FEFFER
GEOLOGICAL CONSULTING

March 23, 2016 File No. 1584-54

Thomas Safran and Associates
11812 San Vicente Blvd. #600
Los Angeles, CA 90049

SUBJECT: **EVALUATION OF POTENTIAL FAULTING**
New Development at Southwest Corner of Cherokee and Franklin
Montecito Apartments 6650 and 6668 Franklin Avenue and 1850 Cherokee Court
Hollywood, CA 90028

Dear Mr. Frandsen:

We are pleased to submit this report summarizing our fault rupture hazard investigation for the subject site at 6650 Franklin Avenue in Hollywood, California. The purpose of this investigation was to assess the potential for surface fault rupture at the site and determine if the area of the planned development is suitable for the construction of human-occupied structures. The mapped trace of the Hollywood Fault Zone was not found on the subject site and is presumed to be located to the south of the project site.

This study consisted of a review of published and unpublished data, geomorphic analysis, and subsurface exploration. The subsurface exploration program consisted of two overlapping trench exposures totaling 57 lineal feet and 6 large diameter (BA-1 to BA-6) borings, in which a total of 250 vertical feet of borehole was drilled and logged. Additionally, exploratory test pits on the subject site were excavated. This fault rupture evaluation has found no active faults traversing the parcel. The combination of nearly continuous, unbroken Late Pleistocene soil horizons and stratigraphy provides compelling evidence to demonstrate the absence of active faulting beneath the entire project site area. Thus the project site is not exposed to the hazard of surface fault rupture. Accordingly, no fault setback distances or "no-build" zones have been established across the entire project site area, and there should be no limit on future development. The subsurface exploration extended a minimum of 50 feet to the south and north of the proposed building on the subject site including data from adjacent geological studies that shadow and overlap this current investigation.

Joshua R. Feffer
Principal Geologist
C.E.G. 2138

PROFESSIONAL GEOLOGIST
JOSHUA FEFFER
No. 2138
Certified Engineering Geologist
STATE OF CALIFORNIA

John Helms
Project Geologist
C.E.G. 2272

REGISTERED GEOLOGIST
JOHN G. HELMS
No. 2272
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

INTRODUCTION AND BACKGROUND

The project site is located at 6650 Franklin Avenue, within a developed portion of the City of Los Angeles (Figure 1). The project site consists of an on-grade parking lot on the southern half of the lot, open space in the northwest quadrant, and a high rise residential building in the northeast quadrant. The site is bounded to the north by Franklin Avenue and to the east by Cherokee Avenue. Existing apartment buildings surround the site. Southern portions of the project site have been graded flat with less than about three feet of overall elevation difference, and the northern portion of the site area slopes gently to the south from Franklin Avenue with less than about seven feet of overall elevation difference (Figure 2).

The original structure on this parcel was constructed prior to the development of the Earthquake Fault Zone (EFZ). Thus, this property had not previously been investigated for the hazard of surface fault rupture. The Hollywood Fault Zone is mapped to the south of the site (Figure 3). In the vicinity of the project site area, the location of the Hollywood Fault Zone is poorly constrained and is mapped as being concealed or buried and approximately located (CGS, 2014).

The mapped location of the Hollywood Fault was also obtained from the City of Los Angeles NavigateLA.lacity.org website and is shown as Figure 4. It should be pointed out that the subject site is located over 300 feet north of the fault location shown in Figure 4.

Development of the site is subject to the conditions of the Alquist-Priolo Special Studies Zone Act of 1972 (California Public Resources Code, Chapter 7.5, Division 2). The Act is designed specifically to mitigate the hazard of surface fault rupture in future earthquakes and defines a fault as active if it has demonstrated movement in Holocene time (past 11,000 years). The Alquist-Priolo Act mandates that sites located within “special studies zones”, which are delineated by the California Geologic Survey (CGS) along active faults, require detailed geologic investigation to preclude the construction of human-occupied structures astride active fault strands. The 1994 Seismic Hazards Mapping Act changed the name of the zones from Special Studies Zones to Earthquake Fault Zones (EFZ). The purpose of this investigation, therefore, was to assess the potential for surface fault rupture at the site and determine if the area of the proposed residential development is suitable for construction of human-occupied structures.

SCOPE OF WORK

Typically, trenching is the preferred method for evaluating the presence or absence of faults because it offers a continuous, direct exposure of the fault zone or near surface stratigraphy. However, the Hollywood fault zone has been difficult to expose in trenches due to the dense urban cover and thick accumulation of young Holocene aged alluvium that has been deposited across the fault since the last rupture. Therefore, trenching and exploratory test pits were utilized across the northern portion of the site area and a series of strategically placed Bucket Auger (BA) borings were drilled to resolve the issue of surface faulting hazard across the southern half of the site area.

The scope of work for this fault rupture hazard investigation consisted of the following tasks:

- Review of published and unpublished geotechnical data in the site vicinity;
- Analysis of topographic maps of the site vicinity;

- Geologic reconnaissance of the site;
- Excavate, clean, describe, and log 57 linear feet of trench exposure (ST-1 and ST-2);
- Excavation of Exploratory Test Pits on the subject site.
- Describe the soil profile exposed in the southern trench exposure (ST-2) and estimate stratigraphic unit ages
- Drill, clean, describe, and log a total of 250 vertical feet of material in six 2-foot diameter Bucket Auger (BA) borings across the site;
- Preparation of this report.

This study conforms to the provisions of the Alquist-Priolo Act and Title 24 of the California Code of Regulations.

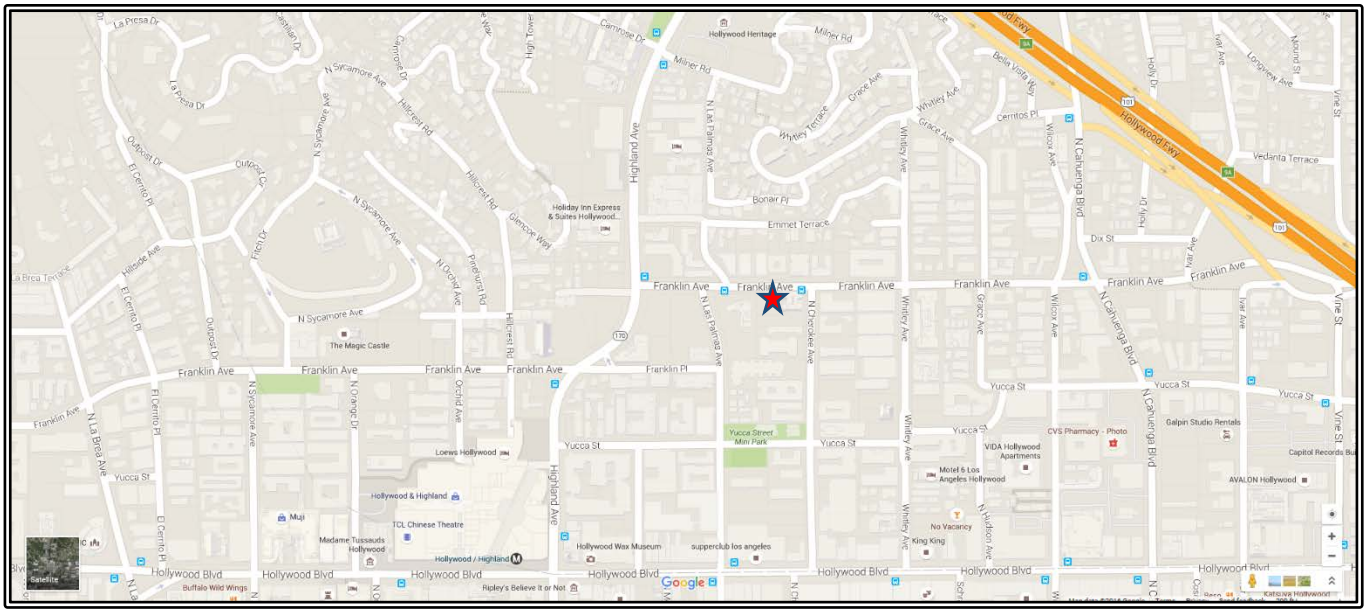

Figure 1. Location of the subject site. A red star is placed on the site location.

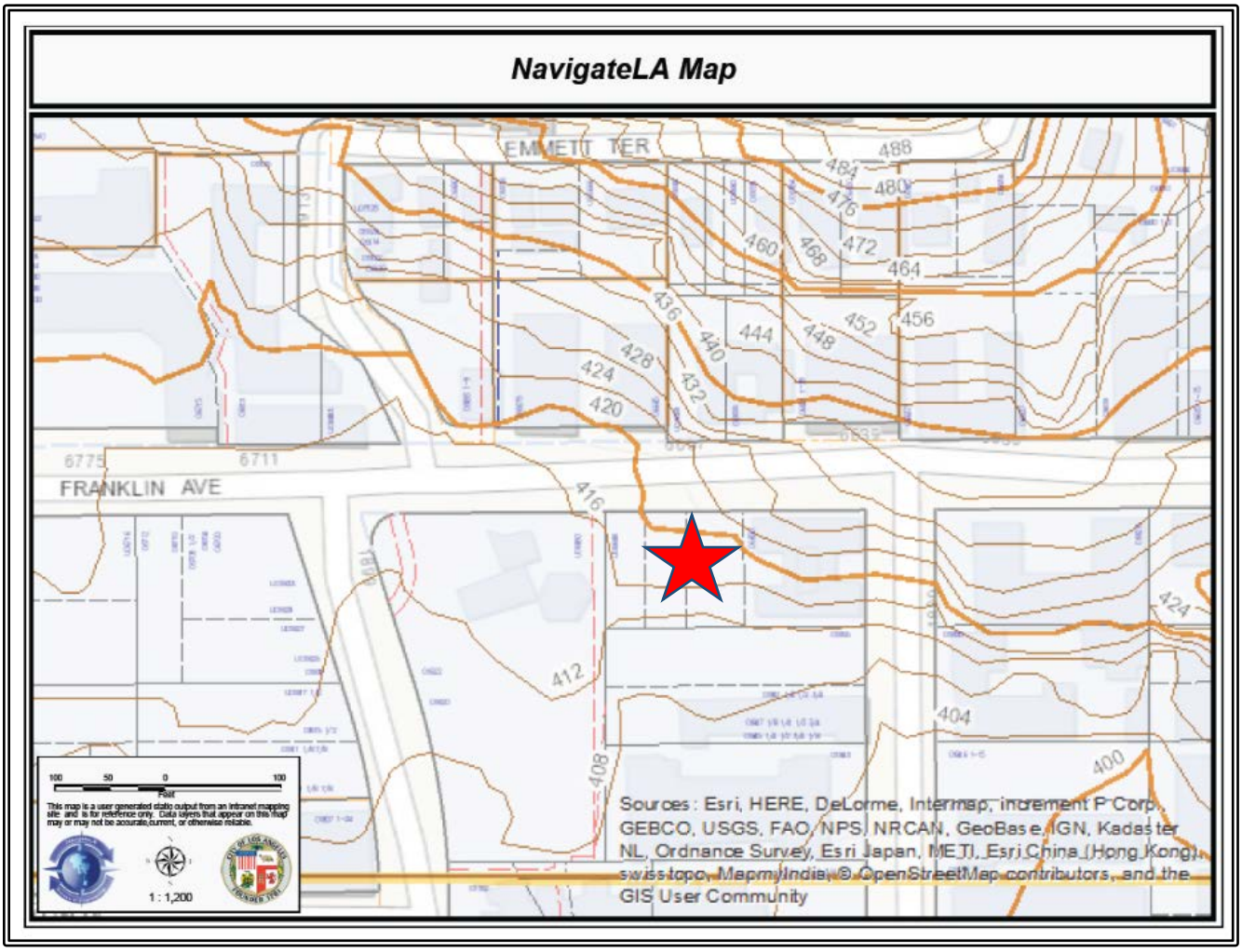

Figure 2. Topographic Map of the Subject Site from NavigateLA website. A red star is placed on the site location.

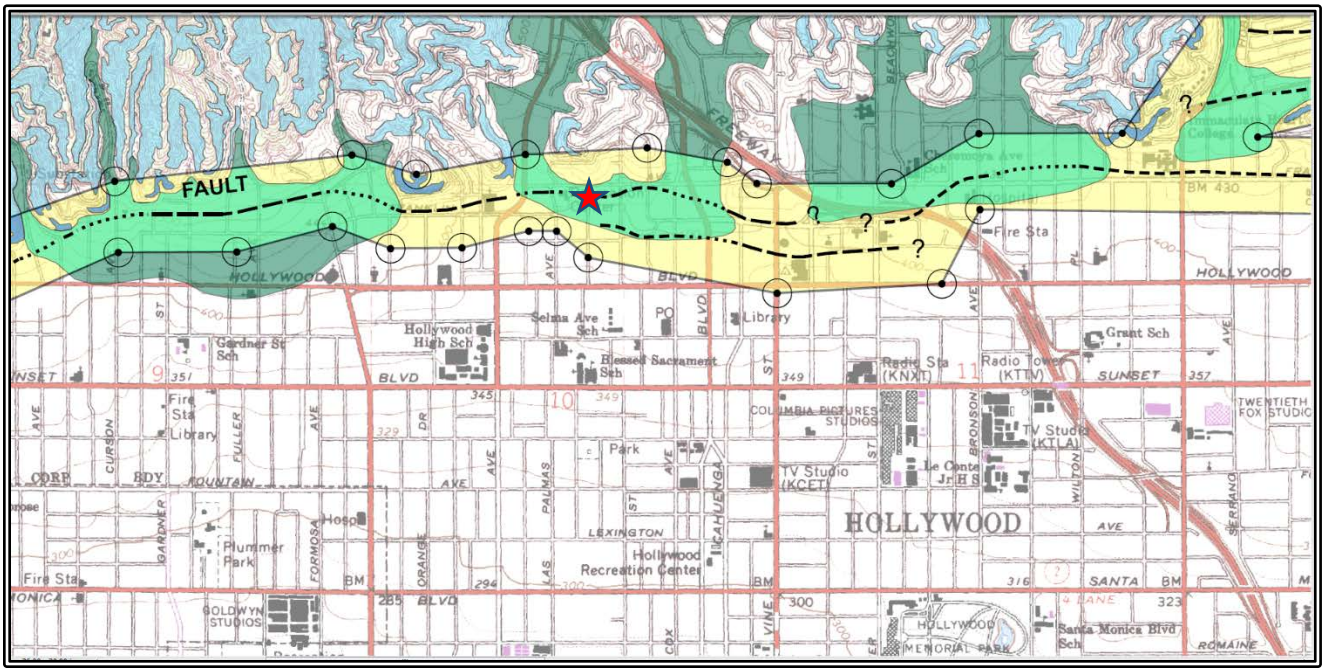

Figure 3. Portion of CGS Hollywood Quadrangle Earthquake Fault Zone Map. Official Map issued November 6, 2014. Subject site designated with a red star.

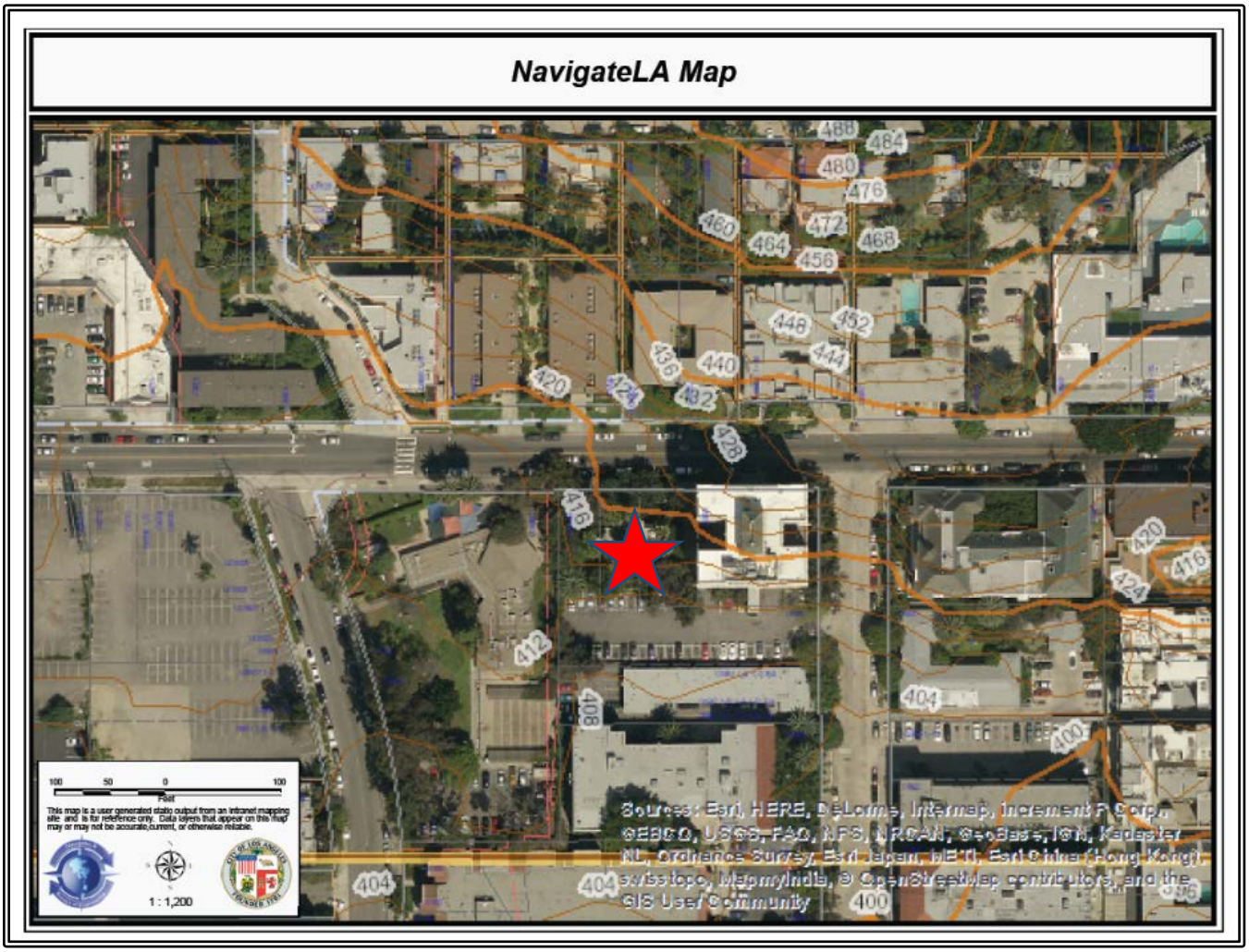

Figure 4. Map from NavigateLA website. Subject site is designated with a red star. The orange/red line is the mapped location of the Hollywood Fault.

FAULT ACTIVITY CRITERIA

The criteria used in our investigation to evaluate fault activity is the same criteria used by the California Geological Survey (CGS) that defines an active fault as those that have had surface displacement within Holocene time (about the last 11,000 years). This criteria for defining an active fault is based on standards developed by the CGS for the Alquist-Priolo Earthquake Fault Zoning Program (Bryant and Hart, 2007). 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, a numerical 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 hazard zone, these faults must prove to be "sufficiently active and well-defined".

As indicated in CGS SP 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 method. 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.

REGIONAL AND LOCAL GEOLOGY

The project site is located in the north central Hollywood Basin, which makes up part of the Transverse Ranges Geomorphic province. The Hollywood Basin lies at the southern edge of the Transverse Ranges geomorphic province and near the northern boundary of the Peninsular Ranges geomorphic provinces (Yerkes et a1. 1965). The basin is bounded on the north by the Santa Monica Mountains and the Hollywood fault, on the east by the Elysian Hills, the west by the Newport-Inglewood Uplift and the south by the La Brea high, an area of shallow bedrock (DWR, 2004).

The most predominate structures near the project site is the east-west trending Hollywood Fault Zone that separates older surficial deposits to the south from the bedrock units found in the Santa Monica Mountains to the north. In the project site area, alluvial fans have been created by sediments carried by water flowing out of area canyons, and colluvium shed from the bedrock slopes to the north blanket the site area. The adjacent area of the Santa Monica Mountains are composed primarily of Miocene Aged Sedimentary Rock. Figure 5 is a portion of the Dibblee Geologic Map of the site area.

Hollywood Fault Zone

The ~15-km long Hollywood fault is expressed as a series of linear, ~N70°E to ~N78°E trending scarps and faceted south-facing ridges along the southern margin of the eastern Santa Monica Mountains. Active deposition of numerous small alluvial fans at the mountain front and a lack of fan incision suggest late Quaternary uplift of the Santa Monica Mountains along the Hollywood fault (Dolan and others, 1997; Dolan and Sieh, 1992; Crook and others, 1983). The fault dips steeply to the north and has juxtaposed pre-Tertiary granite, metamorphic, and Tertiary sedimentary rocks over young sedimentary deposits of the northern Los Angeles basin. The Hollywood fault has not produced any damaging earthquakes during the historical period and has had relatively minor micro seismic activity.

The linear trace of the Hollywood fault and steep dips found in exposures and borings (65 to 90 degrees) suggest that motion along the fault may be largely strike-slip (Dolan and Sieh, 1993). Other westerly trending faults in the Transverse Ranges exhibit a left-lateral component of slip such as the Santa Ynez, San Fernando, Raymond, and Malibu Coast faults. The orientation of the Hollywood fault suggests that the horizontal component of slip also would be left-lateral. If the entire 15-km-long Hollywood fault ruptured by itself, it could produce an Mw ~6.6 earthquake (Dolan and others, 1997). However, if the fault ruptures together with other faults to the west (Santa Monica, Malibu Coast) or to the east (Raymond), then earthquakes much larger than Mw ~6.6 could result. Assuming a minimum slip rate of 0.35 mm/yr for the Hollywood fault, Dolan and others (1997) estimate a recurrence interval of ~4,000 years for an Mw 6.6 event. Dolan and others, 2000, also documented an early to mid-Holocene earthquake on the Hollywood fault zone. The timing of the most recent earthquake is constrained between 6 and 11 ka.

The precise location of the Hollywood fault currently is poorly defined along much of its length. Large scale geomorphic features such as the southern margin of the Hollywood Hills and the over-steepened alluvial fans along this range front have provided the basis for identifying the fault's approximate location. However, the precise locations of individual fault strands within the Hollywood fault zone have been documented only at a few sites. The Hollywood fault has been difficult to study due primarily to (1) the dense urbanization that covers nearly the entire fault trace; and (2) the accumulation of young alluvium at the base of the mountain front which locally buries the fault.

Because the city was developed primarily in the first quarter of this century before the widespread use of mechanized grading equipment, development was draped over the existing landscape with minimal modification to the natural ground surface (Dolan and others, 1997). Therefore, fault scarps and other topographic features are preserved locally beneath the pavement and can be observed along some streets of Hollywood, West Hollywood and Beverly Hills. Many of the scarps, however, are broad features of significant width (>50-200 ft) that preclude one from precisely locating a particular fault trace on geomorphic evidence alone.

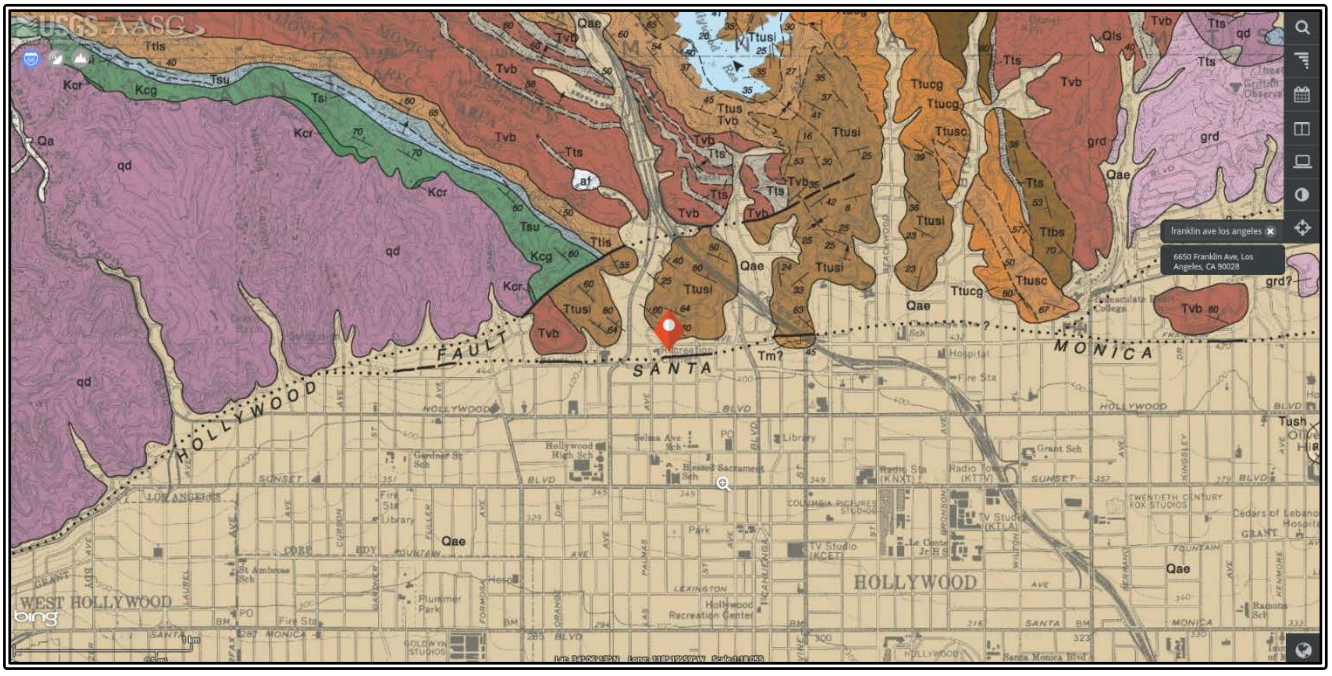

Figure 5. Portion of Dibblee Geologic Map of the Hollywood Quadrangle. The subject site location is at the base of the red diamond.

TOPOGRAPHIC REVIEW

A combined review of previous geomorphic analyses (ECI, 2016, and Dolan and others, 1997) with a review of detailed topographic maps ((Figure 2) with a 4 foot contour interval was performed. The topographic maps show a rough alignment of steep slopes across and south of Franklin Avenue and across the southwestern portion of the project site area. The maps and previous analyses show a wide and degraded fault scarp with several minor slope inflections that occur approximately 30 feet south of the site area (ECI, 2016). This strand aligns roughly with the previously mapped trace of the Franklin Fault strand of the Hollywood Fault zone (Figure 2). Farther south a sharp break in slope occurs over 250 feet south of the site along Argyle Street. This strand aligns with the previously mapped trace of the Yucca Fault strand of the Hollywood Fault zone (Figure 3). These recognizable scarps or breaks in slope may suggest the location of a left step within or parallel discontinuous fault strands of the Hollywood Fault zone south of the project site.

No other significant topographic features suggestive of surface faulting were found projecting towards or in the vicinity of the project site. The breaks in slope located south of Franklin Avenue can be observed in the field and are illustrated in the 2016 ECI report along Cherokee Avenue.

PREVIOUS INVESTIGATION

A review of previous geotechnical and fault rupture hazard investigations that have been completed in the project site's vicinity was conducted for any information that may be pertinent to the project site area. The reports reviewed are summarized below.

The closest completed and most recent study to the project site area was by Advanced Geotechniques (2015) and Earth Consultants International (2016), for a proposed development located on the east side of North Cherokee Avenue (1846 North Cherokee Avenue) approximately 50 feet southeast of the project site. They identified a northeast-trending north dipping fault across the center of the property, and the fault appeared to juxtapose Topanga formation bedrock over older alluvium. This fault was determined to be inactive based on the pedogenic development of the alluvial units that overly this fault zone. Based on discussion with Earth Consultants International, it is our understanding that the soil that overlies the reported fault is unaffected bv rupture and since the soil is older than Holocene age the identified fault is not active. A boring and CPT transect conducted for this study found no faulting in the area that shadows the area south of this project site's southern property line.

To the west of the project site area the closest study to recognize faulting was located at 1840 Highland Avenue (locality 13) where LAW/Crandall (2000) and GeoPentech (2001a, b; 2013c) found evidence of several well-constrained fault strands crossing the northern portion of the site. The faults in the northern and central portion of the site were identified as active. Faulting at this locality consisted of steeply north-dipping faults (about 80°) for the northern strands, and a building setback zone was established. The southern portion of the site contains continuous Holocene and Pleistocene soils and stratigraphic units which are unaffected by faulting.

South of the project site area, a study for the Los Angeles MetroRail project (Converse *et al;* 1981, 1983) found evidence that the Hollywood Fault is located south of Yucca Street at Cahuenga Boulevard (locality 14). The location for this fault corresponds well with differences in groundwater reported at

locality 15 to the east, and a groundwater barrier just south of Yucca Street to the west (Dolan *et al.*, 1997).

To the northwest of the site, a study at Franklin and Sierra Bonita Avenues (Crook et al., 1983 and Crook and Proctor, 1992) found several thin shallowly north-dipping gouge layers and a thicker (60+ cm) gouge mass that they assumed to be part of the Hollywood Fault Zone located at the base of the Santa Monica mountains north of Franklin Avenue. Their investigation extended south of Franklin, further down the fan surface, and found no faulting south of Franklin Avenue.

Farther to the northwest, an additional study for the La Brea Avenue Metro Red Line Transect (Dolan *et al.*, 1997; Earth Technology Corporation, 1993) was performed. Evidence for faulting was found north of Franklin Avenue and includes quartz diorite apparently thrust over Quaternary alluvium and shallow groundwater was encountered north of the fault at depths between about 10 feet to 43 feet. South of the fault and south of Franklin Avenue, groundwater was not encountered within the upper 200 feet of borings. The study reported that the fault dip steepens with depth, ranging from 25° to 60° to the north.

Similarly, Dolan *et al.* (1997) and Earth Technology Corporation (1993) completed a fault study along the Camino Palmero-Martel Avenue Metro Red Line transect. They found evidence for faulting north of Highland Avenue which included groundwater barriers and quartz diorite bedrock faulted over alluvium, with average dips of ~77° to the north. They reported up to four fault strands with apparent north side-up displacement of the granitic bedrock at depth. Groundwater elevation changes were reported on the order of 40 or 50 feet across the fault zone.

East of the project site, a study was completed by Feffer Geological Consulting (2014), for a proposed development located on the southeast corner of Franklin and Western Avenues. The study encountered older alluvial fan deposits that are common along the southern margin of the range front. All of the alluvial deposits observed on this site were observed to be unfaulted. The City of Los Angeles approved the findings on March 16, 2015 Log #86433-01.

Fault Evaluation Report (FER) 253 was recently published by the California Geological Survey on February 14, 2014. As can be seen on Figure 6 (Figure 12 of FER-253) the subject site is located at the eastern end of Segment 2 and is north of the mapped location of the mapped fault traces. Both fault traces are mapped south of the site area in this publication. As described in FER-253 the Franklin Avenue fault strand in this area is marked by a subtle scarp mapped east of Cherokee Ave. and south of Franklin Ave. The subject site is located on a steep alluvial apron and along the western margin of a buried bedrock spur and according to the FER-253 report is north of the area of reported faulting.

Supplement #1 to FER-253 was issued on November 5, 2014 and as can be seen on Figure 7 this supplement revised the locations of the Franklin and Yucca strands of the Hollywood fault in the project site area based on comments from the public and from the ongoing accumulation of new data from geological consultants. The Franklin strand of the Hollywood fault shifted north and straightened on the maps presented in the supplemental report (Figures 6 and 7) and now the Franklin strand of the Hollywood fault clips the southern boundary of the project site area. To the south, the Yucca strand of the Hollywood fault is no longer mapped as a through going feature in the project site area.

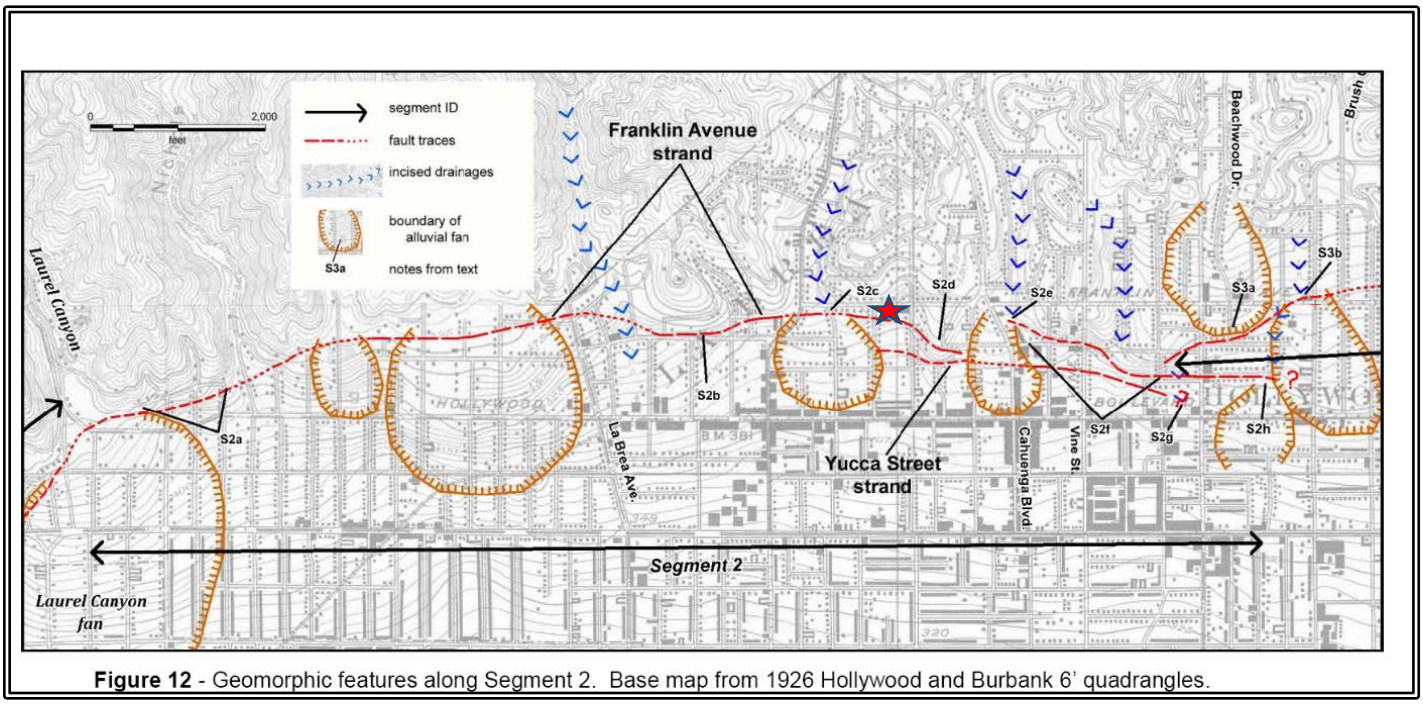

Figure 12 - Geomorphic features along Segment 2. Base map from 1926 Hollywood and Burbank 6' quadrangles.

Figure 6. Figure 12 from FER-253. The approximately location of the subject site is designated with a red star.

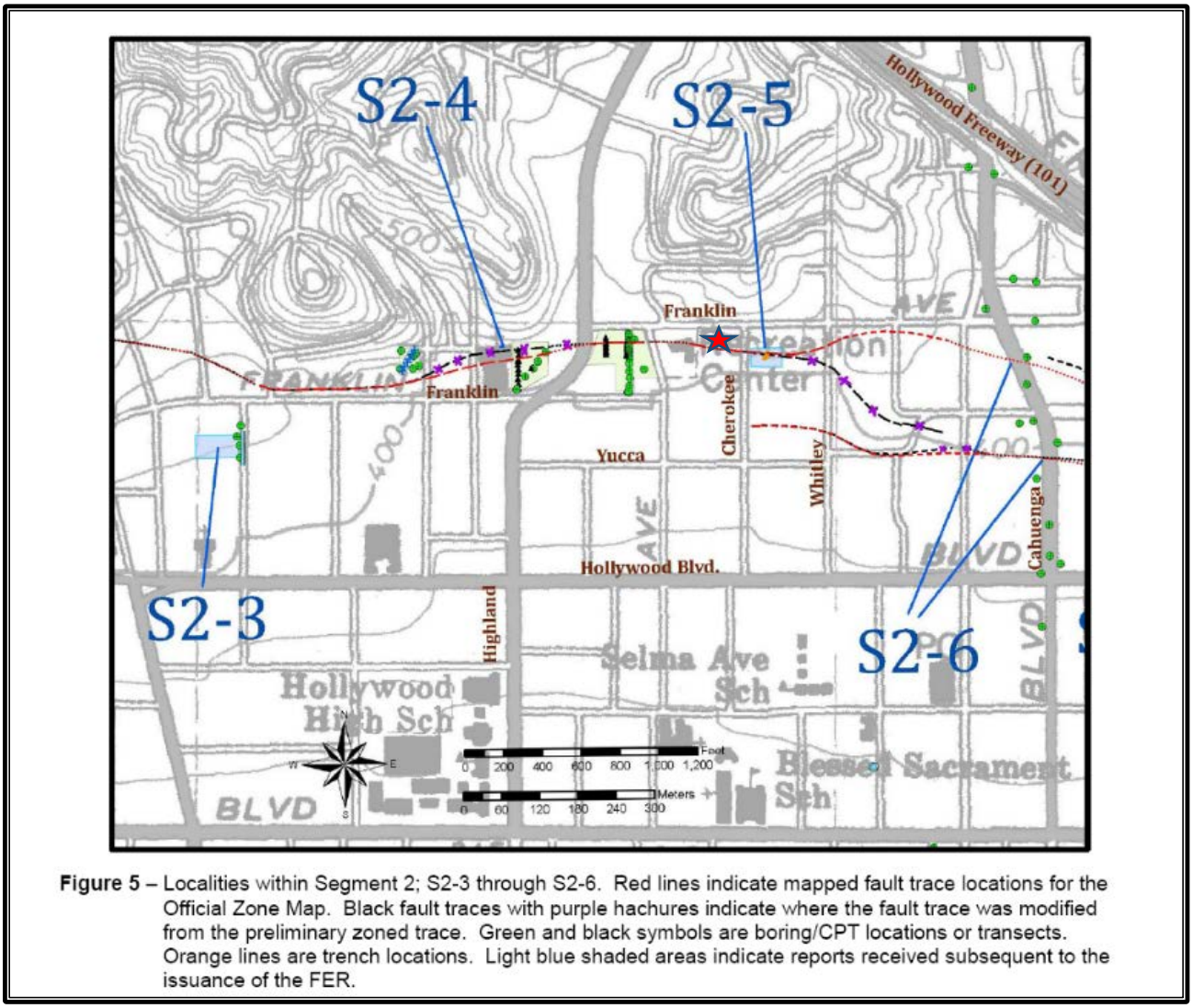

Figure 5 – Localities within Segment 2; S2-3 through S2-6. Red lines indicate mapped fault trace locations for the Official Zone Map. Black fault traces with purple hachures indicate where the fault trace was modified from the preliminary zoned trace. Green and black symbols are boring/CPT locations or transects. Orange lines are trench locations. Light blue shaded areas indicate reports received subsequent to the issuance of the FER.

Figure 7. Figure 5 from FER-253 supplement. The approximately location of the subject site is designated with a red star.

METHODOLOGY

Approach

The subsurface investigation was designed to investigate across the entire subject parcel (see Geological Map in Appendix A). Typically, trenching is the preferred method for evaluating the presence or absence of faults because it offers a continuous, direct exposure of the fault zone or near surface stratigraphy. However, the Hollywood fault zone has been difficult to expose in trenches due to the dense urban cover and thick accumulation of young Holocene aged alluvium that has been deposited across the fault since the last rupture. At the subject site however, due to the proximity of bedrock to the ground surface a trench was able to be excavated along the north side of the property that was supplemented with a series of strategically placed, bucket auger (BA) borings across the southern portion of the site area. In addition, exploratory test pits located along the northern portion of the site and on the adjacent lots to the north indicate that bedrock is located near the ground surface below a few feet of soil.

The boreholes are located on a 1 inch = 20 foot scale base map (Appendix A). The transect was approximately 95 feet long and was designed to capture any east northeast striking fault strands of the Hollywood Fault zone that might traverse the site (Figure 3). The north-south trending trench and BA transect was located across the central portion of the property, starting at the southern property boundary and extending to the north. The northern end of the transect is anchored by a test pit exposure located on the north side of the subject property and by testing at 6651 Franklin Avenue approximately 40 feet from the northern property line.

Field Exploration

Prior to beginning the subsurface field exploration, a literature review, topographic analysis, and geologic reconnaissance of the site was performed. Following this general review, Underground Service Alert (USA) was notified to identify buried utilities in the vicinity of the proposed excavations, as required by law.

Subsurface conditions at the site were explored in four phases along a single north-south oriented transect of subsurface explorations. The first phase was performed on September 10, 2015 and included a forty foot long trench (ST-1) exposure located approximately 45 feet from the center of the northern property line. Phase 2 was performed on November 3 and 4, 2015 and consisted of a nesting of 3 BA borings (BA-1, BA-2, and BA-3) near the center of the site area. Phase 3 was performed on December 9, 2015 and included a fifteen foot long trench (ST-2) exposure located to the south of Trench ST-1 and shadowing the nested BA borings (BA-1, BA-2, and BA-3). Phase 4 was performed from January 27 to 29, 2016 and consisted of 3 evenly spaced BA borings (BA-4, BA-5, and BA-6) across the southern portion of the site area.

Field explorations were located on a 1 inch = 10 foot scale base map provided by the landowners (Appendix A). Horizontal stationing (in feet) along the trench explorations were established with a tape measure and by assuming Station 0 was coincident with the northwestern corner of each trench. This allowed for consistent stationing across the entire project site area.

Trench (ST-1) was excavated using a 3-foot-wide bucket on an extenda-hoe backhoe and was approximately 20 feet-deep. Trench (ST-2) was excavated using a 3-foot-wide bucket on a track mounted excavator and was approximately 22 feet-deep (Appendix A). The entire eastern wall of each trench was scraped clean to obtain a fresh and continuous exposure prior to logging the geologic and pedogenic contacts. A level line was constructed on the wall of each trench to establish horizontal and vertical stationing. The eastern trench walls were logged in the field at a scale of 1 inch = 5 feet. The trench logs are presented in Appendix A. Upon completion of logging and describing each of the trench exposures, field trench inspection meetings were conducted with the City of Los Angeles and California Geological Survey Geologists. These meetings concluded with all parties in concurrence over the presented trench logs and trench log interpretation. A soil description was completed nearest station 4 feet in trench ST-2, and Appendix B presents the soil relative dates and stratigraphic unit correlations. Upon completion of logging, both trenches were backfilled.

The BA borings were drilled using a truck mounted 2-foot diameter bucket auger. The bucket auger excavations were logged and reviewed in the field. Upon completion of logging, all boreholes were backfilled with cuttings. Upon completion of logging and describing each of the borings, field inspection meetings were conducted with the City of Los Angeles and California Geological Survey Geologists. These meetings concluded with all parties in concurrence over the BA boring log interpretations.

RESULTS

This investigation shows that there are no active faults in the area explored. No lineaments or geomorphic features suggestive of active faulting traverse the project site. Two inactive faults were found to be deeply buried across the central portion of the project site area. The transect (Appendix A) found two in-active faults that project across the central portion of the project site area. The faults are numbered 1 and 2 in order of occurrence from north to south. Across this area studied, the section of Holocene- and Pleistocene-aged Alluvium and Colluvium encountered thickens to the south across faults 1 and 2.

Groundwater

An important indicator for the presence or absence of faulting is the depth to groundwater. Past studies have shown that both inactive and active fault strands along the Hollywood Fault zone act as groundwater barriers and produce abrupt steps in the groundwater surface.

Along the attached cross section (Appendix A), groundwater was encountered at the base of trenches ST-1 and 2 in the northern and central portions of the site and in the northern most BA borings (BA-1, BA-2, and BA-3). This data generally indicates that the Hollywood Fault Zone should be located south of the area explored where an abrupt larger step in the groundwater surface is present. Depths to groundwater in the project site area step downward over 25 feet to the south across the buried zone of inactive faults identified. Groundwater was observed at a depth of 20 feet below the ground surface in the northern portion of the site in trench ST-1, and groundwater was observed at a depth of 30 feet below the ground surface in the northern most BA borings (BA-1, BA-2, and BA-3).

Faults

Fault 1, the northern most fault along the transect is an inactive steeply north dipping reverse fault. Fault 1 was observed in borings BA-2 and BA-3 as a bifurcating, undulatory, and wavy zone of shearing. The fault strikes north 65 – 73 west and dips vertically to 80 degrees north, and juxtaposes bedrock on the northeast against stratigraphic units Qoc2 on the southwest. A secondary thin and wavy fault or fracture found in BA-2 strikes north 32 west and dips 69 degrees south. A zone of water seeps was observed along the northern margin of this fault zone at depths between 23 and 27 feet below the ground surface. The tip of Fault 1 was not exposed in the BA borings, so the Phase 3 portion of this study was initiated. Trench ST-2 exposed the tip of fault 1 at a depth of 19 to 20 feet below the ground surface. The fault juxtaposes Monterey formation bedrock against stratigraphic unit Qoc2. A thick section of stratigraphic unit Qoc1 was observed to directly overly this fault zone. The fault as observed in trench exposure ST-2 was orientated north 76 west and dips 53 degrees north. The Qoc1 stratigraphic unit was deposited over a highly degraded (eroded) scarp in this area. The overlying stratigraphic unit Qoc1 unit shows advanced degrees of pedogensis and has a soil relative age date estimate of 29 - 56 ka (Appendix C). Fault 1 is inactive.

Fault 2, the southernmost fault encountered along the transect, lies between trench ST-2 and boring BA-6. Fault 2 was observed in boring BA-6 as a bifurcating, thin, and wavy zone of shearing. The fault strikes north 75 east and dips 63 degrees south, and juxtaposes stratigraphic unit Qoa3 on the north against stratigraphic unit Qoc3 on the south. No water seeps was observed along this fault zone. The tip of a splay of Fault 2 was exposed in boring BA-6, at a depth of 24.5 feet below the ground surface. A thick section of stratigraphic unit Qoc1 was observed to directly overly this fault zone and the Qoc1 unit in BA-6 projects well or straight into Qoc1 unit as observed in the southern end of trench ST-2. The Qoc1 stratigraphic unit was deposited over a short or highly degraded south facing scarp in this area. The Qoc1 unit shows advanced degrees of pedogensis and overlies Fault 2 in this area. Unit Qoc1 has a soil relative age date estimate of 29 - 56 ka (Appendix C). Fault 2 is inactive and discontinuous. Fault 2 is a normal fault, most likely related to hanging wall deformation related to the north dipping off-site faulting and deformation to the south of the project site area.

Alluvium and Soil Horizons

The continuity of soil horizons and primary stratigraphic contacts provides essential data to evaluate the presence or absence of faulting. Several continuous and conformable stratigraphic units within the colluvium and alluvium were encountered in each of the trench exposures and borings along the transect (Appendix A and B).

The youngest unit (Qal1) encountered on site is interpreted as an Holocene aged alluvial sheet wash or braided stream channel deposit and appears continuous and unbroken across the southern portion of the transect (Appendix A). A thin to moderately thick layer of artificial fill and pavement overlies this unit. The Qal1 material typically consists of slightly oxidized, soft, dry, silty SAND with gravel that is coarse-grained with 10 YR soil color hues. Stratigraphic unit Qal1 is massive and abruptly overlies unit Qc across the central and southern portions of the project site area. The Qal material has scoured into unit Qc across the southern portion of the site as observed in BA boring exposures BA-4, BA-5, and BA-6. To the north, the Qal1 material thins and laps onto the underlying colluvium (Qc). The Qal1 stratigraphic unit contains a truncated and weakly developed soil profile. Stratigraphic unit Qal1 does

not have an estimated soil relative age date, but geomorphic and stratigraphic relationships with adjacent dated units indicate an age of 4 – 8 ka for this unit (Appendix C).

The uppermost continuous unit (Qc) encountered on site is interpreted as a Early Holocene to Latest Pleistocene aged colluvial / alluvial apron deposit and appears continuous and unbroken across the entire length of the transect (Appendix A). A moderately thick layer of artificial fill overlies this unit across the northern half of the site. The Qc material typically consists of organic rich, slightly hard, dry, silty SAND with clay and gravel that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qc is massive to crudely stratified with diffuse cobble lines, and this unit directly overlies Monterey Formation sandstone bedrock across the northern portion of the site as observed in trench exposure ST-1. To the south, the Qc material directly overlies unit Qoc1 and then overlays a thin alluvial sheet wash / braided stream channel deposit (Qoa1). The Qc stratigraphic unit contains a truncated soil profile with at least 3 stacked and buried weakly developed argillic soil horizons. Stratigraphic unit Qc has an estimated soil relative age date of 8 to 13 ka (Appendix C).

Unit Qoa1 directly underlies unit Qc and is interpreted as latest Pleistocene alluvial sheet flow or braided stream channel deposit and appears continuous and unbroken across the southern half of the transect(Appendix A). The Qoa1 material typically consists of slightly well oxidized, slightly hard, dry, silty SAND with gravel that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qoa1 is well stratified consisting of a fining upwards sequence. This unit abruptly overlies unit Qoc1 and has differentially scoured lower boundary across the central and southern portions of the site as observed in the trench ST-2 exposure and in boring exposures BA-1 through BA-6. To the north, the Qoa1 material thins and laps onto the Qoc1 stratigraphic unit as observed in trench exposure ST-2. The Qoa1 stratigraphic unit contains a highly truncated soil profile with 2 thinly stacked, buried, and weakly developed transitional (BC) argillic soil horizons. Stratigraphic unit Qoa1 has an estimated soil relative age date of 16 to 26 ka (Appendix C).

Unit (Qoc1) encountered on site is interpreted as a Late Pleistocene aged colluvial / alluvial apron deposit and appears continuous and unbroken across the majority of the length of the transect (Appendix A). The Qoc1 material typically consists of moderately well oxidized, hard, slightly moist, silty SAND with clay and gravel to clayey SAND with gravel that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qoc1 is massive to crudely stratified with diffuse cobble lines, and directly overlies and laps onto the Monterey Formation sandstone bedrock across the northern portion of the site as observed in trench exposure ST-1. In the central portion of the site and south of Fault 1, the Qoc1 material directly overlies unit Qoc2 as observed in trench exposure ST-2. To the south, the Qoc1 material directly overlies a thin alluvial fan deposit (Qoa2). To the east stratigraphic unit Qoc1 interfingers with alluvial fan unit Qoa2, and farther east at adjacent study sites to the east along Cherokee Avenue the Qoc1 unit pinches out and unit Qoa2 is exhumed at the ground surface. The Qoc1 stratigraphic unit contains a highly truncated and well developed soil profile with at least 2 stacked and buried argillic soil horizons. Stratigraphic unit Qoc1 has an estimated soil relative age date of 29 to 56 ka (Appendix C).

Unit (Qoa2) encountered on site is interpreted as a Late Pleistocene aged alluvial fan deposit and appears continuous and unbroken across the southern portion of the transect (Appendix A). The Qoa1 material typically consists of moderately well oxidized, hard, moist, clayey SAND that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qoa1 is well to crudely stratified, and directly overlies and

laps onto stratigraphic unit Qoc2 in the central portion of the site. South of the trench ST-2 exposure, this unit thickens as observed in boring exposures BA-4, -BA-5, and BA-6. In the central and southern portions of the site and south of Fault 2, the Qoa2 material directly overlies a thin and truncated Qoc2 deposit. To the west stratigraphic unit Qoa2 is exhumed at the ground surface at adjacent study sites to the east along Cherokee Avenue. The Qoa2 stratigraphic unit contains a highly truncated and well developed soil profile with at least 2 stacked and buried argillic soil horizons. Stratigraphic unit Qoa2 does not have an estimated soil relative age date, but geomorphic and stratigraphic relationships with adjacent dated units indicate that the Qoa2 and Qoc2 deposits are chronostratigraphic equivalents and an age date of > 29 to 56 ka has been assigned to this unit (Appendix C).

Unit Qoc2 is the lowest unfaulted stratigraphic unit observed across the transect (Appendix A), and is interpreted as a Pleistocene aged colluvial / alluvial apron deposit. The Qoc2 material typically consists of well oxidized, hard, wet, silty SAND with clay and gravel to clayey SAND that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qoc2 is massive to crudely stratified with diffuse cobble lines, and directly overlies and is faulted against the Monterey Formation sandstone bedrock across the central portion of the site as observed in trench exposure ST-2. In the central and southern portions of the site and over Fault 2, the Qoc2 material directly overlies unit Qoc3 as observed in borings BA-4, BA-5, and BA-6. The Qoc2 stratigraphic unit contains a highly truncated and well developed soil profile with at least 2 stacked and buried argillic soil horizons. Stratigraphic unit Qoc2 does not have an estimated soil relative age date, but geomorphic and stratigraphic relationships with adjacent dated units indicate that the Qoc2 deposit must be > 29 to 56 ka in age (Appendix C).

Unit Qoc3 is the youngest faulted stratigraphic unit observed across the transect (Appendix A), and is interpreted as a Pleistocene aged colluvial / alluvial apron deposit. The Qoc3 material typically consists of well oxidized, hard, wet, clayey SAND with gravel that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qoc3 is massive to crudely stratified with diffuse cobble lines. This unit has been faulted under the Monterey Formation sandstone bedrock across Fault 1 in the central portion of the site. Over Fault 2, the base of the Qoc3 material is juxtaposed against stratigraphic unit Qoa3 to the north as observed in boring BA-6. The Qoc3 unit thickens across the site to the south as observed in borings BA-4 and BA-5. The Qoc3 stratigraphic unit contains a stacked and well developed soil profile with at least 2 stacked and buried argillic soil horizons. Stratigraphic unit Qoc3 does not have an estimated soil relative age date, but geomorphic and stratigraphic relationships with adjacent dated units indicate that the Qoc3 deposit must be > 29 to 56 ka in age (Appendix C).

Unit Qoc4 is a localized stratigraphic unit observed in the southern portion of the transect (Appendix A), and is interpreted as a Pleistocene aged colluvial / alluvial apron deposit. The Qoc4 material typically consists of well oxidized, hard, wet, clayey SAND that is coarse-grained with 7.5YR color hues. Stratigraphic unit Qoc4 is massive to crudely stratified. This unit was observed near the base of boring BA-5. Stratigraphic unit Qoc4 laps onto the surface of the underlying Qoa3 deposit to the north near the central portion of the site. The Qoc4 stratigraphic unit contains a highly truncated and well developed soil profile with one remnant argillic soil horizon. Stratigraphic unit Qoc4 does not have an estimated soil relative age date, but geomorphic and stratigraphic relationships with adjacent dated units indicate that the Qoc4 deposit must be in > 29 to 56 ka in age (Appendix C).

Qoa3 is the lowest and oldest alluvial stratigraphic unit encountered on site and is interpreted as Pleistocene aged alluvial fan deposit. This unit appears unbroken across the southern portion of the

transect (Appendix A), and is truncated against Fault 1 to the north. The Qoa3 material typically consists of well oxidized, very hard, wet, sandy CLAY that is coarse-grained with 7.5 to 5 YR color hues. Stratigraphic unit Qoa3 is massive, and is faulted beneath bedrock in the central portion of the site. This unit is steeply inclined to the south as observed in boring exposure BA-5. The Qoa3 stratigraphic unit contains a highly truncated and very mature soil profile with at multiple stacked and buried argillic soil horizons that are plugged with alluvial clay. Stratigraphic unit Qoa3 does not have an estimated soil relative age date, but geomorphic, stratigraphic relationships, and comparisons to adjacent sites with dated units indicate that the Qoa3 deposit is in excess of 100 ka in age (Appendix C).

No features characteristic of faulting, such as shear zones or high angle contacts between units were observed above stratigraphic unit Qoc2 in the two trench exposures or six borings observed. The stratigraphic units described provide visually and texturally distinct, mapable contacts that are overlapping along the entire length of transect A (Appendix A).

EVIDENCE FOR THE ABSENCE OF FAULTING

Several subsurface geologic relationships at the project site provide direct evidence to preclude the presence of Holocene faulting. The topographic analysis also provides indirect evidence that the site is not traversed by active faults. When these relationships are considered together, there is compelling evidence for the absence of faulting beneath the subject site. The primary lines of evidence that support the interpretation that no active faults traverse the site are:

• **Continuous, unfaulted Pleistocene aged soil horizons and primary stratigraphy across the site.** The transect exhibits multiple continuous stratigraphic horizons across the trench and BA boring transect. The conclusion that the upper units are not faulted is based on the assumption that any faults would exhibit a vertical slip component that, over repeated seismic events, would produce recognizable, vertical separations of the units. It would be more difficult to make this case for a pure strike-slip fault. However, even strike-slip faults would likely produce an apparent dip-slip component or truncation of units due to the juxtaposition of different Pleistocene strata or pedogenic horizons.

• **No active faults were encountered in the subsurface exploration.** No features characteristic of active faulting, such as shear zones or high angle contacts between Holocene aged units were observed within the trench and BA boring transect. This line of evidence by itself is not considered compelling enough to preclude the presence of faulting, but it is consistent with and corroborates the other lines of evidence.

• **No irregularities or topographic features indicative of faulting were observed in the project site area.** The topographic maps show a rough alignment of steep slopes south of Franklin Avenue, clipping the southern boundary of the project site area. This feature has been shown to be in active in this study and in adjacent studies (ECI, 2016). Farther south a sharp break in slope occurs over 250 feet south of the site along Argyle Street. This recognizable scarp or break in slope may suggest the location of an active fault strand of the Hollywood Fault zone in the vicinity of the project site.

CONCLUSIONS AND RECOMMENDATIONS

This fault rupture evaluation at 6650 and 6668 Franklin Avenue and 1850 Cherokee Court has found no active faults traversing the subject property. The presence of multiple continuous Pleistocene stratigraphic horizons provide compelling evidence to demonstrate the absence of active faulting beneath the site.

Because no active faults were found to traverse the site within 50 feet beyond the northern and southern site boundaries, the project site is not exposed to the hazard of surface fault rupture. Accordingly, there are no fault setback distances or "no-build" zones recommended for the project site area. These setback zones do not impact the current plans for the new development.

The main trace of the Hollywood fault zone is likely located over 200 feet south of the project site. While the area explored in our study is not subject to the hazard of surface faulting, a future earthquake on the Hollywood or Santa Monica fault zones will likely produce very strong, near-field ground motions at the project site that could possibly exceed the provisions set forth in the current building codes.

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 whether or not active faults are present within the area explored 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 CLIENT and applies only to the proposed construction located at 6650 and 6668 Franklin Avenue and 1850 Cherokee Court in the City of Los Angeles, California. In the event that significant changes in the construction plans should occur, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed by Feffer Geological Consulting, and the conclusions and recommendations of this report are verified in writing.

REFERENCES

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US Geological Survey, 1894, Los Angeles Sheet 100,000 scale topographic map.

APPENDIX 'A'

Geologic Map
&
Cross Sections

NavigateLA Map

HUD Project Name: Montecito Apartments
HUD Project Number: 122-11360
HUD Project Location: Los Angeles, California

A.L.T.A./A.C.S.M. Land Title Survey

(Ground Level)

Date of Survey Map / Plat:
JUNE 11, 2015 (UPDATED PER TEAM COMMENTS, NOT FIELD VERIFIED)
MAY 29, 2015 (UPDATED PER TEAM COMMENTS, NOT FIELD VERIFIED)
MAY 28, 2015 (UPDATED PER PROFORMA AND TEAM COMMENTS, NOT FIELD VERIFIED)
APRIL 8, 2015 (UPDATED PER NEW PTR AND TEAM COMMENTS, FIELD VERIFIED)
DECEMBER 3, 2014 (UPDATED PER NEW PTR AND TEAM COMMENTS)
SEPTEMBER 29, 2014 (ORIGINAL)

Date of Field Survey:
APRIL 3, 2015 (FIELD VERIFIED)
SEPTEMBER 22, 2014 (ORIGINAL)

Address:
6650 & 6668 FRANKLIN AVE., LOS ANGELES, CA. 90028

Adjoining Addresses:
THE ADJOINING ADDRESSES SHOWN ON THIS MAP ARE PER THE CITY OF LOS ANGELES NAVIGATE L.A. DATABASE.

Assessor's Parcel Number (A.P.N.):
5547-003-023 (PARCEL 2), 5547-003-024 (PARCEL 1)

General:
ALL EASEMENT DESCRIPTIONS SHOWN HEREON ARE PER PRELIMINARY REPORTS STATED HEREON AND MAY BE SHORTENED OR ABBREVIATED. ORIGINAL DOCUMENT MUST BE USED FOR COMPLETE VERBIAGE AND INTERPRETATION. OTHER EASEMENTS MAY EXIST WITHIN SUBJECT PROPERTY, NOT INCLUDED WITHIN SAID PRELIMINARY REPORTS. HAHN AND ASSOCIATES, INC. DID NOT PERFORM A TITLE SEARCH FOR THIS PROJECT. PROPERTY LINE CLEARS ARE ORIENTED IN PLAN VIEW, PERPENDICULAR TO PROPERTY LINE.

NO OBSERVED EVIDENCE OF THE SITE BEING USED AS A SOLID WASTE DUMP, SUMP OR SANITARY LANDFILL.
NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS.
NO OBSERVED EVIDENCE OF RECENT STREET OR SIDEWALK CONSTRUCTION OR REPAIRS.
THIS PROPERTY IS NOT SITUATED WITHIN A WETLAND AREA.

BUILDING AREA CALCULATIONS SHOWN HEREON INCLUDE SQUARE FOOTAGE TO THE OUTERMOST BUILDING FASCIA AT FIRST LIVING LEVEL, ACTUAL LIVING SPACE WILL BE SMALLER.

Bench Mark:
THE ELEVATION OF 416.204 ON BENCH MARK NO. 12-20810 (CUT SPK IN EAST CURB LAS PALMAS AVE. NORTH 2 FEET NORTH OF FRANKLIN AVE. SOUTH END CATCH BASIN) NAVD 1988 DATUM, 2000 ADJUSTMENT, AS SHOWN IN CITY OF LOS ANGELES NAVIGATE L.A. DATABASE WAS USED AS ELEVATION DATUM FOR THIS SURVEY.

Basis of Bearings:
THE BEARING OF NORTH ALONG THE CENTERLINE OF CHEROKEE AVE. (FORMERLY MAGNOLIA AVE.) AS SHOWN ON HOLLYWOOD OCEAN VIEW TRACT, MAP BOOK 1, PAGE 62 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

Boundary:
ESTABLISHED PER PTR, ADJUSTED TO FOUND CITY CENTERLINE MONUMENTS, USING STANDARD SURVEYING PROCEDURES.

Area:
GROSS AREA OF BOTH PARCELS: 33,793 SQUARE FEET, 0.78 ACRES
PARCEL 1: 21,792 SQUARE FEET, 0.50 ACRES
PARCEL 2: 12,002 SQUARE FEET, 0.28 ACRES

Flood Zone:
THIS PROPERTY LIES WITHIN ZONE "X" AS SHOWN ON FIRM MAP NUMBER OF 06037C1605F DATED SEPTEMBER 26, 2008. AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

Zoning Information:
REFERENCE: ZIMAS.LACITY.ORG
AMLEGAL.COM(CALIFORNIA/LOS ANGELES PLANNING AND ZONING/MUNICIPAL CODE.)
CITY OF LOS ANGELES DEPARTMENT OF CITY PLANNING(CITYPLANNING.LACITY.ORG)

ZONE: [Q]R4-2 "QUALIFIED MULTIPLE DWELLING ZONE"

ZONE INFORMATION: ZI-2433 HOLLYWOOD COMMUNITY PLAN INJUNCTION
ZI-2436 PRELIMINARY HOLLYWOOD FAULT STUDY AREA
ZI-2374 LOS ANGELES STATE ENTERPRISE ZONE
ZI-1352 HOLLYWOOD REDEVELOPMENT PROJECT
ZI-2277 HOLLYWOOD REDEVELOPMENT PROJECT

MINIMUM BUILDING SETBACKS:

FRONT SETBACK: 15 FEET (BUILDING IS NOT IN COMPLIANCE) (7)

SIDE YARD SETBACK: 13 FEET (BUILDING IS NOT IN COMPLIANCE) (7)

REAR SETBACK: 20 FEET

REQUIRED PARKING: TO BE DETERMINED BY CITY PLANNING OFFICIAL (7)
(SPECIAL NOTE: INSTRUMENT NO. 86-1388699, REDUCES PARKING REQUIREMENT BY 40%)

Total Existing Parking:
STANDARD: 59 SPACES
COMPACT: 7 SPACES
HANDICAPPED: 1 SPACE
RESERVED: 1 SPACE
MAINTENANCE: 1 SPACE

TOTAL PARKING: 69 SPACES

Existing Ground Level Parking:
STANDARD: 40 SPACES
MAINTENANCE: 1 SPACE

TOTAL PARKING: 41 SPACES

Existing Upper Garage Parking:
STANDARD: 10 SPACES
COMPACT: 2 SPACE
RESERVED: 1 SPACE

TOTAL PARKING: 13 SPACES (SEE SHEET 2)

Existing Lower Garage Parking:
STANDARD: 9 SPACES
HANDICAPPED: 1 SPACE
COMPACT: 5 SPACES

TOTAL PARKING: 15 SPACES (SEE SHEET 2)

Utilities:
IF UNDERGROUND PUBLIC UTILITIES, OTHER SUBSTRUCTURES OR ZONE, SETBACK AND STREET WIDENING DATA ARE SHOWN HEREON, IT IS FOR INFORMATION ONLY, HAVING BEEN OBTAINED FROM THE BEST AVAILABLE SOURCES BUT FROM OTHERS NOT CONNECTED WITH THIS COMPANY. THEREFORE, NO GUARANTEE IS MADE AS TO THE ACCURACY OR COMPLETENESS OF SAID INFORMATION. IT IS ADVISED TO CALL UNDERGROUND SERVICE ALERT, (800) 227-2600, BEFORE DIGGING ON THIS SITE.

BURIED UTILITIES SHOWN HEREON PER L.A. CITY SUBSTRUCTURE MAPS 219-3C, 363-14, D-2227-1 & SEWER WYE MAPS 150A185 AND 4901-1.

Proforma ALTA Policy Report (PROFORMA):
PREPARED BY COMMONWEALTH LAND TITLE COMPANY, ORDER NO.: 08012507-919-JMH, DATED MAY 27, 2015.

Legal Description Per PROFORMA:
ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

Parcel 1:
THE EAST 105 FEET OF LOT 11 AND THE NORTH HALF OF LOT 12 IN BLOCK 2 OF THE HOLLYWOOD OCEAN VIEW TRACT, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 1, PAGE 62 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

Parcel 2:
THE WEST 120 FEET OF LOT 11 IN BLOCK 2 OF THE HOLLYWOOD OCEAN VIEW TRACT, IN THE CITY OF LOS ANGELES, COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 1, PAGE 62 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

Schedule B - Part 1 - Exceptions per PROFORMA:

△ A. NOT A SURVEY MATTER.

△ B. NOT A SURVEY MATTER.

△ C. NOT A SURVEY MATTER.

△ 1. WATER RIGHTS, CLAIMS OR TITLE TO WATER, WHETHER OR NOT SHOWN BY THE PUBLIC RECORDS.

△ 2. NOT A SURVEY MATTER.

△ 3. NOT A SURVEY MATTER.

△ 4. A COVENANT AND AGREEMENT WHEREIN THE OWNERS OF SAID LAND COVENANT AND AGREE THAT SAID LAND SHALL BE HELD AS ONE PARCEL AND NO PORTION SHALL BE SOLD SEPARATELY, WHICH COVENANT IS EXPRESSED TO RUN WITH THE LAND AND BE BINDING UPON FUTURE OWNERS.
RECORDED JUNE 11, 1984, AS INSTRUMENT NO. 84-693771, OFFICIAL RECORDS

△ 5. A DOCUMENT SUBJECT TO ALL TERMS, PROVISIONS AND CONDITIONS THEREIN CONTAINED.

ENTITLED: PERPETUAL PRESERVATION AND CONSERVATION RESTRICTION AND AGREEMENT
BY AND BETWEEN: MONTECITO APARTMENTS LIMITED, A CALIFORNIA LIMITED PARTNERSHIP (GRANTOR) AND UNITED COMMUNITY HOUSING AND DEVELOPMENT CORP., A CALIFORNIA NON-PROFIT PUBLIC BENEFIT CORPORATION (GRANTEE)
RECORDED: DECEMBER 31, 1984, AS INSTRUMENT NO. 84-1523595, OFFICIAL RECORDS

REFERENCE IS MADE TO SAID DOCUMENT FOR FULL PARTICULARS.

⬠ 6. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS SET FORTH IN A DOCUMENT
PURPOSE: PUBLIC UTILITIES
RECORDED: JULY 22, 1985, AS INSTRUMENT NO. 85-839954, OFFICIAL RECORDS
AFFECTS: THE WESTERLY 3 FEET OF THE NORTH 50 FEET OF LOT 12.

△ 7. THE MATTERS CONTAINED IN A DOCUMENT ENTITLED "COVENANT AND AGREEMENT" RECORDED OCTOBER 15, 1986, AS INSTRUMENT NO. 86-1388699, OF OFFICIAL RECORDS.

REFERENCE IS MADE TO SAID DOCUMENT FOR FULL PARTICULARS.

AMONG OTHER THINGS, SAID DOCUMENT PROVIDES FOR:

WE DO HEREBY COVENANT AND AGREE TO AND WITH SAID CITY TO DEVELOP THE ADDITIONAL PARKING SPACES REQUIRED IN THE EVENT THE DEVELOPMENT CEASES TO QUALITY UNDER 12 21A(U)(1).

⬠ 8. ANY RIGHTS, INTEREST, OR CLAIMS WHICH MAY EXIST OR ARISE BY REASON OF THE FOLLOWING FACTS SHOWN ON A SURVEY PLAT

ENTITLED: A.L.T.A./A.C.S.M. LAND TITLE SURVEY
DATED: SEPTEMBER 29, 2014 AND LAST REVISED_____, 2015
PREPARED BY: HAHN AND ASSOCIATES, INC.
PROJECT NO.: 0106-11-001

8A A) A 0.32' ENCROACHMENT OF A WALL ONTO THE PROPERTY FROM THE LAND ADJOINING TO THE WEST. SAID ENCROACHMENT IS NEAR THE NORTHWEST CORNER OF SAID PROPERTY.

8B B) A 0.05' ENCROACHMENT OF A WROUGHT IRON FENCE ONTO THE LAND ADJOINING TO THE WEST. SAID ENCROACHMENT IS NEAR THE NORTHWEST CORNER OF SAID PROPERTY.

8C C) AN ENCROACHMENT OF A WROUGHT IRON FENCE INTO THE STREET RIGHT OF WAY OF FRANKLIN AVENUE, TO UNDISCLOSED AMOUNTS.

8D D) A 7.87' ENCROACHMENT OF A BUILDING OVERHANG INTO THE STREET RIGHT OF WAY OF FRANKLIN AVENUE, TO UNDISCLOSED AMOUNTS.

8E E) A 0.01' TO 0.02' ENCROACHMENT OF A AN EXISTING 10-STORY BUILDING INTO THE STREET RIGHT OF WAY OF FRANKLIN AVENUE.

8F F) A 0.04' TO 0.13' ENCROACHMENT OF A CONCRETE SIDEWALK ONTO THE PROPERTY FROM THE STREET RIGHT OF WAY OF CHEROKEE AVENUE.

8G G) AN UNRECORDED EASEMENT OR LESSER RIGHT FOR TWO CONCRETE ELECTRICAL VAULTS WITH MANHOLES AND VENTS LOCATED AT THE SOUTHEAST CORNER OF THE PROPERTY.

8H H) AN ENCROACHMENT OF OVERHEAD UTILITY WIRES RUNNING NORTH-SOUTH ACROSS THE WESTERLY PORTION OF THE PROPERTY ACROSS THE NORTH AND SOUTH BOUNDARIES.

8I I) A 0.1' ENCROACHMENT OF A WALL ONTO THE LAND ADJOINING THE PROPERTY TO THE WEST. SAID ENCROACHMENT IS AT THE SOUTHWEST CORNER OF SAID PROPERTY.

8J J) AN 0.24' ENCROACHMENT OF A WALL ONTO THE LAND ADJOINING THE PROPERTY TO THE WEST. SAID ENCROACHMENT IS NEAR THE MID-POINT OF THE WEST BOUNDARY OF SAID PROPERTY.

△ 9. INTENTIONALLY DELETED.

△ 10.INTENTIONALLY DELETED.

△ 11.INTENTIONALLY DELETED.

△ 12.INTENTIONALLY DELETED.

△ 13.INTENTIONALLY DELETED.

△ 14.MATTERS CONTAINED IN THAT CERTAIN DOCUMENT

ENTITLED: EASEMENT AND MEMORANDUM OF AGREEMENT
RECORDING DATE: APRIL 3, 2012
RECORDING NO: AS INSTRUMENT NO. 20120500494, OFFICIAL RECORDS

REFERENCE IS HEREBY MADE TO SAID DOCUMENT FOR FULL PARTICULARS.

(BLANKET IN NATURE)

△ 15.INTENTIONALLY DELETED.

△ 16.INTENTIONALLY DELETED.

△ 17.INTENTIONALLY DELETED.

△ 18.INTENTIONALLY DELETED.

△ 19.INTENTIONALLY DELETED.

Schedule B - Part 2 - Exceptions per PROFORMA:

△ 1. NOT A SURVEY MATTER.

△ 2. NOT A SURVEY MATTER.

△ 3. A DOCUMENT SUBJECT TO ALL THE TERMS, PROVISIONS AND CONDITIONS THEREIN CONTAINED.
ENTITLED: AGREEMENT CONTAINING COVENANTS AFFECTING REAL PROPERTY
DATED: OCTOBER 22, 1996
BY AND BETWEEN: THOMAS L. SAFRAN, AN UNMARRIED MAN, AND THE COMMUNITY REDEVELOPMENT AGENCY OF THE CITY OF LOS ANGELES, CALIFORNIA, A PUBLIC BODY, CORPORATE AND POLITIC
RECORDED: OCTOBER 31, 1996, AS INSTRUMENT NO. 96-1770322, OFFICIAL RECORDS

REFERENCE IS MADE TO SAID DOCUMENT FOR FULL PARTICULARS.

BY THE PROVISION OF AN AGREEMENT:
DATED: JUNE 1, 2011
EXECUTED BY: MONTECITO APARTMENTS HOUSING, LP, A CALIFORNIA LIMITED PARTNERSHIP; THE COMMUNITY REDEVELOPMENT AGENCY OF THE CITY OF LOS ANGELES, CALIFORNIA, A PUBLIC BODY CORPORATE AND POLITIC; WELLS FARGO BANK, NATIONAL ASSOCIATION, ITS SUCCESSORS AND ASSIGNS
RECORDED: JUNE 27, 2011 AS INSTRUMENT NO. 20110867647 OF OFFICIAL RECORDS

SAID INSTRUMENT WAS MADE SUBORDINATE TO THE REGULATORY AGREEMENT RECORDED JUNE 27, 2011 AS INSTRUMENT NOS. 20110867642 OF OFFICIAL RECORDS.

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Surveyor's Notice:

(1) = NO EASEMENT STATED ON TITLE REPORT FOR OVERHEAD WIRES.

(2) = INTENTIONALLY DELETED.

(3) = THE PLACEMENT OF THE DIVIDING LINE BETWEEN PARCELS 1 & 2 OF PTR HAS BEEN DETERMINED BY CHAIN OF TITLE DOCUMENTS. SENIOR DEED RIGHTS BELONG TO PARCEL 2 OF PTR, GIVING IT THE DEED SPECIFIED "WEST 120 FEET OF LOT 11". ALL EXCESS (APPROXIMATELY 3') HAS BEEN ALLOCATED TO PARCEL 1 OF PTR.

(4) = NO EASEMENT STATED ON TITLE REPORT FOR ELECTRICAL UTILITY STRUCTURES OR POSSIBLE BURIED ELECTRICAL.

(5) = ENCROACHMENT BY SUBJECT PROPERTY ONTO OTHERS.

(6) = ENCROACHMENT ONTO SUBJECT PROPERTY BY OTHERS.

(7) = SUBJECT PROPERTY IS LISTED AS A CALIFORNIA HISTORICAL RESOURCE (N1363)
REFERENCE NO.: 5379-19-0168 & REFERENCE NO.: 0053-0799-0000

Survey Prepared For:

Thomas Safran & Associates
11812 San Vicente Blvd., Suite 600
Los Angeles, CA 90049
(310) 820-4888

Survey Prepared By:

Hahn and Associates, Inc.
26074 Avenue Hall, Suite 2
Valencia, CA 91355
(661) 775-9500

HAHN AND ASSOCIATES, INC.

Surveyor's Certificate:

TO MONTECITO HOUSING APARTMENTS LP; WELLS FARGO BANK, NATIONAL ASSOCIATION; CALIFORNIA COMMUNITY REINVESTMENT CORPORATION; LAWYERS TITLE COMPANY; COMMONWEALTH LAND TITLE COMPANY; DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD); AND TO THEIR SUCCESSORS AND ASSIGNS.

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA NSPS, AND INCLUDES ITEMS 1, 2, 3, 4, 6(a), 6(b), 7(a), 7(b)(1), 7(c), 8, 9, 10(a), 10(b), 11(b), 12, 13, 14, 16, 17, 18, 19, 20(a) OF TABLE A THEREOF. THE FIELD WORK WAS COMPLETED ON APRIL 3, 2015.

DATE OF PLAT OR MAP: JUNE 11, 2015

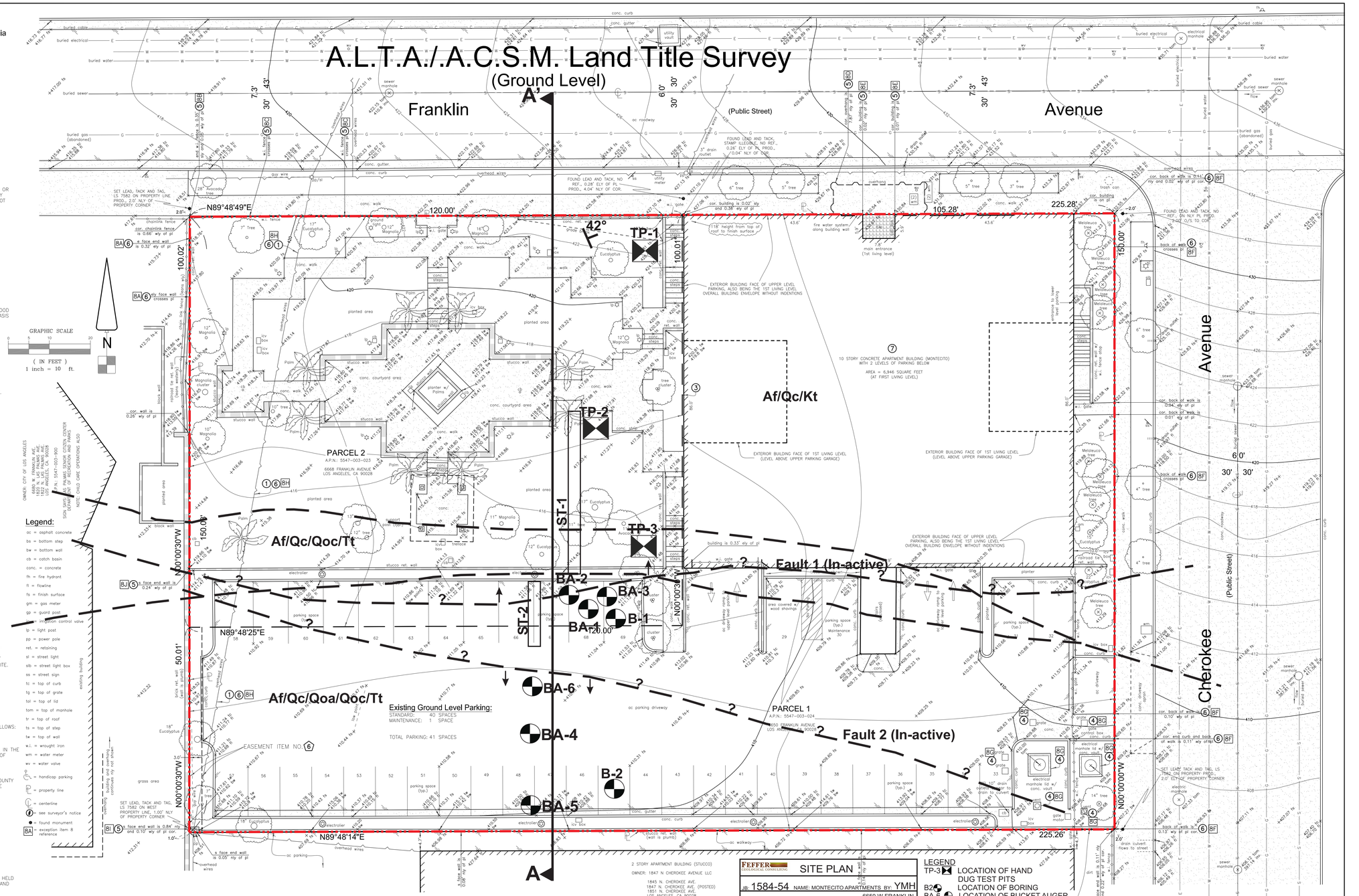
NAME: BRANDON M. HAHN

DATE OF SIGNATURE: JUNE 11, 2015

REGISTRATION NO.: PLS. 7582

LICENSED LAND SURVEYOR · BRANDON M. HAHN · EXP. 12-31-15 · NO. LS 7582 · STATE OF CALIFORNIA

HAHN JOB NO.: 0106-11-001 ©



FEFFER GEOLOGICAL CONSULTING — SITE PLAN

JB: 1584-54 NAME: MONTECITO APARTMENTS BY: YMH
6650 W FRANKLIN
DATE: 3/23/16 SCALE: 1"=16' SITE: AVENUE
REF: BASE MAP FROM SURVEY

LEGEND
TP-3 LOCATION OF HAND DUG TEST PITS
B2 LOCATION OF BORING
BA-6 LOCATION OF BUCKET AUGER
A A' SECTION LINE
ST-1 LOCATION OF FAULT TRENCH
GEOLOGIC CONTACT

FEFFER GEOLOGIC CONSULTING — CROSS SECTION A-A'

JOB: 1584-54 NAME: MONTECITO APARTMENTS BY: YMH

DATE: 3/26//16 SCALE: 1"=10' SITE: 6650 W FRANKLIN AVENUE

REF: TOPOGRAPHY FROM FIELD MAPPING & NAVIGATE LA

A

A'

N0º5

Existing Building

Franklin Avenue

BA-5

BA-4

BA-6

ST-1

ST-2

TP-1

TP-2

TP-3

Fill

Af ?

Af

Qal1

Qc

Qoa1

Qoc1

Qoa2

Qoc2

Qoc3

Qoc4

Qoa3

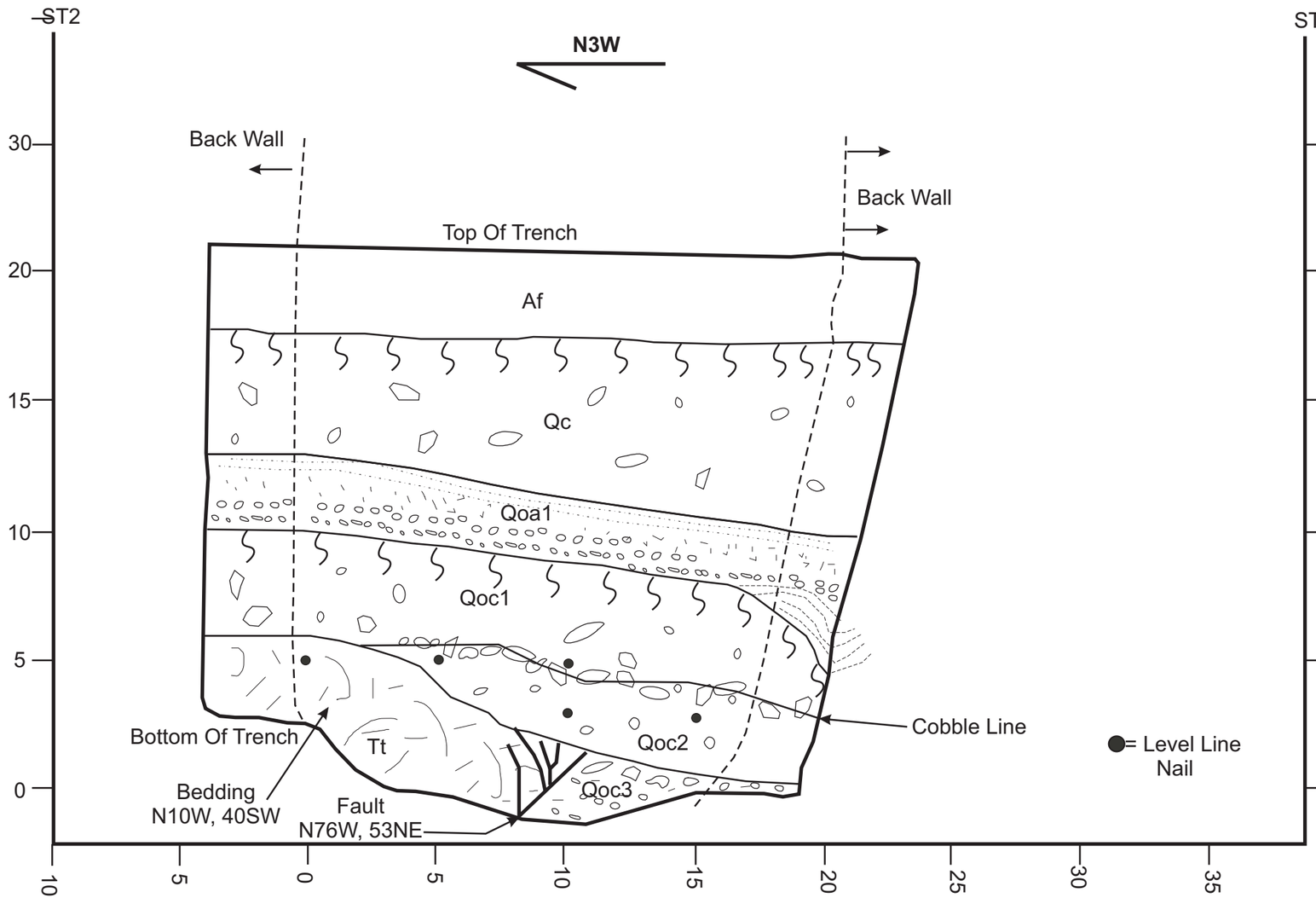
Tt

430
420
410
400
390
380
370
360
350
340
330
320
310
300
290

APPENDIX 'B'

Test Pit
&
Boring
&
Trench Logs

Montecito AP-Trench ST-2 12/9/15



Scale 1”=5”

Trench ST-2

Af-Artificial Fill, surficial layer, dark brown, silty SAND, with concrete debris, clear planar boundary to unit Qc;

Qc-Holocene Colluvium, colluvial apron deposit, continuous across entire trench exposure. Brown (7.5YR 4/4m), silty SAND with clay, massive, slightly hard, moderately sticky, slightly plastic, friable, coarse-grained poorly sorted sand, slight organics, with common fine and medium slate and sandstone sub angular gravel, few fine and medium pores, few fine and medium roots, clear smooth lower boundary to unit Qoa1 across entire trench exposure.

Qoa1-Late Pleistocene Alluvium, sheet wash / channel scour deposit, continuous across entire trench exposure. Strong brown (7.5YR 5/4m), silty SAND, stratified, slightly hard, slightly sticky, slightly plastic, friable, medium-to coarse-grained poorly sorted sand, slightly well oxidized, with localized beds of common to many fine and medium sub angular gravel, abrupt smooth lower boundary to unit Qoc1 across entire trench exposure.

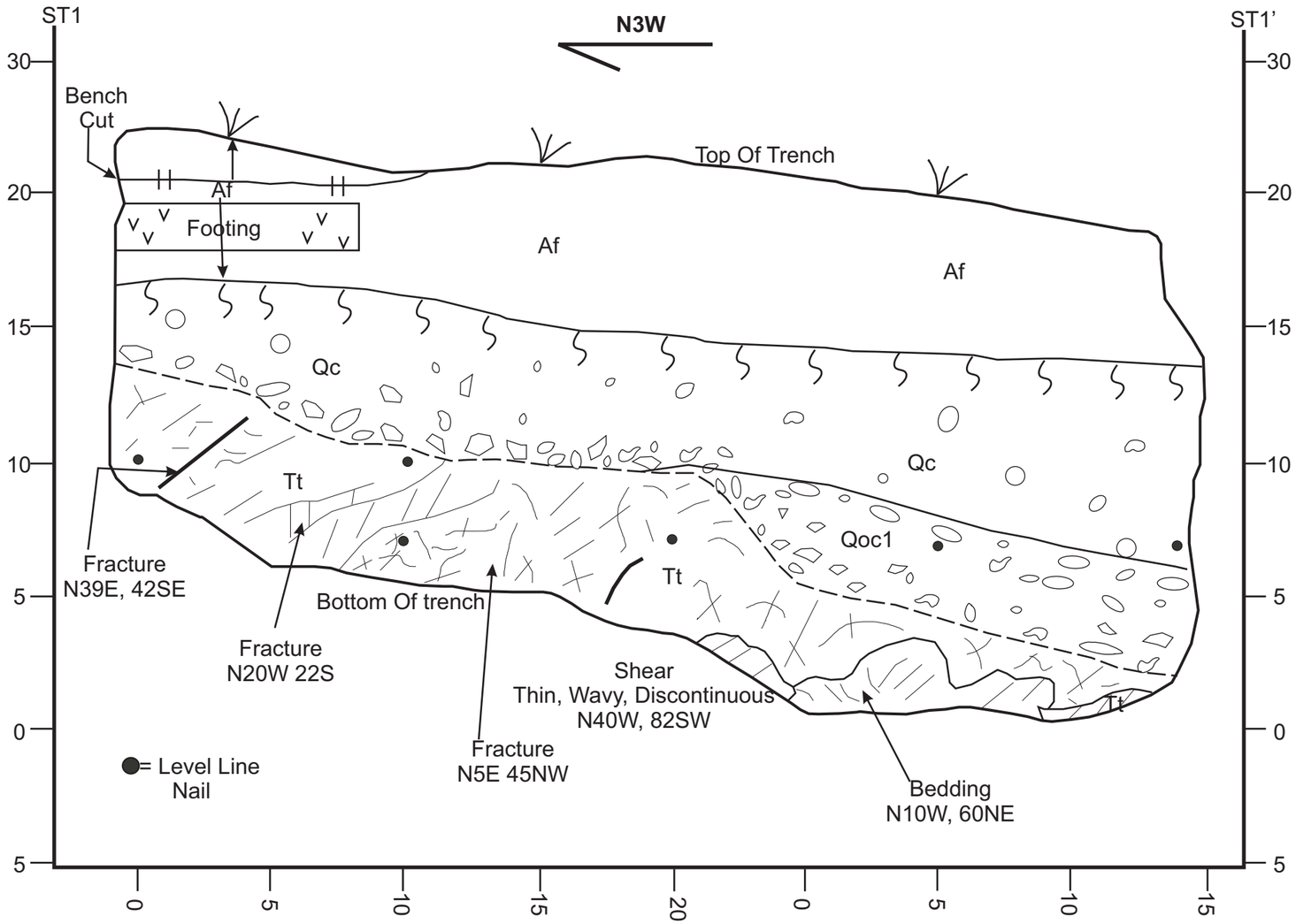
Qoc1-Late Pleistocene Colluvium, colluvial apron deposit, continuous across entire trench exposure. Brown (7.5YR 5/4m), clayey SAND, crudely stratified to massive, hard, moderately sticky, moderately plastic, friable to firm, coarse-grained poorly sorted sand, slightly well oxidized, with common to many fine and medium sandstone sub angular gravel, clear wavy lower boundary to unit Tt across northern half of trench, and gradational smooth lower boundary to unit Qoc2 across southern half of trench.

Qoc2-Late Pleistocene Colluvium, colluvial apron deposit, continuous across southern half of trench exposure. Strong Brown (7.5YR 5/6m), sandy CLAY, crudely stratified to massive, hard, moderately to very sticky, moderately plastic, friable to firm, coarse-grained poorly sorted sand, moderately well oxidized, with common fine and medium highly weathered sandstone sub angular gravel, clear wavy lower boundary to unit Tt to unit Qoc3 across southern half of trench.

Qoc3-Pleistocene Colluvium, colluvial apron deposit, continuous across southern half of trench exposure. Strong Brown (7.5YR 5/8m), sandy CLAY, massive, hard, very sticky, very plastic, firm, coarse-grained poorly sorted sand, moderately well oxidized, with common fine and medium highly weathered sandstone sub angular gravel, abrupt faulted northern boundary to unit Tt, and undetermined lower boundary across southern half of trench.

Tt-Tertiary Topanga Formation, Sandstone (yellowish brown) with interbedded Shale (gray), continuous across northern half of trench exposure. Highly weathered, weak to moderately strong rock strength, blocky rock structure, highly fractured (randomly orientated, tight to slightly open, and discontinuous), localized mottling, abrupt faulted southern boundary to unit Qoc3, and undetermined lower boundary across northern half of trench.

Montecito AP-Trench ST-1 9/1/15



Scale 1”=5”

Montecito Trench Log Unit Descriptions

Trench ST-1

Af-Artificial Fill, surficial layer, dark brown, silty SAND, with abandoned footing and concrete debris, clear planar boundary to unit Qc;

Qc-Holocene Colluvium, colluvial apron deposit, continuous across entire trench exposure. Brown (10YR 5-4/3m), silty SAND with clay, massive, slightly hard, moderately sticky, slightly plastic, friable, coarse-grained poorly sorted sand, slight organics, with common fine and medium slate and sandstone sub angular gravel, few fine and medium pores, few fine and medium roots, clear wavy lower boundary to unit Tt across northern half of trench, and gradational smooth lower boundary to unit Qoc1 across southern half of trench exposure.

Qoc1-Late Pleistocene Colluvium, colluvial apron deposit, continuous across southern half of trench exposure. Brown (10YR 5/4m), clayey SAND, crudely stratified to massive, hard, moderately sticky, moderately plastic, friable to firm, coarse-grained poorly sorted sand, slightly well oxidized, with common to many fine and medium slate and sandstone sub angular gravel, few fine and medium pores, few fine and medium roots, clear wavy lower boundary to unit Tt across northern half of trench, and gradational smooth lower boundary to unit Qoc2 across southern half of trench exposure.

Tt-Tertiary Topanga Formation, Sandstone (yellowish brown) with interbedded Shale (gray), continuous across entire trench exposure. Highly weathered, weak to moderately strong rock strength, blocky rock structure, highly fractured (randomly orientated, tight to slightly open, and discontinuous), localized MnO coatings, undetermined lower boundary.

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 11/3/15

Boring No: BA-1
Boring Location:
Groundwater Level: 32.0'
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
2.5		**Artifical (Af):** Mixed soil and debris. Silty SAND, dry. **Note:** slight organics		Hard	Af
5		**Colluvium (Qc):** Surface soil. Silty SAND with clay, massive, medium to coarse grained poorly sorted sand with few fine and medium subangular gravel Note: organic rich **Gradational smooth lower boundary.**	Brown 10YR 4/3d, 3/2m	Hard	Qc (AB)
7.5		**Colluvium (Qc):** Weak subsoil. Silty SAND with gravel, massive, friable, coarse grained poorly sorted sand with common to many fine, medium, and large subangular and angular gravel, slightly moist. **Clear smooth gently north dipping boundary..**	Brown Slightly oxidized 10YR 5/4d, 4/3m	Slightly Hard	Qc (Btj/BC)
10		**Old Alluvium (Qoc_1):** Terrace deposits, truncated. Silty SAND to silty sand with gravel, fined upwards, stratified, slightly hard- hard, medium to coarse grained moderately-well to poorly sorted sand with many fine and medium gravels at base.	Yellowish Brown 10YR 6/4d, 5/3m	Slightly Hard to Hard	Qoc_1 (Qt)(2C)
12.5		**Old Colluvium (Qoc_1):** Old colluvium, truncated argillic. Silty SAND with clay, massive, coarse grained poorly sorted sand with few to common subangular gravel, few to common fine clay films, slightly moist.	Brown Moderately well oxidized 10YR 4/4d, 3/3m	Hard	Qoc_1 (3Btjb)
15					
17.5					
20					

Feffer Geological Consulting

Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 11/3/15

Boring No: BA-1
Boring Location:
Groundwater Level: 32.0'
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
22.5		**Wavy gradational lower boundary.** **Old Colluvium (Qoc_1):** Stacked subsoil, weak argillic. Silty SAND with clay and gravel, massive, coarse grained poorly sorted sand with common to many fine, medium, and large subangular and angular gravel-sandstone, moist. **Note:** gradational loss of clay with depth.	Yellowish Brown Slightly oxidized 10YR 6/4d, 4/3m	Hard	Qoc_1 (4BCb)
25					
27.5		**Clear Planar south dipping contact.** **Old Colluvium (Qoc_2):** Stacked, truncated argillic. Silty SAND with gravel, massive, friable, common fine, medium, and large subangular gravel, highly weathered	Strong Brown 7.5YR 4/6d, 3/4m	Hard	Qoc_2 (5Btjb)
30					
32.5		Groundwater encountered at 32'			
35		END at 35'			
37.5					
40					

Feffer Geological Consulting

Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 11/3/15

Boring No: BA-2
Boring Location:
Groundwater Level: 32.0'
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
2.5		**Artificial Fill (Af):** West and South walls contain mixed soil and brick debris. Silty SAND. **Note:** slight organics. North and East walls contain bricked wall no motor. Filled with soil debris, dry to slightly moist.		Hard	Af +Wall
5					
7.5					
10					
12.5					
15					
17.5					
20					

Feffer Geological Consulting

Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 11/3/15

Boring No: BA-2
Boring Location:
Groundwater Level: 32.0'
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
		Artificial Fill (Af): Described above			
22.5		**Old Alluvium (Qoc_2):** Truncated argillic, Clayey SAND, massive, slightly moist, basal contact north dipping and clear and irregular. **Note:** slight organics	Brown 10YR 4/3d, 3/3m	Slightly Hard toHard	Qoc_2(Bt) {R} Qoc_2 (BC)
25		**Old Colluvium (Qoc_2):** Stacked soil. Silty SAND with gravel, massive, coarse grained poorly sorted sand with gravel, fine to large subangular, moist to wet, exposed on North and West wall.	Brown 10YR 5/4d, 4/3m	Hard	Tt
27.5		**Old Colluvium (Qoc_3):** Truncated argillic. Sandy CLAY with gravel, massive, coarse grained poorly sorted sand with common highly weathered subangular gravel exposed on North and West walls, faulted to South and East against –	Strong Brown Moderately well oxidized 7.5YR 4/6d, 3/4m	Very Hard	Qoc_3 (2Btb)
30		**Monterey Formation (Tt):** Sandstone Bedrock, medium grained, locally mottled, highly weathered, intensely fractured, weak to moderately strong rock strength, massive rock structure, wet.	Tan		
32.5		Groundwater encountered at 32' @ Fault ~1" thick, white clay gouge zone, plaster, N32W, 695? @ Fault 2 - ~0.25 to 1" thick, white clay gouge zone and shear wavy and biforcately, N73E, 80N-90			
35		END at 35'			
37.5					
40					

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Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 11/3/15

Boring No: BA-3
Boring Location:
Groundwater Level: 30.0'
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
		Asphalt and Base			
2.5		**Artificial Fill (Af):** Mixed soil, rock, concrete, and brick. Massive, slightly moist. Note: slight organics.			Af
5		**Colluvial Top Soil (Qc):** Silty SAND, massive, friable, medium to coarse grained poorly sorted sand with few pores and roots, few fine subangular gravel. Note: organic rich.	Dark Brown 10YR 3/3d, 2/2m	Slightly Hard	Qc (AB)
7.5		**Colluvium (Qc):** Weak subsoil. Silty SAND with gravel, massive, friable, medium to coarse grained poorly sorted sand with common to many fine, medium, and large subangular and angular gravel, poorly sorted sand, few roots, slightly moist.	Brown Slightly oxidized 10YR 4/4d, 3/2m	Slightly Hard to Hard	QC (Btj/BC)
10		**Old Alluvium (Qoa_1):** Terrace deposit. Silty SAND with gravel, stratified, fined upwards, medium to coarse grained poorly sorted sand with common small subangular gravel at base, sl. moist.	Yellowish Brown , Slightly oxidized 10YR 6/4d, 4/3m	Slightly Hard	Qoa_1/ +(2c)
12.5		**Old Colluvium (Qoc_1):** Truncated argillic. Silty SAND with clay, massive, medium to coarse grained poorly sorted sand with few and fine subangular gravel, few to common fine clay films on red faces with weak subangular block structure, slightly moist.	Brown, slightly oxidized 10YR 4/4d, 3/3m	Hard	Qoc_1 (3Btjb)
15					
17.5		**Old Colluvium (Qoc_1):** Stacked soil. Silty SAND with gravel, massive, coarse grained poorly sorted sand with many fine, medium, and large subangular and angular gravel sandstone, moist to wet.	Brown 10YR 5/4d, 4/3m	Slightly Hard to Hard	Qoc_1 (3BCb)
20					

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 11/3/15

Boring No: BA-3
Boring Location:
Groundwater Level: 30.0'
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
22.5		**Old Colluvium (Qoc1):** Described above.	Brown 10YR 5/4d, 4/3m	Slightly Hard to Hard	Qoc1 (3BCb)
25		**Old Colluvium (Qoc_3):** Truncated and Faulted, argillic. Sandy CLAY with gravel, massive, coarse grained poorly sorted sand with common subangular highly weathered sandstone, fine, medium, and large gravel.	Strong Brown Moderately well oxidized 7.5YR, 4/6d, 3/4m	Hard to Very Hard	Qoc_3 (5Btb)
27.5		**Old Colluvium (Qoc_2):** Silty SAND with gravel, coarse grained, poorly sorted sand, many subangular fine, medium, and large sandstone gravel, massive, wet..	Brown 10YR, 5/4d, 4/3m	Slightly Hard to Hard	Qoc_2 (4BCb)
		NOTE: Fault- 0.25 TO 0.50" thick white gouge, wavy N65°-73°W,90° ~4" vertical seperation on unit **Qoc_2**			
30		Groundwater encountered at 30'.			
		END at 30' Logged to 27' Groundwater encountered at 30'			
32.5					
35					
37.5					
40					

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Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-4
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
0 – 3	Af	**Artificial Fill (Af)**: Clayey sand with gravel, massive with concrete and construction debris, abrupt planer lower boundary	Brown		Af
4 – 5		**(Qal) Alluvium**, sheet wash deposit, massive, silty sand,very friable, coarse grained, poorly sorted sand, slightly oxidized, with few fine gravel, clear smooth lower boundary	Yellowish brown	Loose	Qal
6 – 7		**Qc (AB) Colluvium**, truncated AB soil horizon, silty sand with clay, organic rich, massive, medium grained moderately well sorted sand with few fine and medium subrounded gravel, gradational wavy lower boundary	Brown	Slightly hard	Qc (AB)
8 – 10		**Qc (Bt) Colluvium (Base)**, argilic horizon, silty sand, massive to crudely stratified, slightly well oxidized, gradational loss of clay with depth, coarse grained, poorly sorted sand with common fine, medium and large gravel, abrupt planar lower boundary	Yellowish brown	Slightly hard	Qc (Bt)
11 – 12		**Qoa1 Old Alluvium**, thin sheet wash deposit, crudely stratified, sand with silt, friable, medium grained, moderately well sorted sand with few common fine and medium gravel, clear planer lower boundary	Light brown	Soft	Qoa1
13 – 16		**Qoc1 (Bt) Old Colluvium**, truncated argillic soil horizon, silty sand with clay, massive, moderately well oxidized, plugged with clay, coarse grained poorly sorted sand with common fine and medium gravel, slightly moist, abrupt wavy lower boundary	Reddish brown	Hard	Qoc1 (Bt)
17 – 20		**Qoa2 (BC) Old Alluvium**, well stratified beds of silty sand and sand with silt and gravel, very friable, abrupt wavy lower boundary	Yellowish brown	Soft	Qoa2 (BC)

Feffer Geological Consulting

Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-4
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
20					
21		**Qoc2 (Bt) Old Colluvium**, truncated argillic horizon, massive, silty sand with clay to clayey sand, medium grained moderately well sorted sand with few fine and medium completely weathered gravel, plugged with clay, gradational wavy lower boundary	Brown	Hard	Qoc2 (Bt)
23					
24					
25					
26					
27		**Qoc3 (Bt) Old Colluvium** argillc subsurface soil horizon massive, clayey sand, , medium grained moderately well sorted sand with few to common completely weathered fine and medium gravel, gradational increase in clay with depth, clear wavy lower boundary	Yellow brown	Hard	Qoc3 (Bt)
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-4
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
40–49		**Qoa3 (Bt) Old Alluvium**, truncated mature argillic, sandy clay, massive, , plugged with clay, well oxidized, strong soil structure, undetermined lower boundary	Reddish brown	Very hard, firm	Qoa3 (Bt)
50–54	SLUFF				
55		Logged To 50', Drilled To 55'			

Feffer Geological Consulting

Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-5
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
0 – 3	Af	**Artificial Fill (Af)** silty sand with gravel and concrete debris, massive	Brown		Af
4 – 5		**Qal (Btj / BC) Alluvium**, sheet wash/channel deposit, juvenile argillic to transitional soil horizon, silty sand to sandy silt, massive, friable, coarse grained poorly sorted sand with common fine slate and sandstone gravel, abrupt smooth lower boundary	Olive brown	Soft	Qal (Btj / BC)
6 – 8		**Qc (AB) Colluvium**, near surface truncated and buried transitional soil horizon, silty sand, massive, organic rich, coarse grained poorly sorted sand with few to common fine and medium subangular gravel, gradational wavy lower boundary	Dark brown	Soft to slightly hard	Qc (AB)
9 – 11		**Qc (Bt /BC) Colluvium**, argillic to transitional soil horizon, silty sand, massive, slight organics, coarse grained poorly sorted sand, with few fine sub angular gravel, clear smooth lower boundary	Yellowish brown	Slightly hard	Qc (Bt /BC)
12 – 13		**Qoa1 (Bt) Old Alluvium**, sheet wash/channel deposit, crudely stratified, fining upwards, silty sand to sandy with silt and gravel, soft, fine to coarse grained well to poorly sorted and with few to common fine medium sub rounded gravel, abrupt smooth lower boundary	Light yellowish brown		Qoa1 (Bt)
14 – 17		**Qoc1 (Bt) Old Colluvium**, truncated argillic soil horizon, massive, silty sand with clay, slightly well oxidized, coarse grained poorly sorted sand with few fine and medium sub angular gravel, clear smooth lower boundary	Brown	Hard	Qoc1 (Bt)
18 – 20		**Qoa2 (Bt) Old Alluvium**, sheet wash / channel deposit, massive to crudely stratified, silty sand with gravel, coarse grained poorly sorted sand with common fine and medium sub angular highly weathered gravel, slightly moist, localized sand lenses, gradational boundary to;	Yellowish brown	Slightly hard	Qoa2 (Bt)

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-5
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
20					
21		**Qoa2 (BC) Old Alluvium**, channel deposit, well stratified, silty sand to sandy silt, fine grained well sorted sand, localized pocket scours with many small and medium sub rounded gravel, few common wavy CaCo3 lined fractures (randomly orientated and discontinuous), clear wavy lower boundary	Yellowish brown		Qoa2 (BC)
23		**Qoc2 (Bt1) Old Colluvium**, truncated argillic soil horizon, massive, clayey sand to sandy clay, coarse grained poorly sorted sand with few fine and medium highly weathered gravel, slightly well oxidized, few CaC03 lined fractures on NW wall (discontinuous and wavy to planer), gradational lower boundary	Strong brown	Hard	Qoc2 (Bt1)
28		**Qoc3 (Bt2) Old Colluvium**, argillic subsurface soil horizon, silty sand with clay, massive, coarse grained poorly sorted sand with few fine and medium highly weathered sub angular gravel, (@28'- localized zone of many highly weathered gravel), gradational lower boundary	Brown	Slightly hard to hard	Qoc3 (Bt2)
37		**Qoc3 (BC) Old Colluvium**, transitional soil horizon, silty sand with clay, massive, coarse grained poorly sorted sand common fine and medium sub angular highly weathered gravel, clear smooth lower boundary	Dark yellowish brown	Slightly hard	Qoc3 (BC)
40					

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-5
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
40–42		**Qoc4 (Bt) Old Colluvium**, truncated and stacked strong argillic horizon, massive, clayey sand, hard, coarse grains poorly sorted sand with few fine and medium completely weathered gravel, abrupt wavy lower boundary	Brown	Hard	Qoc4 (Bt) Old Colluvium
43–44		**Qoa3 (Bt) Old Alluvium**, truncated strongly developed argillic soil, massive, well oxidized, plugged with clay, , sandy clay, , coarse grained poorly sorted sand, undetermined lower boundary	Reddish brown	Very hard	Qoa3 (Bt)
45–49	SLUFF	Sluff			
50		Logged To 45', Drilled To 50'			
51–60					

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-6
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
0–4	Af	**Artificial Fill (Af)**, silty sand with gravel and construction debris, massive, abrupt wavy lower boundary	Dark brown		Af
4–5		**Qal -Alluvium**, channel scour deposit, silty sand with gravel, massive, coarse grained and poorly sorted sand with common fine sub rounded gravel, irregular south dipping lower boundary	Olive brown	Slightly hard	Qal
5–7		**Qc (AB) Colluvium**, truncated transitional soil horizon, silty sand, massive, slight organics,coarse grained poorly sorted sand with few sub angular gravel, gradational wavy lower boundary	Dark brown	Slightly hard to hard	Qc (AB)
7–8		**Qc (Btj/BC) Colluvium**, juvenile argillic soil horizon, silty sand, massive, coarse grained poorly sorted sand with few subangular gravel, gradational smooth lower boundary			Qc (Btj/BC)
8–9		**Qoc1 (Bt) Old Colluvium**, truncated argillic soil horizon, massive, , silty sand with gravel, coarse grained poorly sorted sand, common to many fine and medium sub angular gravel, clear wavy south dipping lower boundary	Yellowish brown		Qoc1 (Bt)
9–10		**Qoa2 (Btj) Old Alluvium**, truncated juvenile argillic soil horizon, sheet wash/channel deposit, sand with silt and gravel, massive,friable, many fine and medium sub rounded gravel, abrupt wavy lower boundary	Light brown	Loose	Qoa2 (Btj)
10–11		**Qoa2 (BC) Old Alluvium**, transitional soil horizon, channel deposit, silty sand, well-stratified, few fine and medium sub rounded gravel, medium grained moderately well sorted sand, abrupt smooth lower boundary	Light brown	Soft	Qoa2 (BC)
11–12		**Qoa2 (BC) Old Alluvium**, transitional soil horizon, channel deposit, silty sand, well-stratified, soft, few fine and medium sub rounded gravel, medium grained moderately well sorted sand, abrupt smooth lower boundary	Light brown		Qoa2 (BC)
12–18		**Qoc2 (Bt) Old Colluvium**, truncated argillic Horizon, silty sand with clay, slight organics, slightly oxidized, massive, coarse grained poorly sorted sand with few fine sub angular gravel, gradational wavy, north dipping lower boundary	Brown		Qoc2 (Bt)
18–19		**Qoc2 (BC) Old Colluvium**, transitional soil horizon, silty sand, slightly medium grained moderately well sorted sand, massive, clear wavy west sloping lower boundary	Light brown	Slightly hard	Qoc2 (BC)
19–20					

Feffer Geological Consulting

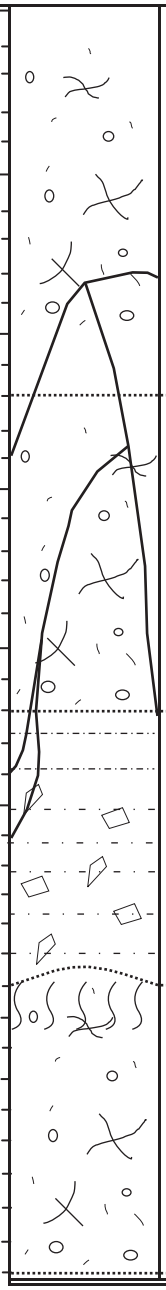
Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-6
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
20–40		**Qoc2 (BC) Old Colluvium**, transitional soil horizon,silty sand, medium grained moderately well sorted sand, massive, clear wavy west sloping lower boundary	Light brown	Slightly hard	Qoc2 (BC)
		Qoc3 (Bt) Old colluvium, truncated, strong argillic horizon, , clayey sand with gravel, massive, slightly well oxidized, coarse grained poorly sorted sand with common fine and medium highly weathered gravel Fault-Thin wavy shear N75E 63S irregular west dipping contact	Strong brown	Hard	Qoc3 (Bt)
		Qoa3 (Bt1) Old Alluvium, stacked and truncated argillic soil horizon, , sandy clay, , massive, moderately well oxidized coarse grained poorly sorted sand with few fine highly weathered gravel Fault on west wall, thin wavy shear N85W, 65S	Reddish brown	Very hard	Qoa3 (Bt1)
		Qoa3 (Bt2 gley) Old alluvium, argillic subsurface soil horizon, clayey sand with gravel, massive, coarse grained with few fine medium and large completely weathered gravel, wet, clear wavy north sloping boundary;	Partially gleyed gray, pale brown	Hard	Qoa3 (Bt2 gley)

Feffer Geological Consulting

Figure

LOG OF EXPLORATORY BORING

Job Number: 1584-54
Project: Montecito Apartments

Date Performed: 1/27/16

Boring No: BA-6
Boring Location: See Site Map
Groundwater Level: N/A
Drill Type: Bucket Auger

Depth in Feet	Soil Type	Bedrock/ Soil Description	Color	Density	Soil Type
40					
41	SLUFF	**Qoa3 (Bt3) Old alluvium**, argillic subsurface soil horizon, , sandy clay, massive, , plugged with clay, well oxidized, medium grained moderately well sorted sand with few pea gravel, wet, undetermined lower boundary	Reddish brown	Very hard	Qoa3 (Bt3)
42					
43					
44					
45		Drilled to 45'			
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					

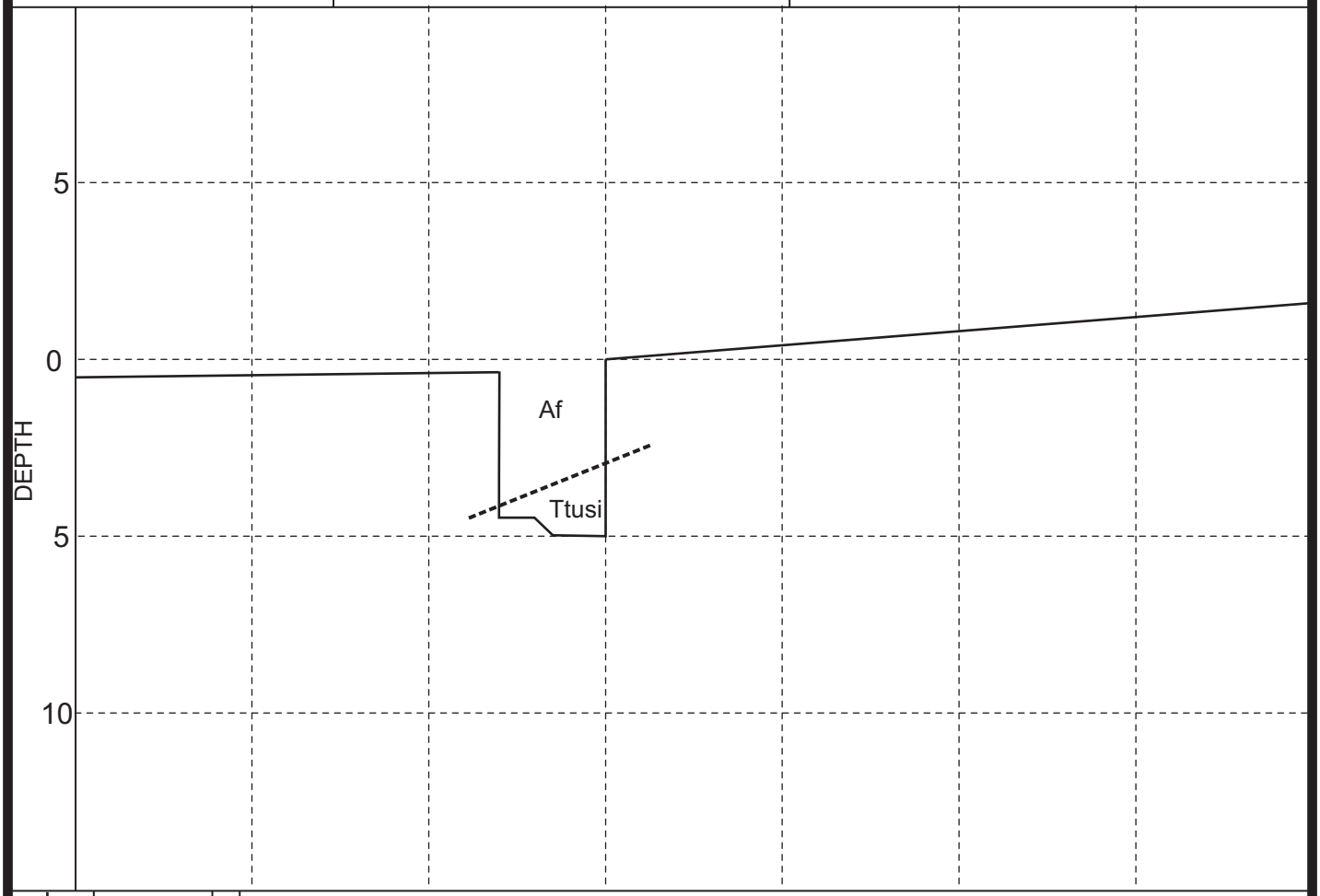
GRAPHIC LOG

APPROXIMATE SCALE : 1"=5'

DATE LOGGED : 7/10/15 BY : RAM

TEST EXCAVATION : 1

ADDRESS: 6650 W. Franklin Avenue



RING	BULK	SAMPLE DEPTH	Blows	LOCATION : See Site Map DESCRIPTION: Classification (USCS), color, moisture, consistency etc.
		1 2 3 4 5 6 7 8 9 10 11 12 13 14		0-3' Fill (Af): Clayey sandy silt, tan, yellow brown, moist, dense, contains scattered rootlets, roots and rock fragments 3-5' Bedrock (Ttusi): Topanga Formation siltstone, orange brown, gray, moist, hard, thinly bedded moist, hard @4' Bedding Observed N24W 42NE End At 4', Fill To 1', No Water, No Caving

FEFFER GEO CONSULTING	F.N. 1584-54	Montecito Apartments (TSA)	PLATE

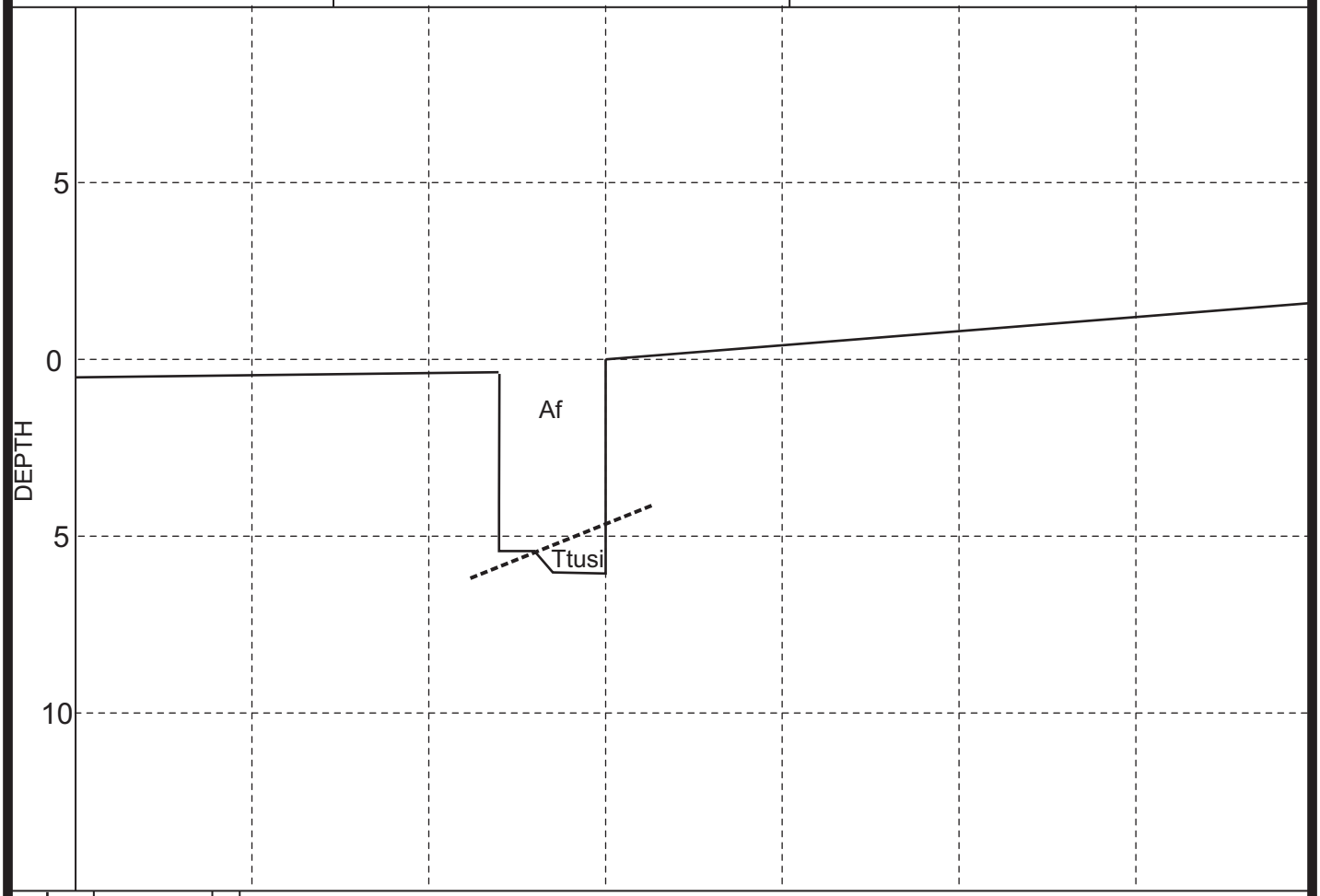
GRAPHIC LOG

APPROXIMATE SCALE : 1"=5'

DATE LOGGED : 7/10/15 BY : RAM

TEST EXCAVATION : 2

ADDRESS: 6650 W. Franklin Avenue



RING	BULK	SAMPLE DEPTH	Blows	LOCATION : See Site Map DESCRIPTION: Classification (USCS), color, moisture, consistency etc.
		1 2 3 4 5 6 7 8 9 10 11 12 13 14		0-6' Fill (Af): 0-2' Sandy silt, dark brown, moist, dense, contains scattered roots, rock fragments and debris 2-4' Silty sand, mottled brown, yellow brown, moist, dense, contains scattered rootlets, roots, rock fragments and concrete debris 4-6' Silty sand, mottled brown, dark brown, moist, medium dense, contains scattered rootlets and rock fragments 6-7' Quaternary Soil (Qs): Sandy silt, dark brown, mottled brown, moist, medium dense 7-9' Bedrock (Ttusi): Topanga Formation siltstone, yellow brown, tan, moist, hard, weathered End At 9', Fill To 6', No Water, No Caving

FEFFER GEO CONSULTING	F.N. 1584-54	Montecito Apartments (TSA)	PLATE

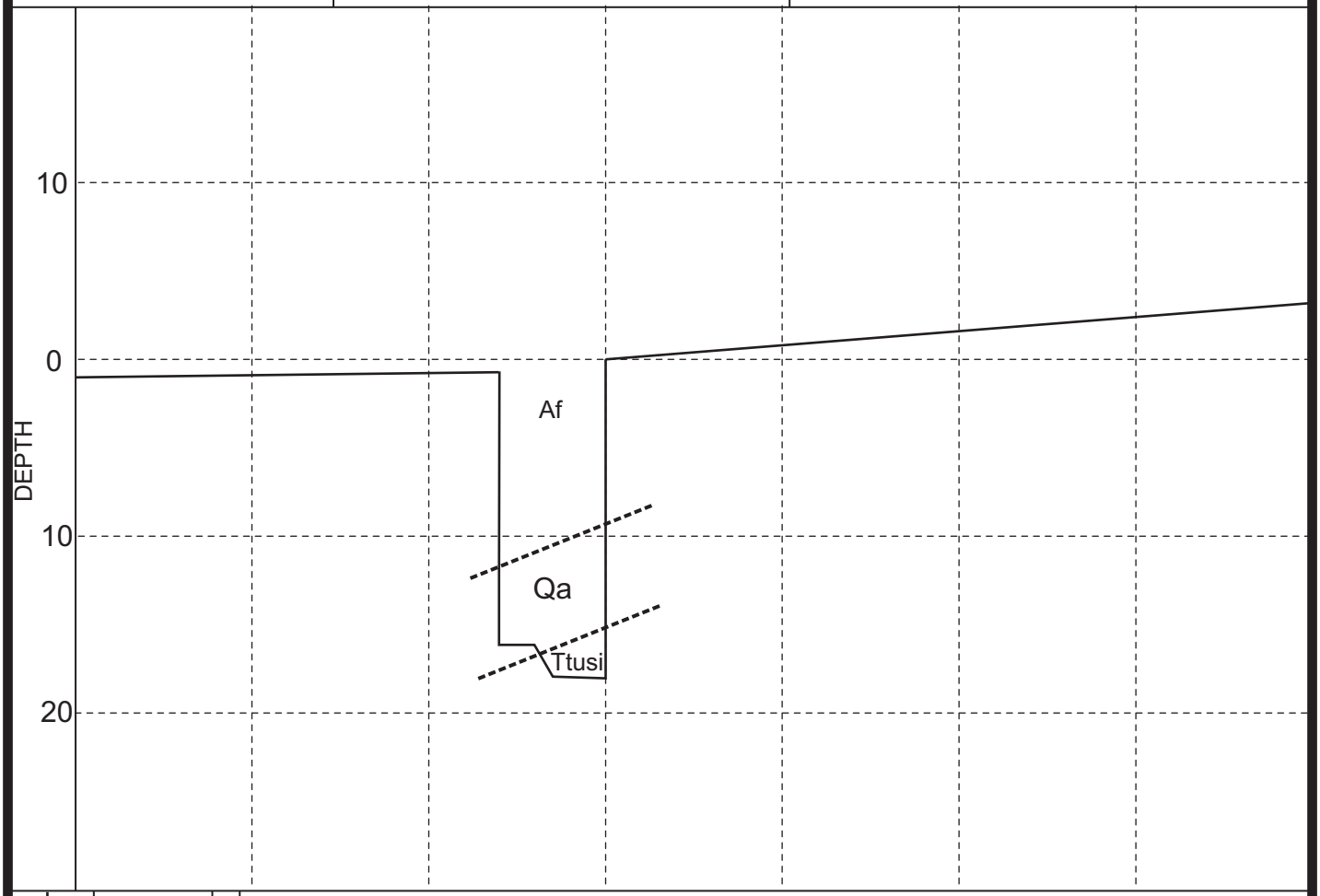
GRAPHIC LOG

APPROXIMATE SCALE : 1"=5'

TEST EXCAVATION : 3

DATE LOGGED : 7/10/15 BY : RAM

ADDRESS: 6650 W. Franklin Avenue



RING	BULK	SAMPLE DEPTH	Blows	LOCATION : See Site Map DESCRIPTION: Classification (USCS), color, moisture, consistency etc.
		2		0-6' Fill (Af): 0-2' Silty sand, dark brown, brown, moist, dense, contains scatter rootletts, roots and concrete debris
		4		
		6		
		8		2-6' Silty sand, orange brown, yellow brown, moist, dense, contains scattered rootlets and debris
		10		
		12		6-19' Alluvium (Qa): @6'Sandy silt, clayey sandy silt, dark brown, mottled brown, moist, dense @13'Silty sand, yellow brown, tan, moist, dense @16' Gravelly silty sand, tan, yellow brown, mottled brown, moist, contains scattered rock fragments
		14		
		16		
		20		
		18		Bedrock (Ttusi): Topanga Formation interbedded siltstone and sandstone, yellow brown, tan, mottled brown, moist, very hard, highly weathered
		22		
		24		
		26		End At 19', Fill To 6', No Water, No Caving
		29		

FEFFER GEO CONSULTING	F.N. 1584-54	Montecito Apartments (TSA)	PLATE

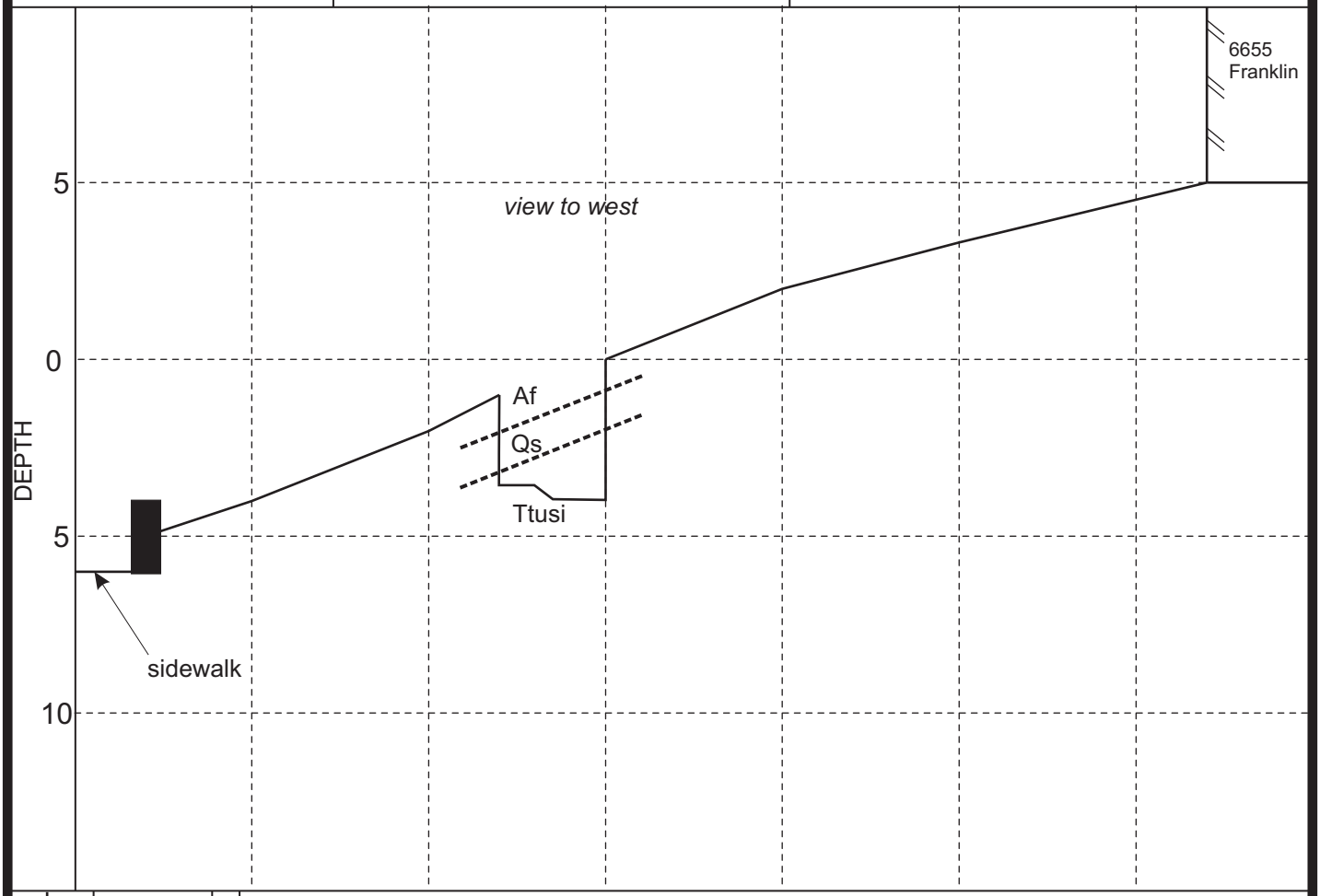
GRAPHIC LOG

APPROXIMATE SCALE : 1"=5'

DATE LOGGED : 3/18/16 BY : PB

TEST EXCAVATION : 4

ADDRESS: 6655 W. Franklin Avenue



RING	BULK	SAMPLE DEPTH	Blows

LOCATION : See Site Map

DESCRIPTION: Classification (USCS), color, moisture, consistency etc.

1
2
3
4
5
6
7
8
9
10
11
12
13
14

0-1' Fill (Af):
Silty sand, brown, slightly moist to moist, medium dense, contains scattered rootlets, roots

1-2' Quaternary Soil (Qs):
Silty sand, tan brown, moist, medium dense, contains scattered subangular pebbles, slightly gradational contact with underlying bedrock

2-4' Bedrock (Ttusi):
Topanga Formation interbedded shale and sandstone, gray-tan-yellow-brown, moist, hard

End At 4', Fill To 1', No Water, No Caving

FEFFER GEO CONSULTING	F.N. 1584-54	Montecito Apartments (TSA)	PLATE

APPENDIX ‘C’

Soil Stratigraphy Study And Relative Age Estimates
For A Fault Rupture Hazard Assessment At
6650 Franklin Avenue, City Of Los Angeles, California

Prepared by:

John Helms, CEG
40344 Wood Court, Palmdale, California 93551
Voice & FAX (661) 206-5860

Submitted to:

Mr. Josh Feffer, CEG
Feffer Geological Consulting, Inc.
1990 South Bundy Drive, 4th Floor
Los Angeles, CA 90025

March 29, 2016

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

Mr. Josh Feffer, CEG
Feffer Geological Consulting, Inc.
1990 South Bundy Drive, 4th Floor
Los Angeles, CA 91025

March 29, 2016

Subject: Soil Stratigraphy Study And Relative Age Estimates For A Fault Rupture Hazard Study At 6650 Franklin Avenue, City of Los Angeles, California.

Dear Mr. Feffer:

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 6650 Franklin Avenue, City of Los Angeles, California. This information presents the relative age estimate for a deposit in a single trench (T-2) exposure.

Feffer Geological Consulting, Inc. (FGC) retained John Helms CEG to describe the exposed soil stratigraphy and to assign relative age dates for the deposits identified. 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 and describes a soil profile, identifies stratigraphic relationships, defines soil chronosequences, and estimates relative age for the deposit under study. 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 33 to 64 ka for the entire stratigraphic section under study. The youngest member of the stratigraphic section ranges in relative age from approximately 8 to 13 ka. Please see Table 2 in the attached report for a summary listing 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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Soil Stratigraphy Study And Relative Age Estimates For A Fault Rupture Hazard Investigation At 6650 Franklin Avenue, City of Los Angeles, California.

INTRODUCTION

One soil profile has been studied for geomorphic characteristics and relative degrees of weathering to estimate a deposit's 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 Feffer Geological Consulting Inc. (FGC) to assess the recency and recurrence of faulting across the study area. Alluvial units are assessed chronostratigraphically across a single trench exposure that is located in the central portion 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 a single soil profile. The trench exposure is located across a graded alluvial apron surface that buries a short bedrock spur.

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 soil subsurface horizons within the stratigraphic section studied indicates that the modified ground surface across the entire study area is moderately old. Ages range from 8 to 13 ka for the thick surficial colluvial soil that underlies artificial fill across the project site area. The colluvium is characterized as a massive to crudely bedded, clayey, and gravel-rich deposit that is hard, coarse-grained with weak to moderately strong sub angular and angular blocky ped structure. The stacked and buried soils encountered in this study classify as alfisols that relative age estimates range from 8 to 13 ka for the surface soil in soil profile 1 to 33 to 64 ka for the third and lowest buried soil. 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 Haploxeralfs. Soil profile locations are indicated on the geologic map and trench log of trench ST-2 that has been provided with the FGI fault rupture hazard investigation report.

MATERIALS AND METHODS

One soil profile from station 4 feet in trench exposure ST-2 was described, sampled, classified, and quantified within the study area. The soil was 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 lists the soil description for each studied surface in longhand format. Table 1.2 lists the soil description in soil conservation service notation and shows the SDI calculations. This table shows 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. Table 1.2 lists all of the determined HI, SDI, and MHI values for the soil 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 the Hollywood Basin. SDI values are calibrated to a common depth of 7 feet.

The changes in the subsurface pedogenic properties of the alfisol 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 soil profile under study is located across a colluvial surface that may laterally differ in relative age, facies of deposition, and degrees of preservation. A sequence of stacked, buried, and truncated gravelly soils with illuvial clays characterizes the soil profile described on the project site.

The soil profile described has a surface age implied by estimating the time of inception for the exposed surficial soil. The soil within this study area also contains a series of stacked or buried 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 have developed into alluvial fan and apron deposits that buries or locally truncates older soils that have developed previously in older sediments. A cumulic 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 member 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

The attached Table 1.1 presents the soil profile descriptions in longhand format. Figure 1 is the soil profile illustration that shows the nature of the described soil horizon boundaries, physical characteristics of the soil, and views of the related surface morphology. Table 1.2 presents the results of the calculated SDI values. Table 2 is a summary of the soil relative age estimates the soil profile under study. Table 3 is a compilation of the comparative data in a format that compares to the data generated for this study. Table 4 is a soil abbreviation key to be used in conjunction with the SDI calculation sheets. Table 5 lists the stratigraphic unit correlations and relative ages for the project site area.

The soil description, SDI calculations, and relative age determinations follow for the soil profile studied.

Soil Profile 1
Test Pit Exposure

Soil profile 1 is located nearest station 4 feet in trench exposure ST-2 excavated near the center of the project site area. The soil profile lies across a graded surface that is geomorphically inactive. This soil profile consists of a series of stacked, truncated, and buried argillic soil horizons. Most of the diagnostic soil horizons observed are moderately well developed and the individual soil members are classified as Alfisol soils. The surface soil member has developed within an alluvial apron deposit that has draped over and buried a bedrock spur and truncated the lower soil members described. The soil profile described contains a surface soil and one buried soil to a depth of approximately 16.2 feet below the ground surface. 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 thick and truncated remnant Haploxeralf. This soil is slightly well oxidized and displays 10YR and 7.5YR mixed soil color hues. The deposit is massive to crudely bedded and coarse-grained, and has a scoured contact with the underlying buried soil. Diagnostic properties observed within this soil are an organic rich transitional (ABt) horizon over a series of argillic Bt subsurface soil horizons that contain very few moderately thick and common fine clay films on ped faces and common moderately thick coating clasts. This soil horizon is slightly hard to hard with weak sub angular and angular blocky structure. This deposit forms a scoured and clear contact with the underlying buried soil. A relative age estimate of 8 to 13 ka for the surface soil remnant in profile 1 was obtained by comparing the observed clay film development and soil development index values to the more mature soil profile Qt3 in the Ventura Basin soil chronosequence (Rockwell, 1988) and the less mature soil profile S-4 in the Mission Creek soil chronosequence (McFadden, 1988).

Buried soil 1 is classified as a truncated Haploxeralf. The horizonation is characterized by a 2Btb argillic horizon. This deposit is well stratified and fine- to medium-grained. Diagnostic properties observed within this soil's argillic Bt subsurface horizon contains common fine clay films on ped faces and common moderately thick coating clasts. This soil has weak to moderately strong sub angular and angular blocky structure. A relative age estimate of 8 to 13 ka for buried soil 1 in soil profile 1 was obtained by comparing the observed clay film development and soil development index values to the more mature soil profile Qt3 in the Ventura Basin soil chronosequence (Rockwell, 1988). and the less mature soil profile S-4 in the Mission Creek soil chronosequence (McFadden, 1988).

Buried soil 2 is classified as a truncated Paleoxeralf. The horizonation is characterized by a mature 3Btb argillic horizon. This deposit is massive to crudely stratified and coarse-grained. Diagnostic properties observed within this soil's argillic Bt subsurface horizon contains common fine and few moderately thick clay films on ped faces and common moderately thick coating clasts. This soil has moderately strong sub angular and angular blocky structure. A relative age estimate of 13 to 30 ka for buried soil 2 in soil profile 1 was obtained by comparing the observed clay film development and soil development index values to the more mature soil profile Qt5a in the Ventura Basin soil chronosequence (Rockwell, 1988) and the less mature soil profile S-4 in the Mission Creek soil chronosequence (McFadden, 1988).

Buried soil 3 is classified as a truncated Inceptisol. The horizonation is characterized by a remnant residual 4Crb weathered bedrock horizon. This deposit is massive and medium- to coarse-grained. Diagnostic properties observed within this soil's residual C basal soil horizon contains very fine clay films on ped faces. This soil has a massive structure. A relative age estimate of 4 to 8 ka for buried soil 3 in soil profile 1 was obtained by comparing the observed clay film development and soil development index values to the more mature soil profile S-4 in the Mission Creek soil chronosequence (McFadden, 1988) and the less mature soil profile Qt3 in the Ventura Basin soil chronosequence (Rockwell, 1988).

In conclusion, the entire stratigraphic section for soil profile 1 is estimated to be 33 to 64 ka. Most of this age resides within the lowest (or buried) soil in this exposure. The materials described in this test pit exposure for soil profile 1 appear similar to the materials exposed across the trench exposure.

TABLE 1.1 Soil Profile – 1, Trench T-2, Station 4 feet.

Fault Rupture Hazard Study at 6650 Franklin Avenue, City of Los Angeles, California.

Soil Classification: Series of stacked and truncated Alfisols
Geomorphic Surface: Alluvial / Colluvial Apron
Parent Material: Santa Monica Range Front Alluvium
Vegetation: Urban
Described By: John Helms
Date Described: 12/10/15
Exposure Type: Trench Exposure

Horizon	Depth (ft.)	Thickness (ft.)	Description of T-2, Sta. 4 ft.
Af	0 – 1.9	1.9	Artificial Fill – Dark Brown, loam, coarse-grained with construction debris and buried footing, abrupt smooth lower boundary to;
AB / Bt1	1.9 – 3.7	1.8	Yellowish brown (10YR 5/4 d; 10YR 4/3 m); clay loam to loam; massive to weak medium and coarse sub angular blocky; slightly hard, firm, moderately sticky, moderately to very plastic; dark yellowish brown (10YR 4/4 d; 10YR 3/3 m) clay and humus films few to common thin and very few moderately thick on ped faces, few to common thin common fine coating clasts; slight organics, slightly oxidized, fine-grained well sorted sand; 0 - 5% fine sub rounded gravel; few to common fine and medium pores, no roots, dry; massive truncated transitional to argillic horizon; gradational wavy lower boundary to:
Bt2	3.7 – 5.4	1.7	Brown (7.5YR 4/4 d; 7.5YR 3/3 m); clay loam; moderately strong fine and medium angular blocky; hard, firm, moderately to very sticky, very plastic; dark brown (7.5YR 3/3 d; 7.5YR 2.5/2 m) clay films common thin and few moderately thick on ped faces, common few thin coating clasts, and common few thin lining pores; trace organics, slightly well oxidized, fine-grained well sorted sand; 0 - 5% fine sub rounded sandstone gravel; no roots, few fine and medium pores, dry to slightly moist; sub soil argillic horizon, massive scour deposit; gradational wavy lower boundary to:

Horizon	Depth (ft.)	Thickness (ft.)	Description of T-2, Sta. 4 ft. (Cont.)
Bt3	5.4 – 7.4	2.0	Brown (7.5YR 4/3 d; 7.5YR 3/3 m); sandy loam to loam; weak to moderately strong fine and medium sub angular blocky; slightly hard, friable, moderately to slightly sticky, slightly plastic; brown (7.5YR 4/3d; 7.5YR 2.5/3 m) clay films few thin on ped faces, and few thin coating clasts; slightly well oxidized, fine to medium-grained moderately well sorted sand; 5 - 10% fine and medium sub rounded and sub angular highly weathered sandstone gravel; no roots, no pores, slightly moist; massive, sub soil argillic horizon, scour deposit; clear smooth lower boundary to:
2Bt1b / 2BCb1	7.4 – 8.9	1.5	Brown (7.5YR 4/4 d; 7.5YR 3/3 m); clay loam to loam; weak to moderately strong fine and medium angular blocky; hard, friable, moderately to very sticky, very plastic; slightly well oxidized, medium-grained moderately well sorted sand; 10 - 15% fine and medium rounded gravel; dark brown (7.5YR 3/4 d; 7.5YR 3/2 m) clay films common thin on ped faces and common moderately thick coating clasts; no roots, no pores, slightly moist; truncated transitional or sub surface argillic horizon, crudely stratified stacked scour / sheet wash deposit, gradational wavy lower boundary to:
2Bt2b / 2BCb2	8.9 – 10.0	1.1	Strong brown (7.5YR 5/4 d; 7.5YR 4/3 m); sandy loam to loam; massive to weak fine sub angular blocky; soft to slightly hard, friable, slightly sticky, slightly plastic; moderately well oxidized, medium-grained moderately well sorted sand; 10 - 25% fine and medium sub rounded and rounded gravel; brown (7.5YR 4/3d; 7.5YR 2.5/3 m) clay films few thin on ped faces, and few thin coating clasts; no roots, no pores, slightly moist; transitional or sub surface argillic horizon, well stratified fining upwards scour deposit, abrupt wavy lower boundary to:

Horizon	Depth (ft.)	Thickness (ft.)	Description of T-2, Sta. 4 ft. (Cont.)
3Btb1	10.0 – 12.9	2.9	Strong brown (7.5YR 5/6 d; 7.5YR 4/4 m); clay loam; moderately strong medium and coarse angular blocky; hard, firm, very sticky, very plastic; brown (7.5YR 4/3 d; 7.5YR 3/2 m) clay films common thin, few moderately thick, and very few thick on ped faces, and common moderately thick coating clasts; moderately well oxidized, medium-grained moderately well sorted sand; 5 - 10% fine and medium sub rounded and sub angular highly weathered sandstone gravel; no roots, few fine pores, slightly moist; truncated argillic horizon, massive colluvial deposit; gradational wavy lower boundary to:
3Btb2 / 3BCb1	12.9 – 14.2	1.3	Brown (7.5YR 5/4 d; 7.5YR 4/3 m); sandy loam; single grained to weak medium and coarse sub angular blocky; hard, friable, slightly to moderately sticky, slightly plastic; brown (7.5YR 4/3 d; 7.5YR 3/2 m) clay films common thin, few moderately thick, on ped faces, and few moderately thick coating clasts; moderately well oxidized, MnO webbing on ped faces, fine to medium-grained moderately well sorted sand; 25 - 50% fine, medium, and coarse sub angular highly weathered sandstone gravel; no roots, no pores, moist; transitional to sub soil argillic horizon, base of massive colluvial deposit; gradational clear irregular lower boundary to:
4Crb	14.2 – 16.2+	2.0+	Grayish brown (10YR 5/2 d; 10YR 3/1 m); Topanga Formation sandstone bedrock; highly weathered, moderate rock strength, massive to blocky rock structure, crudely bedded, completely fractured, fractures are tight to slightly open, stepped, randomly orientated, and closely spaced, moist; breaks to loamy sand; single grained; hard, friable, slightly to non-sticky, non-plastic; localized moderately well oxidized beds, medium-grained moderately well sorted sand; 0 - 3% fine rounded gravel; no roots, no pores; undetermined lower boundary.

TABLE 1.2 - Soil Development Index Calculation Sheet
Soil Profile - 1, Trench Exposure

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, po*	*X/6*	*0*	*X/15*		
Profile 1																	
ABt1	1.8	10YR 5/4	0.3	10YR 4/3	0	l-cl	0.58	1 sbk	0.33	sh	0.33	s, p-vp	0.75	1-2fpf, v1mkpf, 2fcl	0.47	0.39	0.71
Bt2	1.7	7.5YR 4/4	0.4	7.5YR 3/3	0.1	cl	0.67	2 abk	0.67	h	0.6	s-vs, vp	0.92	1mkpf, 2fpf, 1dpo, 1dcl	0.63	0.57	0.97
Bt3	2	7.5YR 4/3	0.3	7.5YR 3/3	0.1	sl-l	0.42	1 sbk	0.33	sh	0.33	ss-s, ps	0.42	1fpf, 1fcl	0.32	0.32	0.63
2Bt1b / 2BC1b	1.5	7.5YR 4/4	0.4	7.5YR 3/3	0.1	l-cl	0.58	1-2 abk	0.58	h	0.6	s-vs, vp	0.92	2fpf, 2dcl	0.43	0.52	0.77
2Bt2b / 2BC2b	1.1	7.5YR 5/4	0.4	7.5YR 4/3	0.1	sl-l	0.42	1 sbk	0.33	so-sh	0.25	ss, ps	0.33	v1-1fpf	0.18	0.29	0.32
3Bt1b	2.9	7.5YR 5/6	0.6	7.5YR 4/4	0.2	cl	0.67	2 abk	0.67	h	0.6	vs, vp	1.00	2fpf, 1dpf, 2dcl	0.63	0.62	1.81
3Bt2b/ 3BCb	1.3	7.5YR 5/4	0.4	7.5YR 4/3	0.1	l	0.5	1 sbk	0.33	h	0.6	s-ss, ps	0.42	2fpf, v1dpf, 2dcl	0.48	0.40	0.53
4Crb	2	10YR 5/2	0.3	10YR 3/1	0	ls	0.17	m	0.00	h	0.6	ss, po	0.17		0	0.18	0.35

INDEX VALUES AND ESTIMATED AGES (ka)

Soil Member	MHI	Mean Soil Index	SDI @ 7 feet	Color Index	Clay Film Index	Soil Age Estimate ka	Section Age Estimate ka	Stratigraphic Unit
Surface Soil	**0.57**	**2.31**	**2.94**	**1.2**	**1.42**	**8 - 13**	**8 - 13**	**Qc**
Buried Soil 1	**0.52**	**1.09**	**2.94**	**1**	**0.61**	**8 - 13**	**16 - 26**	**Qoa1**
Buried Soil 2	**0.62**	**2.34**	**3.89**	**1.3**	**1.11**	**13 - 30**	**29 - 56**	**Qoc1**
Buried Soil 3	**0.18**	**0.35**	**1.24**	**0.3**	**0.00**	**4 - 8**	**33 - 64**	**Tt**

Table 2. Soil Surface Relative-Age Estimates

Summary Table

Profile Number	Soil Member	MHI Value	SDI Value	Clay Film	Age (ka)
1	Surface Soil	0.57	2.94	1.42	**8 - 13**
	Buried Soil 1	0.52	2.94	0.61	**16 - 26**
	Buried Soil 2	0.62	3.89	1.11	**29 - 56**
	Buried Soil 3	0.18	1.24	0	**33 - 64**

Table 3. 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
S1 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 4. Soil Field Description Abbreviation Key

Texture		Structure		Consistence						Clay Films		Calcium Carbonate	
				Dry		Moist		Wet				(Pedogenic CaCO3)	
S	- sand	m	- massive	l	- loose	vfr	-very friable	so	non stickey	v1	veryfew	sl dis	slightly dissemenated
LS	- loamy 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 5. Stratigraphic Unit Correlation

Strat. Unit	Locality	Deposit Type	Age (ka)
Qal	BA4 - BA6	Surficial channel or sheet flow deposit	< 8.0 - 13.0
Qc	FT-2	Surficial alluvial apron deposit	8.0 - 13.0
Qoa1	FT-2	Buried channel or sheet flow deposit	16.0 - 26.0
Qoc1	FT-2	Buried alluvial apron deposit	29.0 - 56.0
Qoa2	BA4 - BA6	Buried channel or sheet flow deposit	> 29.0 - 56.0
Qoc2	BA4 - BA6	Buried alluvial apron deposit	> 29.0 - 56.0
Qoc3	BA4 - BA6	Buried alluvial apron deposit	> 29.0 - 56.0
Qoc4	BA4 - BA6	Buried alluvial apron deposit	> 29.0 - 56.0
Qoa3	BA4 - BA6	Buried alluvial fan remnant	~ 150.0

CONCLUSIONS

The soils observed across the study area are alfisols that have developed in alluvial environments. The soil profile described consists of a series of stacked, truncated, and buried soil horizons. The soil profile appears laterally continuous across the project site area area. In this sedimentological environment surfaces that have been stable long enough to form a 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 soil relative age estimates given 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 should be utilized as minimum ages.

The truncated and buried soil with an argillic sub surface soil horizon is moderately well developed. The buried alfisol soil typically has 7.5YR colors with a moderate amount of secondary (pedogenic) clay. Structure is typically moderately strong angular blocky and hard. Clay films are moderately abundant and moderately thick.

The soils exposed in the trench ST-2 exposure are Late Pleistocene in age. The stacked soils display soil horizons that have moderately strong argillic horizon development. The stratigraphic section for profile 1 is estimated to be 33 to 64 ka. Most of this age resides within the second buried soil in this exposure.

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 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 Feffer Geological Consulting, Inc. and applies only to the Fault Rupture Hazard Study located at 6650 Franklin Avenue. In the event that significant changes in the interpretations of this study are 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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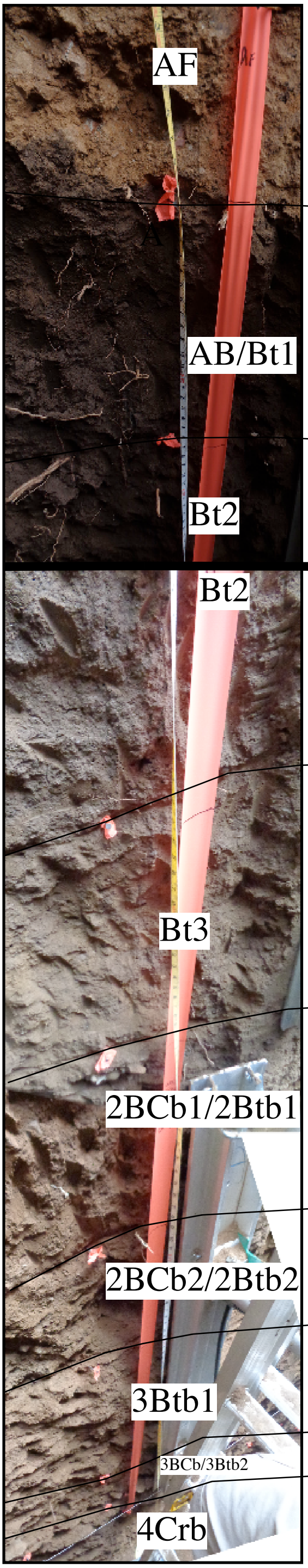
Soil Profile 1, Trench ST-2, Station 4 feet



Soil Classifications (Stratigraphic Unit)

Artificial Fill
Af

Haploxeralf
Qc

Haploxeralf
Qoa1

Haploxeralf
Qoc1

Bedrock
Tt