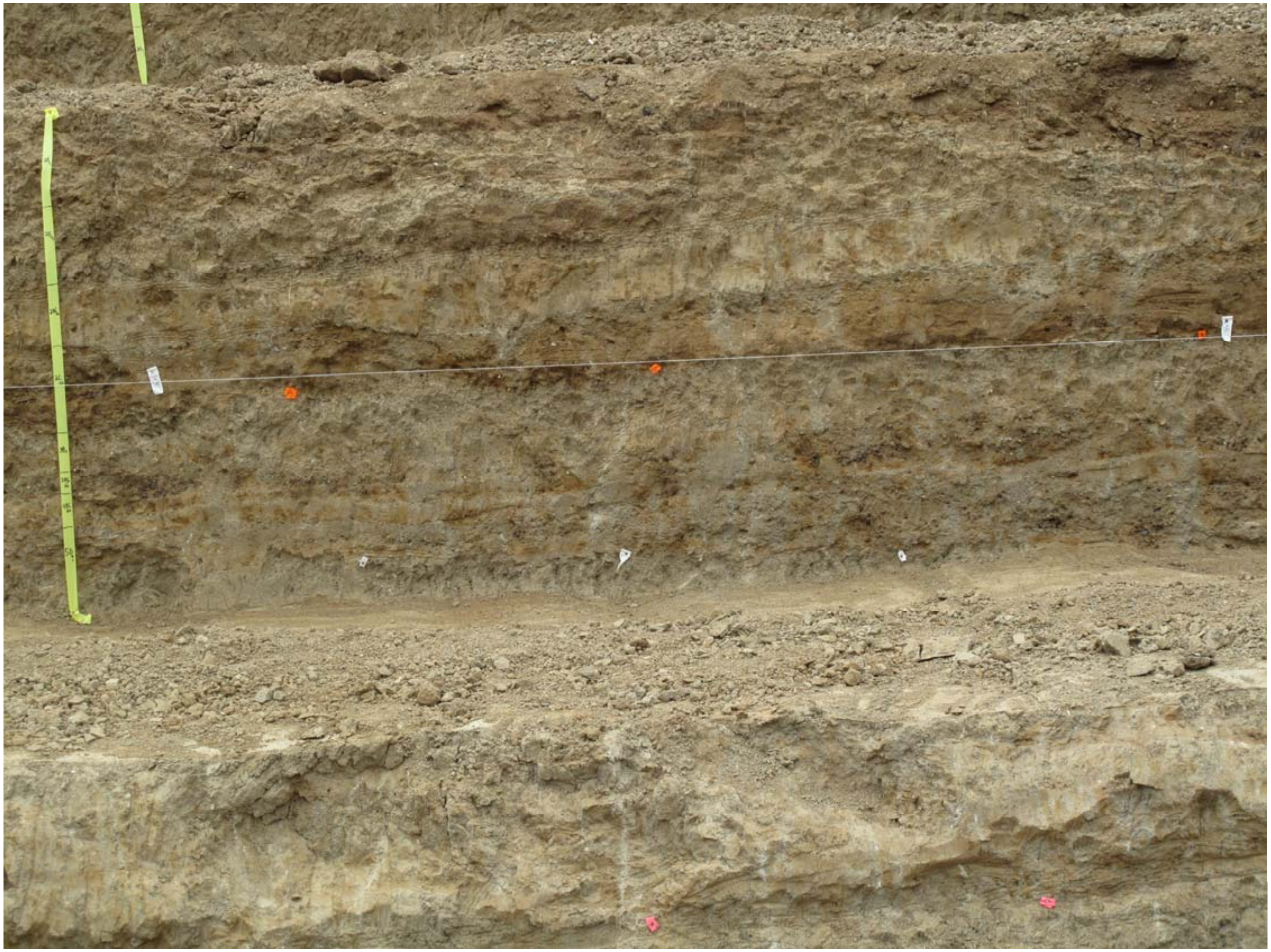
BENCH 2 PHOTOS **Stations 1+60 to 1+70**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C46



GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 1+70 to 1+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C47



GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 1+80 to 1+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C48

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Station 1+90 to 2+00**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C49

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS
Stations 2+00 to 2+10

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C50

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 2 PHOTOS Stations 2+10 to 2+20		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C51

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 2+20 to 2+30**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C52

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 2+30 to 2+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C53

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 2+40 to 2+50**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C54

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS
Stations 2+50 to 2+60

10000 Santa Monica Boulevard

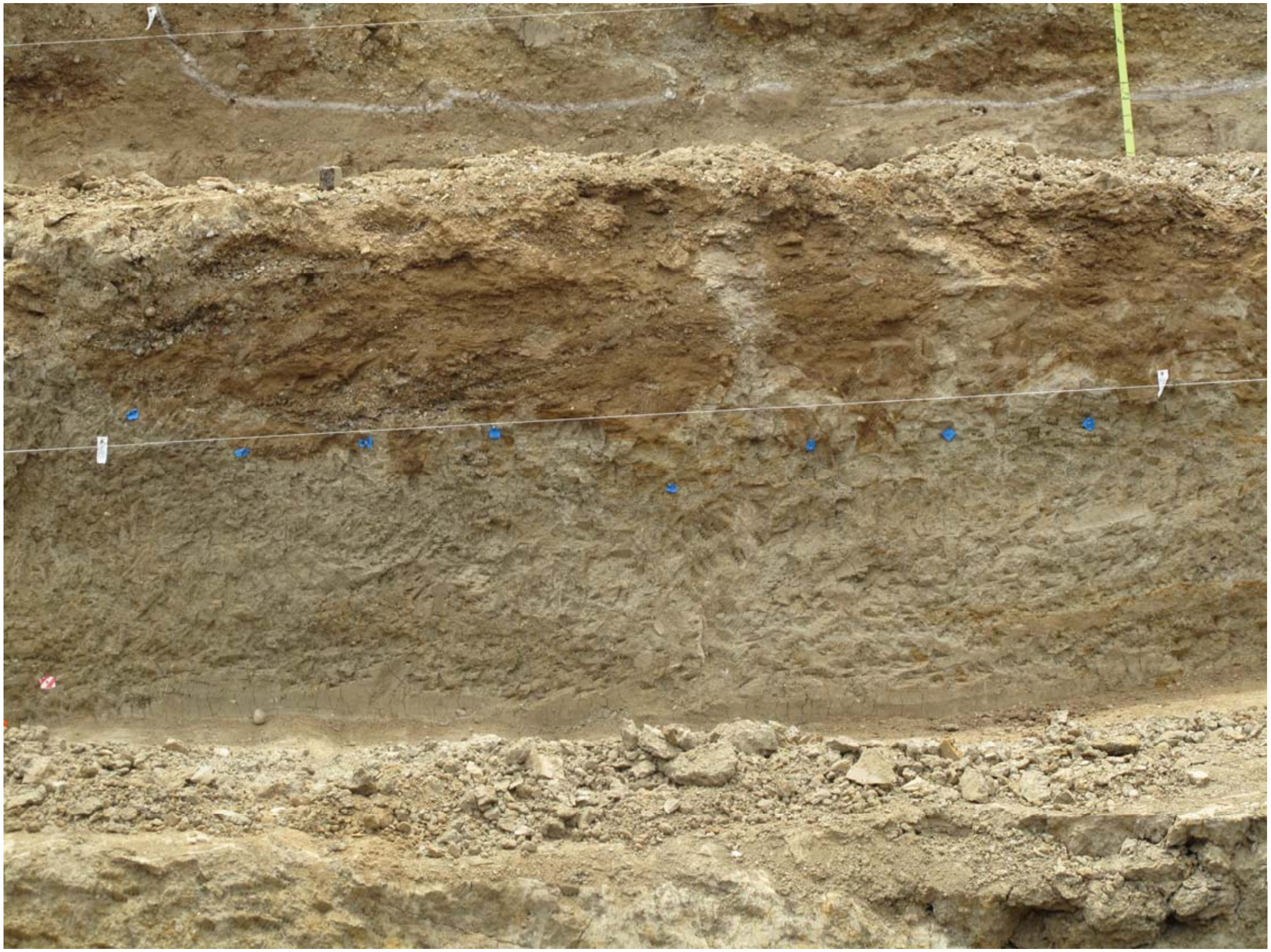
Los Angeles, California

A8928-06-01	August 2012	Figure C55

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS Stations 2+60 to 2+70		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C56



GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 2+70 to 2+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C57

GEOCON WEST, INC.

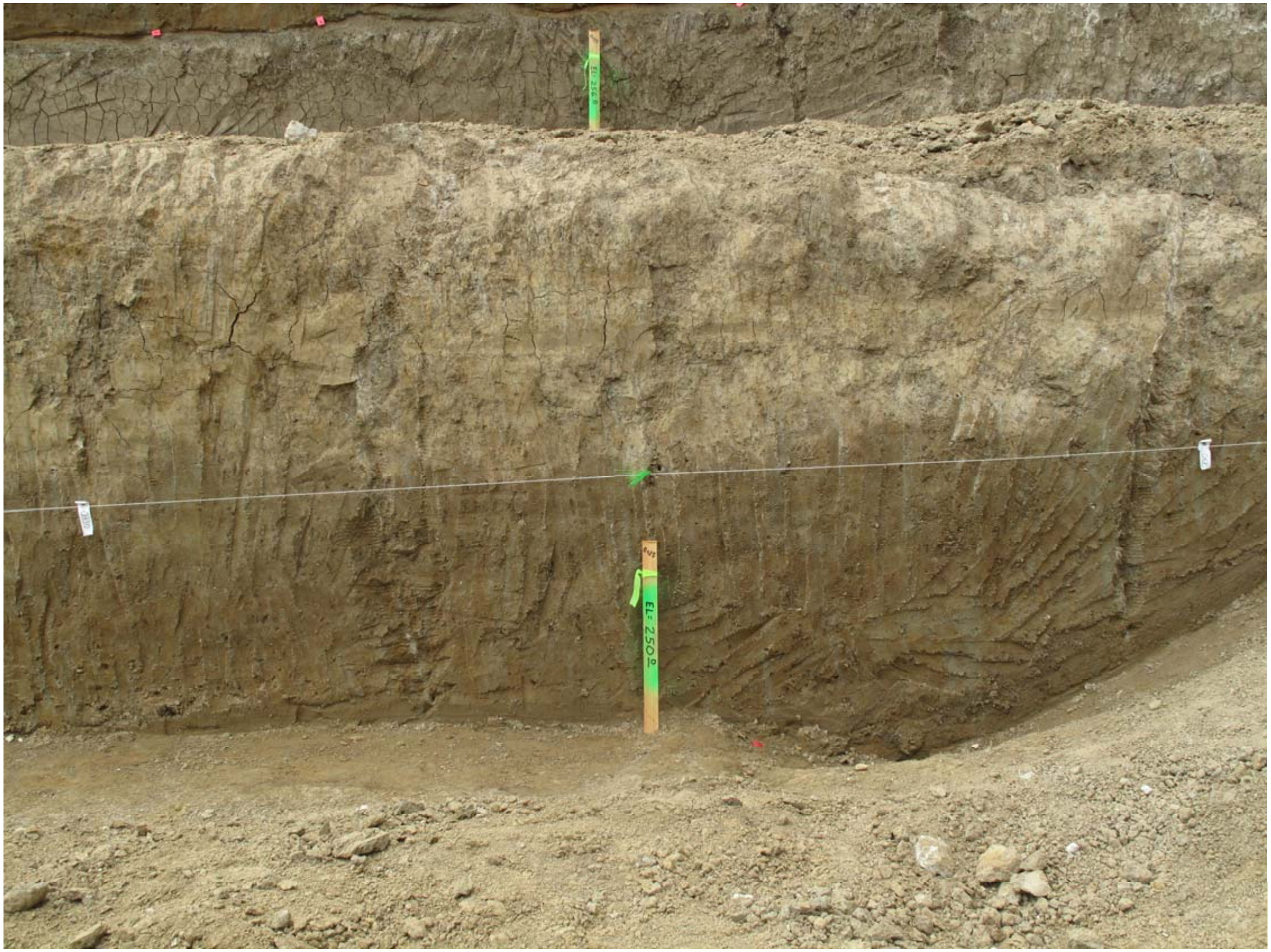
FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 2+80 to 2+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C58

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 2 PHOTOS **Stations 2+90 to 3+00**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C59



GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS
Stations 0+20 to 0+30

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C60

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 0+30 to 0+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C61

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 0+40 to 0+50**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C62

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BENCH 3 PHOTOS **Stations 0+50 to 0+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C63

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS Stations 0+60 to 0+70		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C64

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS Stations 0+70 to 0+80		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C65

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 0+80 to 0+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C66

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 0+90 to 0+100**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C67

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+00 to 1+10**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C68

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+10 to 1+20**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C69

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS
Stations 1+20 to 1+30

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C70

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS
Stations 1+30 to 1+40

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C71

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+40 to 1+50**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C72

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+50 to 1+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C73

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+60 to 1+70**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C74

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+70 to 1+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C75

GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+80 to 1+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C76

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 1+90 to 2+00**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C77

GEOCON
WEST, INC.

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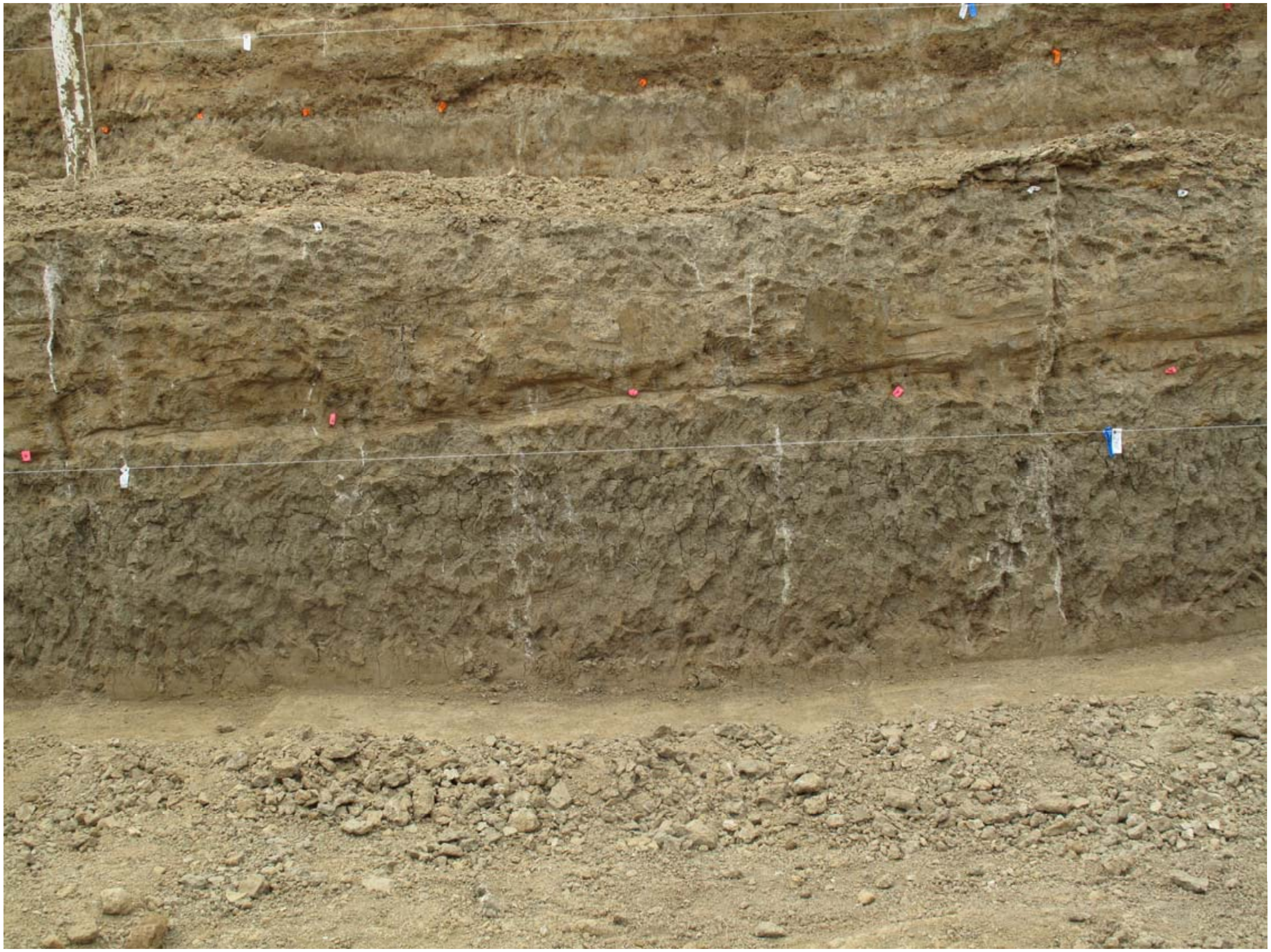
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 2+00 to 2+10**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C78



GEOCON
WEST, INC.

FEFFER
GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 2+10 to 2+20**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C79

GEOCON
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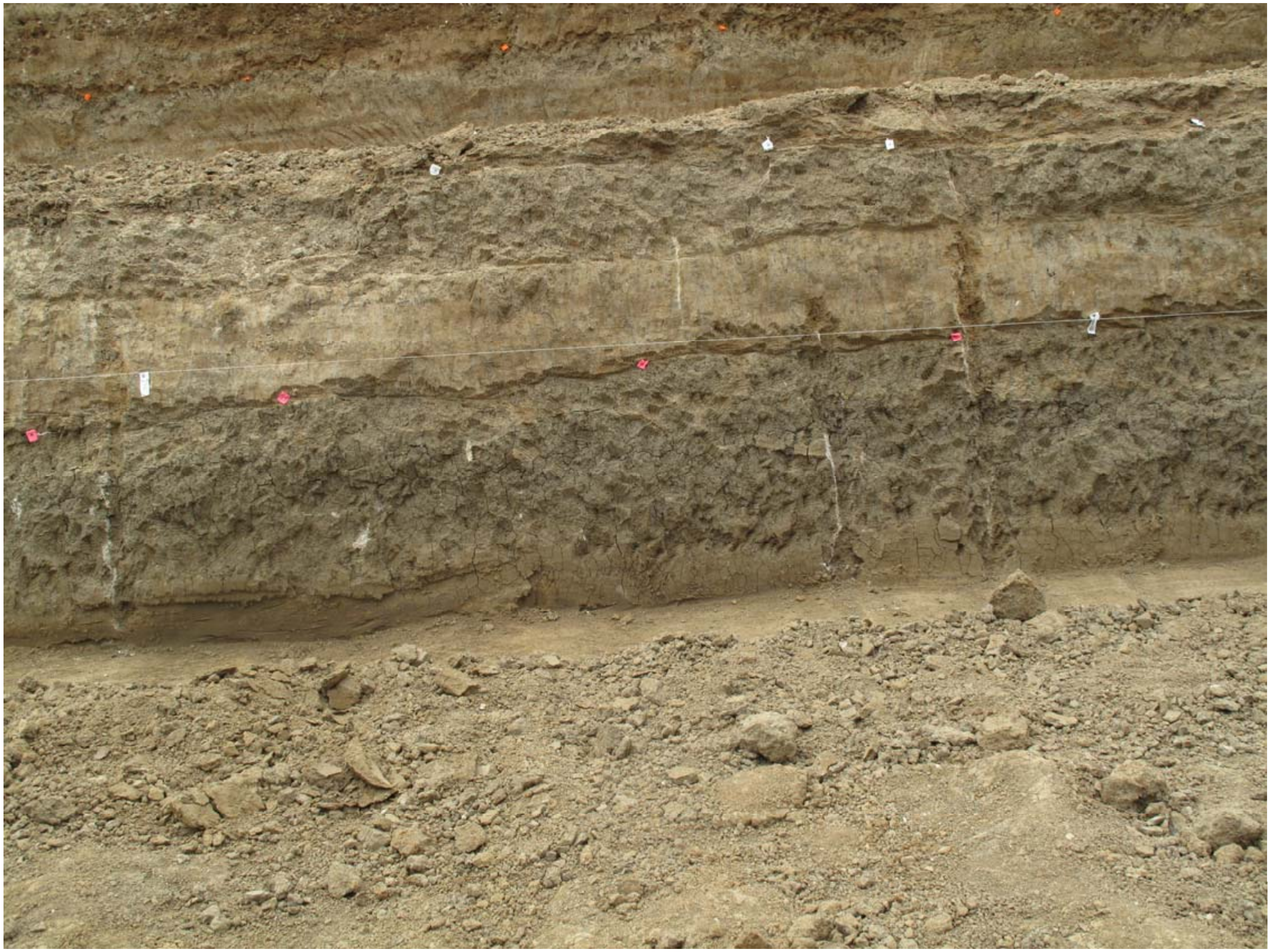
BENCH 3 PHOTOS Stations 2+20 to 2+30		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C80



GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 2+30 to 2+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C81

GEOCON
WEST, INC.

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BENCH 3 PHOTOS **Stations 2+40 to 2+50**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C82

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS **Stations 2+50 to 2+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C83

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 3 PHOTOS Stations 2+60 to 2+70		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C84

GEOCON
WEST, INC.

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BENCH 3 PHOTOS **Stations 2+70 to 2+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C85

GEOCON
WEST, INC.

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BENCH 3 PHOTOS **Station 2+80 to 2+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C86

GEOCON
WEST, INC.

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BENCH 3 PHOTOS **Stations 2+90 to 3+00**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C87

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS Stations 0+20 to 0+30		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C88

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS Stations 0+30 to 0+40		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C89

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS Stations 0+40 to 0+50		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C90

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 0+50 to 0+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C91

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 0+60 to 0+70**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C92

GEOCON
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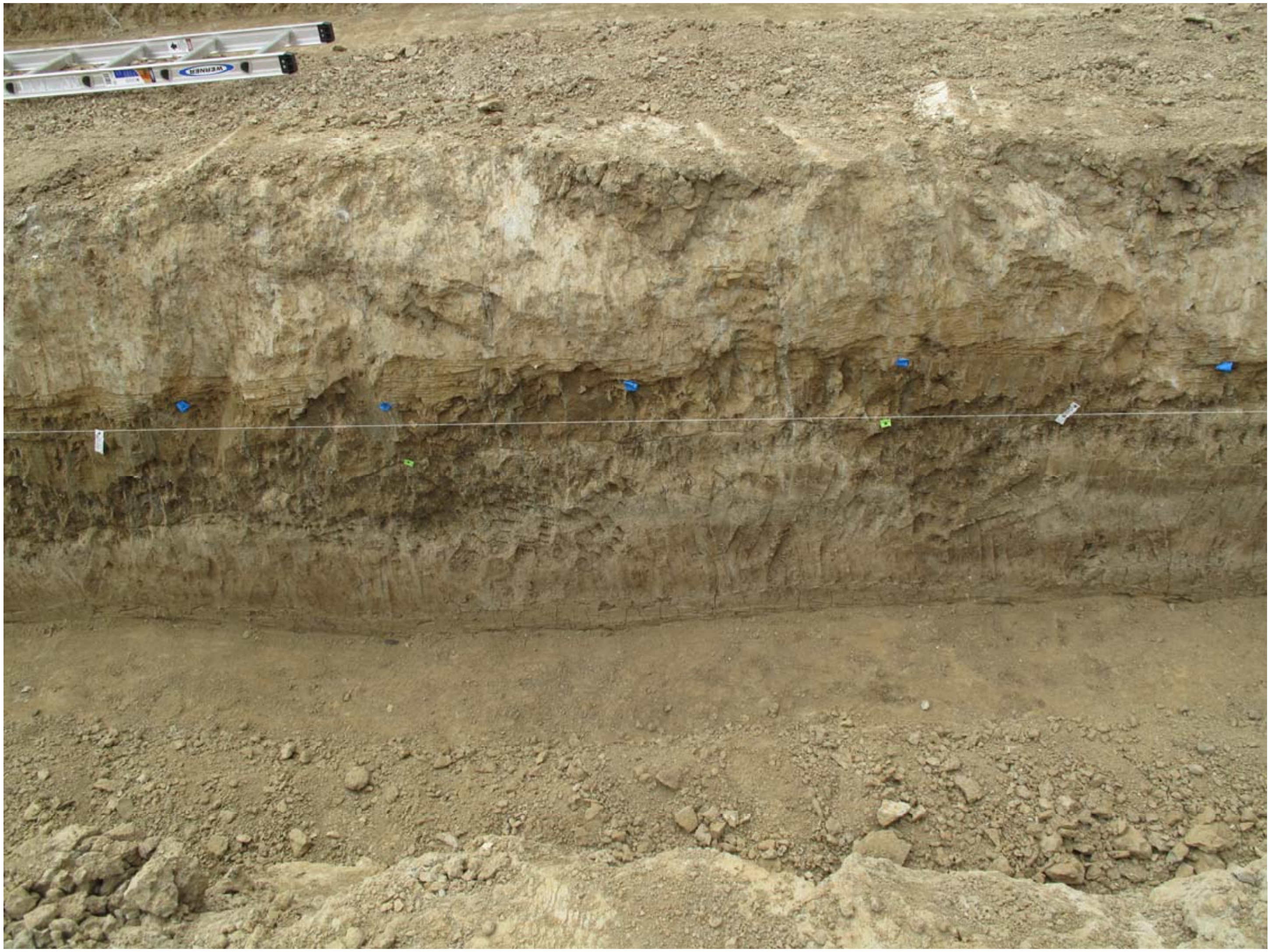
GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 0+70 to 0+80**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C93



GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 0+80 to 0+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C94

GEOCON
WEST, INC.

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BENCH 4 PHOTOS
Stations 0+90 to 1+00

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C95

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+00 to 1+10**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C96

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+10 to 1+20**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C97

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+20 to 1+30**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C98

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+30 to 1+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C99

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+40 to 1+50**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C100

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+50 to 1+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C101

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+60 to 1+70**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C102

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS Stations 1+70 to 1+80		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C103

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+80 to 1+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C104

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 1+90 to 2+00**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C105

GEOCON WEST, INC.

FEFFER GEOLOGICAL CONSULTING

BENCH 4 PHOTOS
Stations 2+00 to 2+10

10000 Santa Monica Boulevard

Los Angeles, California

A8928-06-01	August 2012	Figure C106

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BENCH 4 PHOTOS **Stations 2+10 to 2+20**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C107

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 2+20 to 2+30**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C108

GEOCON
WEST, INC.

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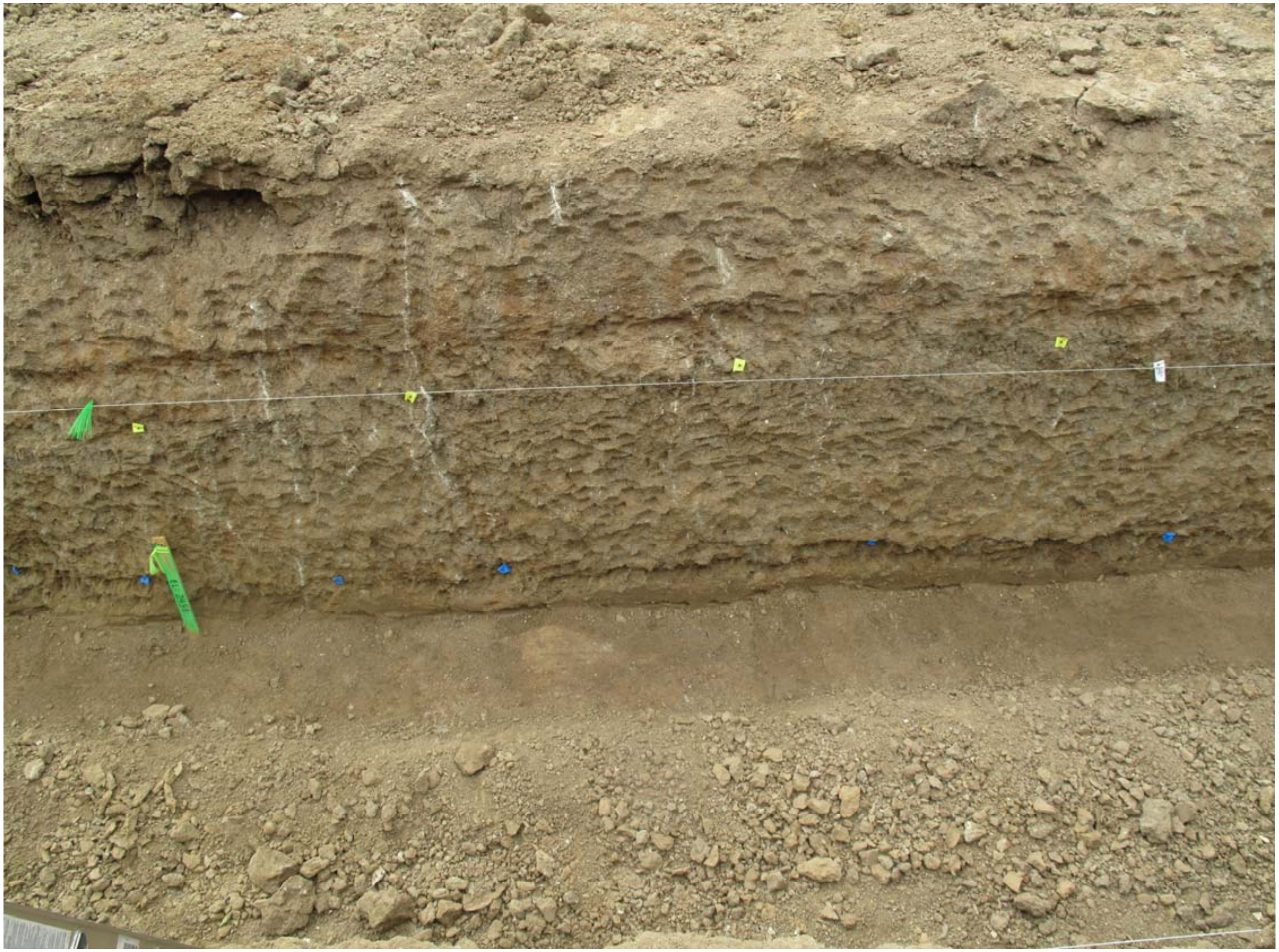
GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 2+30 to 2+40**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C109



GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS Stations 2+40 to 2+50		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C110

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 2+50 to 2+60**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C111

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 2+60 to 2+70**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C112

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS Stations 2+70 to 2+80		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C113

GEOCON
WEST, INC.

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GEOLOGICAL CONSULTING

BENCH 4 PHOTOS **Stations 2+80 to 2+90**		
10000 Santa Monica Boulevard Los Angeles, California		
A8928-06-01	August 2012	Figure C114