Appendix E:
Geology and Soils Geotechnical Supporting Information

E.1 - Updated Preliminary Geotechnical and Geologic Report

CORNERSTONE
EARTH GROUP

TYPE OF SERVICES	Updated Preliminary Geotechnical & Geologic Report
PROJECT NAME	Lester-Shriner Property Residential Development
LOCATION	Dublin Canyon Road Pleasanton, California
CLIENT	Ponderosa Homes
PROJECT NUMBER	132-8-2
DATE	March 31, 2020

CORNERSTONE
EARTH GROUP

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Project Name	**Lester-Shriner Property Residential Development**
Location	**Dublin Canyon Road** **Pleasanton, California**
Client	**Ponderosa Homes**
Client Address	**6130 Stoneridge Mall Road, Suite 185** **Pleasanton, CA**
Project Number	**132-8-2**
Date	**March 31, 2020**

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Type of Services	**Updated Preliminary Geotechnical & Geologic Report**
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SECTION 1: INTRODUCTION

This updated preliminary geotechnical and geologic report was prepared for the sole use of Ponderosa Homes for the Lester-Shriner Property Residential Development in Pleasanton, California. The purpose of this study was to review and investigate the existing subsurface conditions and develop an opinion regarding potential geotechnical concerns that could impact the proposed development. The preliminary geotechnical recommendations contained in this report are for your forward planning, cost estimating, and preliminary project design. For our use, we were provided with the following documents:

- A report titled "Preliminary Geotechnical and Geologic Investigation, Lester Property Residential Development, Pleasanton, CA," prepared by Lowney Associates dated March 4, 1998.
- Plan sheets titled, "Slope Analysis and Grading Plan, Hidden Canyon (Lester Property), Pleasanton, CA, Sheets TM7-TM8" prepared by Ruggeri Jensen Azar & Associates dated June 13, 2019.
- A site plan titled, "Overall Boundary Exhibit, Lester Property, Pleasanton, CA," prepared by Ruggeri Jensen Azar & Associates dated March 13, 2014.

1.1 PROJECT DESCRIPTION

The project site consists of two parcels located near the northwestern portion of the City of Pleasanton, just south of the intersection of Dublin Canyon Road and Canyon Creek Circle. The eastern portion of the Lester parcel is included in the development plan. The Shriner parcel, which is located just north of the Lester parcel, is also included in the development plan. The parcels have rolling hillside topography. The Shriner parcel is bordered by Dublin Canyon Road to the north; the Lester parcel is flanked by Devaney Creek to the south. The Lester site is currently undeveloped and has been used for cattle grazing. The Shriner parcel has a remnant barn structure that has fallen down. We understand that a residential development is currently planned for the site.

The preliminary land plan prepared by RJA dated June 13, 2019, indicates the planned development will include up to 30 single-family homes. Appurtenant streets, utilities, landscaping and other improvements necessary for site development are also likely planned. We assume residential structures will be of wood-frame construction with concrete mat foundations. The land plan indicates grading will consist of cuts and fills up to about 25 to 30 feet deep. The primary site entrance will be near the west end of the site off of Dublin Canyon Road. We understand that two residential lots (Lots 29 and 30) will be located on the east side of Devaney Creek that will have a separate entrance from Dublin Canyon Road.

1.2 SCOPE OF SERVICES

Our scope of services was presented in our proposals dated March 14, 2014, August 19, 2014, September 22, 2014 and February 26, 2020, and consisted of reviewing available subsurface soil data, reviewing available published geologic and seismic hazard maps of the area, a site geologic reconnaissance, supplemental exploratory test pits and borings, preliminary engineering analysis to evaluate grading, building foundations and pavements, and preparation of this preliminary report. A brief description of the prior and recent site exploration is presented below.

1.3 PREVIOUS EXPLORATION PROGRAM

A preliminary field exploration was performed in 1997 by Lowney Associates that consisted of 19 exploratory test pits (TP-1 to TP-19) excavated to depths ranging from approximately 3 to 18 feet. Thirteen of the 19 test pits were located within the currently proposed development area (Lester parcel). The previous investigation also included performing four seismic refraction survey lines ranging from about 165 to 220 feet long. Only one of the refraction survey lines (L1) was within the currently proposed development area.

The approximate locations of the previous test pits and seismic refraction survey lines are shown on the Site Topographic & Preliminary Geologic Map, Figure 2. Logs of the previous test pits are included in Appendix A.

1.4 RECENT EXPLORATION PROGRAM

A supplemental field exploration was performed on the Shriner parcel that consisted of eight exploratory test pits (TP-1 to TP-8) excavated on August 30, 2014, to depths ranging from approximately 5 to 15 feet. Two supplemental borings were also performed on the western end of the Shriner parcel on October 7, 2014, to depths ranging from approximately 25 to 31 feet. Practical refusal was encountered in Boring EB-1 at a depth of 31 feet due to very hard bedrock. The test pits were excavated with four-wheel drive, rubber-tired backhoe equipment; the borings were drilled with track-mounted hollow stem auger drilling equipment that was equipped with a 5-foot-long dry-core sampling device.

The approximate locations of the recent test pits and borings are also shown on the Site Topographic & Preliminary Geologic Map, Figure 2. Logs of the recent explorations are included in Appendix A.

1.5 ENVIRONMENTAL SERVICES

Cornerstone Earth Group also provided environmental services for this project, including a Phase 1 site assessment; environmental findings and conclusions are provided under separate cover.

SECTION 2: REGIONAL SETTING

2.1 GEOLOGICAL SETTING

The site is located in the western Diablo Range of the Coast Ranges structural and geomorphic province of California. This represents one mountain range in a series of northwesterly-aligned mountains forming the Coast Ranges geomorphic province of California that stretches from the Oregon border nearly to Point Conception. In the San Francisco Bay area, most of the Coast Ranges have developed on a basement of tectonically mixed Cretaceous- and Jurassic-age (70- to 200-million years old) rocks of the Franciscan Complex. Locally younger sedimentary and volcanic rocks cap these basement rocks. Still younger surficial deposits that reflect geologic conditions for the last million years or so cover most of the Coast Ranges.

Rocks of two main basement complexes juxtaposed by major regional faults are exposed in the East Bay hills and Diablo Range. These are the Franciscan Assemblage and the Coast Range Ophiolite. The basement complexes are unconformably overlain by Mesozoic and Cenozoic sedimentary and volcanic rocks. These two Mesozoic basement complexes are the Franciscan Complex and the Great Valley Complex (Graymer, 2000). The ophiolite rocks are the remnants of arc-related oceanic crust. The Great Valley Sequence is composed of turbidutes (sandstone, conglomerate and shale) of Jurassic and Cretaceous age that were deposited on top of the crustal rocks. A sequence of unnamed Cretaceous rocks (Ks) that consists of sandstone with siltstone and shale is also exposed in steep portions of the East Bay Hills both north and south of Niles Canyon (Graymer et al., 1996). Tertiary rocks in the map area include Paleocene to Miocene marine sedimentary rocks that unconformably overlie the Mesozoic basement rocks (Graymer and others, 1996).

Bedding in Cretaceous and Tertiary geologic units in the map area is generally steep and locally overturned, attesting to the considerable tectonic deformation that has taken place. Several northwest-southeast trending synclines have been mapped in the hills between the Hayward Fault and the Calaveras Fault (Graymer et al, 1996).

Published geologic maps indicate the site is in an area dominated by a northwest trending band of tertiary age marine sedimentary units (Dibblee, 1980; Dibblee 2005,) that have been faulted and folded by regional forces. A portion of the Dibblee and Minch map of 2005 is reproduced in as Figure 3. Dibblee shows northwest trending synclines and anticlines located on the north side of Highway 580. The geologic units mapped as trending through the site include the following: an unnamed Miocene siltstone and clay shale (Tmc), the Miocene Clairmont Shale member of the Monterey Formation (Tm), an unnamed Miocene sandstone (Tms) and an unnamed Cretaceous sandstone (Kp). Locally overlying these geologic formations within low lying areas and the valley bottom are Quaternary Alluvium (Qa).

The following unit descriptions are from Dibblee and Minch, (2005). The Tmc unit is described as “Clay shale and siltstone, gray, vaguely to moderately bedded, includes fine grained sandy facies.” The Clairmont Shale (Tm) is described as “Siliceous shale, white-weathered, thin bedded, platy, porcallenous to cherty, brittle.” The Tms unit is described as “Sobrante Sandstone: local lens at base of the Tmc Clairmont Shale member which is similar to the Briones Sandstone.”

2.2 REGIONAL SEISMICITY

The San Francisco Bay area is one of the most seismically active areas in the Country. While seismologists cannot predict earthquake events, the U.S. Geological Survey’s Working Group on California Earthquake Probabilities 2007 estimates there is a 63 percent chance of at least one magnitude 6.7 or greater earthquake occurring in the Bay Area region between 2007 and 2036. As seen with damage in San Francisco and Oakland due to the 1989 Loma Prieta earthquake that was centered about 50 miles south of San Francisco, significant damage can occur at considerable distances. Higher levels of shaking and damage would be expected for earthquakes occurring at closer distances.

The two major active strike-slip faults in the study area are the Hayward Fault, located west of the site, and the Calaveras Fault, located approximately 3,800 feet east of the site. Other significant faults in the study area include the Pleasanton Fault and the Verona Fault. These faults, as well as several other faults that juxtapose Cretaceous and Tertiary age geologic units in the East Bay Hills, appear to have a compressional component of slip. Neither of these faults is included in an Alquist-Priolo Earthquake Fault Zone Map for the Dublin Quadrangle (CDMG, 1982)

More locally, the Dublin Fault trends southerly through the hills located north of Highway 580 but the map by Dibblee (1980) and Dibblee and Minch (2005) show it as terminating within Tertiary geologic units located just on the north side of Hwy 580. Our review of historical aerial photography (see references) confirms a general alignment of drainages and topographic saddles along the mapped surface trace of this fault. Crane (1988) shows an unnamed “detachment fault” projecting through the far southwest corner of the site from the southeast but he depicts it terminated near (south of) the south property line. The earlier site investigation on the adjacent Lester property mistakenly projected this detachment fault through the site with a northwesterly trend. This fault truncates some but not all of the Tertiary age units southeast of the site but does not offset and Quaternary age geologic units and therefore is a Pre-Quaternary fault and not active. During our recent updated site reconnaissance, we noted a zone of deformation within the Tertiary geologic units located just east of the Crane fault projection within the creek channel. This zone of deformation may represent a subsidiary fault.

The faults considered capable of generating significant earthquakes are generally associated with the well-defined areas of crustal movement, which trend northwesterly. The table below presents the State-considered active faults within 25 kilometers of the site.

Table 1: Approximate Fault Distances

Fault Name	Approximate Distance	
	(miles)	(kilometers)
Calaveras	0.7	1.5
Hayward (Total Length)	6.2	10.0
Greenville	12.2	19.7
Concord-Green Valley	13.3	21.5

A regional fault map is presented as Figure 4, illustrating the relative distances of the site to significant fault zones.

SECTION 3: SITE CONDITIONS

3.1 SURFACE DESCRIPTION

The site consists of two parcels currently referred to as the Lester parcel and the Shriner parcel. Both adjoining parcels are located south of Dublin Canyon Road and west of Foothill Road. The eastern approximately 22 acres of the Lester parcel and the entire Shriner parcel are being considered for residential development. The site is bordered by mostly undeveloped parcels to the south, east and west. A Jehovah’s Witness Church borders the northeast corner of the site and residential development is located just north of Dublin Canyon Road.

Current topographic information indicates the site has approximately 208 feet of topographic relief from the northwest to the southeast. Existing site grades range from approximately Elevation 650 feet at the western edge of the Lester parcel to approximately Elevation 442 feet near the northeastern corner of the site (datum unknown). The prominent topographic features on the site are two saddle ridges along the northern site boundary of the Lester parcel (approximately Elevation 610 and 600 feet). Most of the Lester parcel slopes downward toward Devaney Canyon and the seasonal creek that flows towards the northeast along the southern site boundary. The Shriner parcel is located on the north side of the saddle ridges and drains primarily to the north towards Dublin Canyon Road.

Generally, existing hillsides are moderately steep to steep with slopes ranging from 5:1 to 2½:1 (horizontal:vertical). Devaney Creek has side slopes that vary from relatively flat terraces to approximately 2:1. The creek is surrounded by a dense riparian canopy of large trees and bushes. We observed locally steepened stream banks that were near vertical due to erosion and minor slumping. At least three minor drainage swales with locally eroded side slopes appear to flow into the stream from the northwest. The northwest corner of the site drains into a broad ravine that slopes to the north towards the Shriner parcel.

The Shriner parcel is comprised of north-facing slopes that range from about 4:1 to 2:1. The western half of the parcel’s slopes are moderately steep and are traversed by two broad drainage swales that sheet flow towards Dublin Canyon Road. The northeastern portion of the Shriner parcel is moderate to steeply sloped and covered with dense trees and brush. The toe of the slope daylights adjacent to Dublin Canyon Road and is buttressed by a retaining wall immediately adjacent to the road.

At the time of our recent site reconnaissance, the site was used for cattle grazing and covered with low grass and weeds. Several mature Oak trees were scattered across the site. The northeast corner of the site that is located east of the creek is relatively flat and occupied by two residential structures and several associated barns, sheds, vehicles and miscellaneous fences, gravel driveways and landscaping around the houses. A former barn structure was observed on the Shriner parcel that has collapsed. We also observed an approximately 18-inch diameter by 8-foot deep cistern behind the former barn that appears to have been used to collect water for cattle grazing.

3.2 SITE GEOLOGY

A summary of the regional geologic setting was discussed in the “Regional Setting” section of this report. We have adopted the nomenclature of Dibblee, (1980) in assigning geologic unit names for our characterization of the site (see also Dibblee and Minch, 2005). Lowney Associates previously conducted a preliminary geologic and geotechnical investigation of the Lester property, the results of which were published in their report of March 1998. As part of their investigation, they excavated and logged nineteen test pits on the site. While no graphic test pit logs were provided within the report, they did indicate (in table form) the thickness of earth materials at the excavations as well as descriptions of the earth materials encountered within the report. The previous test pits on the Lester Property encountered surficial colluvium varying from typically 2 to 11 feet thick overlying a variety of sedimentary units including; sandstone and lesser occurrences of interbedded sandstone with shale as well as minor claystone. No bedrock structural information was documented in their table or depicted on the site geologic map. A seismic refraction survey was conducted on portions of the site in order to determine rippability of the geologic units. They concluded the rock was rippable with a Catepillar D-9N with Single Shank No. 10 rippers.

During our reconnaissance of both parcels in 2014 we observed colluvium and residual soil overlying sedimentary bedrock (Tm and Tmc). The colluvium tends to accumulate within swales and coalesces with alluvial terrace deposits in the lower portions of slopes, or in the nearly level basins between hillsides. Where exposed in cuts and deep erosion scars the colluvium consists of very dark gray brown sandy clay and fat clay with sand. We did not observe evidence of past disturbance or grading and therefore have not identified any fills at the site. Alluvial terrace deposits were observed in the creek bank exposures along the path of Devaney Creek. These deposits consist of horizontally stratified gravels and sands. The gravels tend to be somewhat flattened and the deposits very dense and form nearly vertical to vertical slopes. We observed sandstone and shale at various parts of the site at the ground surface and in particular within the creek bank exposures. The sandstone was either massive cemented and resistant to erosion (blocky outcrops at the ground surface), or medium bedded and weakly cemented (within the creek channel). Our field measured bedding attitudes suggest there may be a dip-slope geometry within the bedrock along the southern flank of the ridges in the western portion of the property. Variations in bedrock bedding orientations within the Devaney Creek suggests may be associated with the mapped detachment fault that was mapped by Crane (1988). A zone of convoluted bedding and tight folding within the Tertiary bedrock was also noted within the Devaney Creek channel approximately 130 feet east of the mapped projection of the mapped fault of Crane. This secondary zone of deformation may represent a subsidiary fault. These faults do not cut geology formations younger than Quaternary, and therefore, are not considered a hazard for fault surface rupture (see Section 4). Additionally, localized folding of the geologic units is apparent at a cut slope exposure and at our B-2 boring location within the Shriners parcel. Previously mapped small scale landslides (of Lowney, 1998) were also observed in our current site reconnaissance of the Lester Property and have led to our conclusion that these areas represent areas of rapid (seasonal) creep of the colluvial deposits rather than mobilized landslides (see Section 4).

3.3 SOIL AND BEDROCK CONDITIONS

As discussed, the site is generally blanketed with residual soil and colluvium consisting of medium stiff to stiff lean to fat clay with varying amounts of sand and gravel. The 1998 Lowney investigation on the Lester parcel indicates the surficial colluvium was approximately ½ to 2 feet thick near the tops of ridges, and generally increased to approximately 5 to 11 feet thick within the saddles and localized drainage swales. More recently (2014) we conducted six test pits and two exploratory borings on the Shriners parcel. The test pits extended to depths ranging from 6.5 feet to 14 feet below the nearest adjacent ground surface. The borings extended to depths that ranged from approximately 25 feet to 31 feet. On the Shriner parcel, the surficial colluvium and residual soil ranged from approximately 1 to 6 feet thick on ridges and slopes, and increased to as much as 13 feet in drainage swales. At the northern edge of the Shriner parcel, the colluvium was approximately 6 feet thick and underlain by older alluvial soil consisting of very stiff sandy lean clay. Our explorations encountered the Tm unit (generally described as siliceous shale) within the northeastern portion of both parcels, and the Tmc unit (generally described as clay shale and siltstone) in the central portion of the Lester parcel and in the southwestern portion of the Shriners parcel.

Previous Plasticity Index (PI) tests performed on two samples of these surficial clays at a depths ranging from 1 to 3 feet resulted in PI’s of 28 and 53, indicating moderate to very high plasticity and expansion potential.

On the Lester parcel, the colluvium was reportedly (Lowney, 1998) underlain by bedrock which varied somewhat from the more general descriptions on the regional geologic map by Dibblee (1980, 2005). The bedrock consisted of interbedded sandstone, siltstone, and shale to the maximum depth previously explored at 18 feet. In general, the bedrock was reported by Lowney (1998) to be highly weathered, soft to moderately hard, friable, and intensely to moderately fractured. On the adjacent Shriner parcel, colluvium was also underlain by silty sandstone and claystone in the northeast portion and by interbedded sandstone, siltstone and minor claystone in the southwestern portion of the parcel. All of the bedrock units were weak in terms of rock strength, pervasively fractured with close spacing and severely weathered.

Our exploratory borings conducted in 2014 within the western portion of the Shriner property included continuous dry coring in order to determine if a landslide existed in this area as mapped by Majmundar (1996). At these boring locations the bedrock (interbedded siltstone, sandstone and minor claystone) was typically thin bedded to laminated, weak in terms of rock strength and severely weathered. Drilling resistance increased steadily through the subsurface profile. Bedding orientations varied within the bedrock because of regional and localized folding in the area. This folding was also observed at a nearby cut exposure of siltstone. Dips ranged from moderate to the southwest to locally gently dipping toward the north. We did not encounter evidence of shearing or clay seams, soft zones or other evidence suggestive of landsliding. We conclude that the interpretation by Majmundar (1996) of a large landslide extending into the western portion of the Shriners parcel is incorrect.

A more detailed description of the subsurface conditions is presented on the exploration logs in Appendix A.

3.4 GROUND WATER

Free ground water was not encountered in the previous test pits (Lowney Associates, 1998) or in our recent explorations. Perched ground water adjacent to the existing creek will likely be encountered, particularly during the rainy season. Our recent reconnaissance and experience in the area indicates that seeps and springs may be encountered within cuts in the bedrock and in topographic swale areas.

Fluctuations in ground water levels occur due to many factors including seasonal fluctuation, underground drainage patterns, regional fluctuations, and other factors.

SECTION 4: GEOLOGIC HAZARDS

4.1 FAULT SURFACE RUPTURE

As discussed above, several significant faults are located within 25 kilometers of the site. The site is not located within a State-designated Alquist-Priolo Earthquake Fault Zone. Our research, site reconnaissance, and limited field exploration has indicated no known surface traces of any Quaternary-active faults are thought to cross the site; therefore, fault surface rupture hazard is not a significant geologic hazard at the site.

4.2 ESTIMATED GROUND SHAKING

Moderate to severe (design-level) earthquakes can cause strong ground shaking, which is the case for most sites within the Bay Area. A site modified peak ground acceleration (PGA_M) was determined in accordance with Section 21.5 of ASCE 7-16. Therefore, we recommend a site-specific peak ground acceleration, PGA_M, of 0.99g for this project.

4.3 LIQUEFACTION POTENTIAL

The southern portion of the site flanking the existing creek channel is located within a State-designated Liquefaction Hazard Zone (CGS, Dublin Quadrangle, 2008). During strong seismic shaking, cyclically induced stresses can cause increased pore pressures within the soil matrix that can result in liquefaction triggering, soil softening due to shear stress loss, potentially significant ground deformation due to settlement within sandy liquefiable layers as pore pressures dissipate, and/or flow failures in sloping ground or where open faces are present (lateral spreading) (NCEER 1998). Limited field and laboratory data is available regarding ground deformation due to settlement; however, in clean sand layers settlement on the order of 2 to 3 percent of the liquefied layer thickness can occur. Soils most susceptible to liquefaction are loose, non-cohesive soils that are saturated and are bedded with poor drainage, such as sand and silt layers bedded with a cohesive cap.

As discussed in the “Subsurface” section above, the proposed development area is blanketed by a thin layer of cohesive soils underlain by bedrock. The creek area is likely underlain by young alluvial soils consisting of sands, gravels, silts and clays. Based on the above, our screening of the site for liquefaction indicates a low potential for liquefaction in the main development area. For the two proposed residential lots being considered near the northwest corner of the site, liquefaction potential is considered moderate to high. Additional investigation and analysis should be performed during the design-level investigation.

4.4 LATERAL SPREADING

Lateral spreading is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water; typically lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. As failure tends to propagate as block failures, it is difficult to analyze and estimate where the first tension crack will form.

The site is bounded by a creek channel that is flanked by moderate to steep hillsides underlain by bedrock. As discussed, the creek channel likely has young alluvial sediments within the channel or at remnant terrace deposits that may be susceptible to lateral movement following strong ground shaking. Since bedrock is shallow on the adjacent hillsides, the potential for lateral spreading to impact the proposed development is considered low, with the exception of the proposed bridge crossing. Foundations in this area may need to be designed to tolerate impacts due to seismically-induced creek bank movement.

4.5 SEISMIC SETTLEMENT/UNSATURATED SAND SHAKING

Loose unsaturated sandy soils can settle during strong seismic shaking. As the soils previously encountered at the site were predominantly medium stiff to stiff clays underlain by bedrock, in our opinion, the potential for significant differential seismic settlement affecting the proposed improvements is low.

4.6 LANDSLIDING

Our review of published, regional scale landslide-themed maps indicates suspected small-scale landslides at the subject site; however, interpretations differ between the sources (Nilsen, 1975; Majmundar, 1996; Weigers 2010). It should be noted that subsequent to the issuance of our 2014 report, the California Geological Survey in 2016 made available an interactive mapping application (Landslide Inventory and Deep-Seated Landsliding Susceptibility) which compiles mapped landslides from several published sources. Our review of the CGS interactive map did not reveal any additional mapped landslides at the site other than what has already been mentioned through the map of Majmundar.

Majmundar (1996) depicts three suspected earthflows on sloping portions of the Lester parcel site, and a fourth, relatively large earthflow at and extending into the Shriners parcel and inferred to have moved in a northerly direction. These slides are mapped based on interpretation of aerial photos only and not site-specific information. The mapped slides on the Lester Parcel are small-scale and are characterized by Majmundar as involving surficial soil or colluvium and is not believed to involve bedrock. The Landslide Identification map of the Dublin

Quadrangle by Weigers (2010) is not in agreement with that of Majmundar in that it shows a single small, “young, dormant” landslide within the north central portion of the Lester parcel and no landslides within the Shriners parcel. The large landslide shown within the Shriner parcel by Majmundar is shown as extending into the alluvial flats at and beyond Dublin Canyon Road. However, there are no topographic features that would suggest a lobate landslide toe in that area.

The previous investigation by Lowney Associates (1998) shows four landslides on the south facing hillsides within the Lester parcel. These mapped landslides are characterized as earthflow/debris flows that are associated with colluvial-filled swales. Our observations and inferences made during our recent site reconnaissance suggests these features are not the result of slope movements but are the result of seasonal pervasive downhill creep of the surficial colluvial soils. These creeping areas are typically relatively small in size and are associated with colluvial filled swales as already mentioned. Figure 2 shows these features mapped during our aerial photo review and site reconnaissance. The identified creeping colluvial areas that are located nearest to the proposed building sites are generally small-scale, shallow and are not thought to involve bedrock. As for the large landslide mapped by Majmundar on the Shriners property, we performed two continuous dry coring explorations within this feature. Sample recovery was generally good (85 to 95%) and consistent in terms of down pressure during sampling. We did not encounter shear zones of clay gouge and although bedding orientations did vary, this variability is consistent with localized folding that was observed at exposures adjacent to the boring locations. Based on this information, it is likely that the topographic characteristics that led to this being mapped as a landslide on the map of Majmundar is more likely due to erosional processes.

The current development calls for cuts and the placement of fills at the site. The proposed cuts are oriented in a north-south trend and, based on the somewhat limited amount of bedrock structural information is known at the site, would probably not result in bedding planes dipping out of slope; however, local variations in the bedrock structure can be expected and may be encountered during the site grading (see “Conclusions” section). The future design-level investigation should further define this potential. While the global stability of natural slopes at the site appears relatively stable, cuts proposed at the site during future grading should be observed by an engineering geologist to determine if some of the bedrock discontinuities (i.e., bedding or jointing) have potentially unstable geometries and, therefore, of issue in terms of stability of finished slopes.

The State Seismic Hazard Zone map for the Dublin Quadrangle indicated localized areas on south-facing slopes at the site are located within an earthquake-induced landslide zone (CGS, 2008). Furthermore, Majmundar (1998) published a map indicating landslide susceptibility and indicates sloping portions of the site are designated within Zones 2 (marginally susceptible) and 3 (generally susceptible) with a minor portion located in Zone 4 (most susceptible). These designations are the result of interpretive mapping, the nature of the geologic formations and the inferred bedrock structure as extracted from regional scale published maps. Future design-level investigations at the site should include screening slope stability analyses performed in general accordance with state guidelines.

4.7 FLOODING

Based on our internet search of the Federal Emergency Management Agency (FEMA) flood map public database, the site is located within Zone X, determined to be outside the 0.2 percent annual chance floodplain. We recommend the project civil engineer be retained to confirm this information and verify the base flood elevation, if appropriate.

The Association of Bay Area Governments has compiled a database of Dam Failure Inundation Hazard Maps (ABAG, 1995). The generalized hazard maps were prepared by dam owners as required by the State Office of Emergency Services; they are intended for planning purposes only. Based on our review of these maps, the site is not located within a dam failure inundation area.

SECTION 5: CONCLUSIONS

5.1 SUMMARY

From a geotechnical and geologic viewpoint, the project is feasible provided the concerns listed below are addressed in the project design. The preliminary recommendations that follow are intended for conceptual planning and preliminary design. A design-level geotechnical investigation should be performed once site development plans are prepared indicating where proposed structures, retaining walls and cut slopes are planned. The design-level investigation findings will be used to confirm the preliminary recommendations and develop detailed recommendations for design and construction. Descriptions of each geotechnical concern with brief outlines of our preliminary recommendations follow the listed concerns.

- Differential settlement of proposed fills and cut/fill transitions
- Possible excavation difficulties in hard bedrock.
- The presence of moderately to highly expansive soils that mantle the hillsides
- Localized liquefaction potential near the existing creek

5.1.1 Differential Fill Settlement

The conceptual site plan indicates that fills up to about 30 feet thick are proposed on the southern edge of the development area. Foundations constructed over deep fills will be subject to long-term settlement. Even well-compacted fills may experience minor long-term settlements due to secondary strains or hydro-compression. Provided that the fills are placed and compacted in accordance with our recommendations, on a preliminary basis, we estimate that total long-term post-construction fill settlement would be less than approximately ½ percent of the fill thickness.

In addition, shallow foundations, such as reinforced or post-tensioned mats, constructed over cut/fill transitions may experience differential movements under static and seismic loading conditions. Therefore, to reduce the potential for differential movement beneath structures on these lots, we recommend that building pads on cut/fill transition lots be over-excavated to provide a more uniform cushion for shallow foundation support. In addition, lots with significant differential fill thickness should he over-excavated to provide a resulting differential fill thickness no greater than 10 feet and not exceeding a slope of 15 percent. Preliminary recommendations are presented in the "Earthwork" and "Foundations" sections of this report.

5.1.2 Bedrock Excavation

The conceptual site plan indicates that cuts up to approximately 30 feet are proposed near the western end of the development area. Therefore, bedrock will be encountered during mass grading and also during utility trench excavations in cut areas. Based on our review of geologic maps in the area, materials encountered in the previous and recent test pits and seismic refraction survey, conventional construction equipment should be capable of ripping and excavating the upper 15 to 20 feet of bedrock. Where fresh, competent bedrock is encountered below these depths, or in areas where resistant sandstone beds outcrop at the surface, then excavation with conventional grading equipment may be difficult. Our experience in the vicinity indicates that these resistant sandstone beds may require very heavy single-tooth ripping with a Caterpillar D10. Hydraulic jacking or light blasting may be necessary if hard rock areas are not rippable using conventional grading equipment. Preliminary recommendations for bedrock excavation and further discussion of rippability and reuse of materials are presented in the "Earthwork" section of this report.

5.1.3 Expansive Soils

Expansive soils and bedrock can undergo significant volume change with changes in moisture content. They shrink and harden when dried and expand and soften when wetted. If structures are underlain by expansive soils it is important that foundation systems be capable of tolerating or resisting any potentially damaging soil movements. In addition, it is important to limit moisture changes in the surficial soils by using positive drainage away from buildings as well as limiting landscaping watering. The moderately to highly expansive clays (colluvial soil) that mantle the hillsides are generally 2 to 11 feet thick based on the previous and recent test pits, although variations could occur.

Since significant cuts and fills are proposed, if feasible, we recommend that all expansive colluvial soil be buried in the deeper fills a minimum of 2 feet below finished grade, or be used to cover finished graded fill slopes to promote growth of the erosion control materials. Provided these recommendations are followed, in our opinion, the potential for moderately to highly expansive soils to impact foundations and pavements areas could be adequately mitigated. If expansive bedrock layers are encountered at or near the surface in foundation or pavement areas, these materials may need to be over-excavated to depths on the order of 2 to 3 feet and backfilled with non-expansive fill. We recommend that the final grading plans be reviewed, and that earthwork observation and testing be performed during construction to confirm that the native expansive materials are adequately buried and subdrains installed prior to placing engineered fill.

5.1.4 Potential for Liquefaction-Induced Settlements

As discussed, southeastern and northeastern portions of the site that lie within or near the creek area and near the existing residential structures at the northeastern corner of the site are located within a State-designated liquefaction hazard zone. Structures or improvements to be located within or adjacent to these areas may need to be designed to tolerate or resist potential liquefaction-induced settlement. This could involve supporting the new residential structures on more rigid mat foundations designed to tolerate increased total and differential settlement. Additional exploration and analysis should be performed during the design-level geotechnical investigation.

5.2 DESIGN-LEVEL GEOTECHNICAL INVESTIGATION

The preliminary recommendations contained in this preliminary report were based on limited site development information, review of previous subsurface information by others, our recent site reconnaissance and supplemental exploration, and our experience in the area with similar projects. As site conditions may vary significantly between the explorations previously performed by others, we also recommend that we be retained to 1) perform a design-level geotechnical investigation, once detailed site development plans are available; 2) to review the geotechnical aspects of the project structural, civil, and landscape plans and specifications, allowing sufficient time to provide the design team with any comments prior to issuing the plans for construction; and 3) be present to provide geotechnical observation and testing during earthwork and foundation construction.

SECTION 6: EARTHWORK

6.1 SITE DEMOLITION, CLEARING AND PREPARATION

In proposed fill areas, the site should be stripped of all surface vegetation, and surface and subsurface improvements within the proposed development area. Since the site will likely include a significant amount of cut material to be removed from the site, it may be feasible to leave most surface vegetation since it will likely be blended with significant quantities of the underlying soil and bedrock materials during off-hauling. Where necessary, vegetation and topsoil should be stripped to a sufficient depth to remove all material greater than 3 percent organic content by weight, unless material is to be reused in future landscaping areas.

6.2 COLLUVIUM OVER-EXCAVATION

As discussed in the “Conclusions” section, several areas of deeper colluvial soils have been encountered that will be susceptible to creep and potential slope instability. Although a significant portion of these weak materials will be excavated during mass grading for the site, the lower portions of the colluvial material could potentially creep or move downslope during the life of the project. Therefore, we recommend that colluvial material beneath proposed fills or extending beyond the limits of grading be over-excavated and replaced as an engineered fill buttress. If it is not feasible to over-excavate these materials, it may be necessary to stabilize the keyways with buried concrete stitch piers, subsurface drains and/or geosynthetic grids to reduce impacts from additional creep or downslope movement of the remainder of the landslide materials.

Additional analyses should be performed during the design-level investigation to further evaluate the need and extent of any additional colluvial soil mitigation measures. The actual lateral extent and depth of all colluvial soils should be determined in the field by the Geotechnical Engineer during grading.

6.3 REMOVAL OF EXISTING FILLS

While undocumented fills were not encountered in the previous explorations, artificial fills (including previous test pit backfill) encountered during site grading should be over-excavated and replaced as engineered fill. All fills should be completely removed from within building areas and to a lateral distance of at least 5 feet beyond the building footprint or to a lateral distance equal to fill depth below the perimeter footing, whichever is greater. Provided the fills meet the “Material for Fill” requirements below, the fills may be reused when backfilling the excavations. If materials are encountered that do not meet the requirements, such as debris, wood, trash, those materials should be screened out of the remaining material and not be reused. Backfill of excavations should be placed in lifts and compacted in accordance with the “Compaction” section below.

6.4 ROCK EXCAVATION

Based on the previous field exploration and our experience in the vicinity, in our opinion, the bedrock that underlies the site can likely be excavated with conventional construction equipment such as a Caterpillar D9 bulldozer. The excavation characteristics of the bedrock will be dependent on such properties as rock type, the degree of weathering, the orientations of bedding planes and joints, and the strength of properties of the material. The previous investigation recorded bedrock shear wave velocities during the seismic refraction survey that ranged from approximately 1,300 to 8,900 feet per second. The shear wave velocities indicate soft to moderate ripping is likely within the upper approximately 15 to 20 feet, while moderate to hard ripping is likely below 20 feet. The prior rippability assessment presented by Lowney Associates was reportedly based on information published in the Caterpillar Performance Handbook.

It should be noted that some resistant beds of sandstone may be encountered locally that will be very difficult to excavate with conventional equipment and may require the use of very heavy single-tooth ripping with a Caterpillar D10, or hydraulic jacking and hammering. We recommend that local grading contractors experienced in rock excavation methods be contacted to aid in determining the efficiency, time and costs associated with the proposed cuts. It should be noted that seismic refraction survey is considered to have an accuracy range of plus or minus 20 percent. Seismic layers do not always correspond directly to lithology changes that might be found in boreholes or trenching data.

Care should be used in estimating bedrock rippability at depths greater than 20 to 25 feet. If desired, a more detailed seismic refraction survey could be performed during the design-level geotechnical investigation to determine shear wave velocities at deeper depths. Since additional excavation for utilities will he required in roadway areas, it may he desirable to over-excavate the road subgrade and replace with compacted fill. This may reduce excavation costs during storm drain, sewer, and joint trench installation. The depth of the over-excavation in roadway areas would likely be on the order of 5 to 6 feet and will depend on the required utility depths. Prior to over-excavating the roadway, it may be feasible to pot-hole with conventional backhoe equipment once the roadway subgrade has been exposed to determine if over-excavation would be appropriate.

6.5 CUT/FILL OR MATERIAL TRANSITION OVER-EXCAVATION

Lots with cut/fill transitions should be over-excavated to provide a relatively uniform fill thickness beneath the building footprint. On a preliminary basis, the depth of over-excavation below pad grade should be equal to the maximum fill thickness on the pad but need not exceed 5 feet, as shown in Figure 5. If material transitions are observed within proposed building or street areas, it may be necessary to over-excavate exposed bedrock materials, such as interbedded claystone materials, to reduce the potential impact on improvements due to localized expansion or heave. The depth of the over-excavation will depend on the type of material exposed and will be determined in the field during construction.

In general, over-excavation should extend to at least 5 feet beyond the building footprint or street improvements. Adjustments to the depth and lateral limits of the over-excavation may need to be made at the time of construction depending on the actual conditions encountered during grading.

6.6 SUBGRADE PREPARATION

After site clearing, demolition and mass excavation is complete, and prior to backfilling any excavations resulting from fill removal or demolition, the excavation subgrade and subgrade within areas to receive additional site fills, slabs-on-grade, foundations and/or pavements (including exposed bedrock cut materials) should be scarified to a depth of 6 to 12 inches, moisture conditioned, and compacted in accordance with the “Compaction” section below.

6.7 MATERIAL FOR FILL

On-site soils with an organic content less than 3 percent by weight may be reused as general fill. General fill should not have lumps, clods or cobble pieces larger than 6 inches in diameter; 85 percent of the fill should be smaller than 2½ inches in diameter. Minor amounts of oversize material (smaller than 12 inches in diameter) may be allowed provided, the oversized pieces are not allowed to nest together, and the compaction method will allow for loosely placed lifts not exceeding 12 inches, such an 815 or REX compactor.

Due to the interbedded sandstone and siltstone that may be exposed on some cut slopes, consideration should be given to reusing some of the native topsoil to provide soil cover for finished graded slopes to aid in re-vegetating finished slopes for erosion control. Topsoil should be spread thinly over a section of on-site materials, moisture conditioned and thoroughly blended or track-walked. The necessary topsoil layer thickness will depend on the stripping organic content and the feasibility of stockpiling topsoil materials during site grading.

6.8 COMPACTION REQUIREMENTS

On a preliminary basis, all fills, and subgrade areas where fill, slabs-on-grade, and pavements are planned, should be placed in loose lifts 8 inches thick or less and compacted to at least 90 percent relative compaction in accordance with ASTM D1557 (latest version) requirements. Keyway fill or fills greater than 5 feet deep should be compacted to at least 93 to 95 percent relative compaction. In general, clayey soils should be compacted with sheepsfoot equipment and sandy/gravelly soils with vibratory equipment; open-graded materials such as crushed rock should be placed in lifts no thicker than 18 inches consolidated in place with vibratory equipment. Each lift of fill and all subgrade should be firm and unyielding under construction equipment loading in addition to meeting the compaction requirements to be approved.

6.9 PERMANENT CUT AND FILL SLOPES

On a preliminary basis, all permanent cut slopes in bedrock should have a maximum inclination of 2:1 (horizontal:vertical); however, all cut slopes will need to be observed by our engineering geologist during site grading to confirm that cuts expose relatively competent, favorably bedded rock.. All permanent fill slopes derived from on-site soil or bedrock materials should have a maximum inclination of 2:1 (horizontal:vertical). Fill slopes should be overbuilt and trimmed back, exposing engineered fill when complete. If adverse bedding conditions are encountered during site grading, some slopes may need to be over-excavated and re-constructed as a buttress fill slope. Preliminary guidelines for over-excavation and engineered fill buttress construction are discussed in the following sections. Final slope grading and engineered buttress fill design criteria should be developed during the design-level geotechnical investigation.

6.9.1 Engineered Fill Buttress

As discussed, the proposed 20- to 30-foot-high cut slopes to be located along the western end of the site will expose interbedded sandstone, siltstone and shale. Although the bedding of these materials appears to be generally favorable, portions of the exposed bedrock materials may be relatively weak and may be susceptible to shallow sloughing.

To reduce impacts due to cut slope instability, on a preliminary basis, we recommend that south-facing cut slopes greater than 10 feet high be over-excavated and reconstructed as an engineered fill buttress. This buttress should extend at least 10 to 20 vertical feet above the proposed residential pads. If required, the top of the buttress should include a debris catchment bench and a drainage ditch to collect and control surface water runoff. Appropriate keyways, benches and subsurface drainage will be required for slope buttresses, as discussed below.

6.9.2 Keyways and Benches

In general, fill placed on existing ground inclined at 6:1 or greater, or new cut slope buttress fills, should be benched into the existing slope and a keyway constructed at the toe of the fill. Benches should be angled slightly into the slope be spaced vertically at no greater than 5 feet between benches and extend at least 3 to 5 feet into competent material. Depending on the thickness of any colluvial/residual soil layer that blankets the bedrock, the benches may need to be widened beyond the minimum width to extend into competent bedrock. Keyways should extend at least 5 feet below grade or into competent bedrock, be at least 20 to 25 feet wide, and be angled slightly into the slope (minimum 2 percent inclination). A typical keyway and benched fill detail is shown in Figure 6; final buttress fill configuration should be determined during the design-level geotechnical investigation.

6.9.3 Fill Drainage

A permanent subsurface drainage system consisting of a series of perforated gravity pipes or drainage strips should be constructed between engineered fill placed against a bedrock slope and within all keyways. This system is intended to intercept perched water flowing through the bedrock and transmit it to suitable outlet structures and reduce the potential for hydrostatic pressures building up behind the fills and causing slope instability. The drain lines should be placed at the back of the keyways and benches.

A typical subsurface drainage system for engineered fills is shown in Figure 7. All drainage lines should slope towards suitable outlet structures at an inclination of at least ½ percent. Suitable outlet structures may consist of connecting the drainage lines to a storm drain system; if the drain lines will outlet overland at the toe of the slope, an appropriate rock spill pad should be provided; the drain lines should not outlet onto the slope. Cleanouts, or access ports, will likely be required at all upslope ends of the drainage lines and at all 90-degree bends.

6.10 SITE DRAINAGE

6.10.1 General Surface Drainage

Surface water runoff should not be allowed to flow over the top of or pond at the top or toe of engineered slopes or retaining walls. Surface water should also not be allowed to pond on or adjacent to pavements or concrete flatwork. Surface drainage should be directed towards suitable drainage facilities such as lined or unlined drainage ditches or drain inlets. If feasible, drainage ditches should be included near the mid-height of fill slopes. All drainage ditches and drain inlets should be sized to accommodate the design storm events for the upslope tributary area. Concrete-lined j- or v-ditches should be reinforced as required and have adequate control and construction joints and should be constructed neat in excavations; backfill around formed ditches should not be allowed.

Upslope sources of water should be evaluated. If upslope irrigation is planned, additional surface and subsurface drainage, or construction of drained buttress fills may be needed to protect site improvements. We should further evaluate this issue during the design-level investigation.

6.10.2 Lot Surface Drainage

Surface water runoff should not be allowed to pond adjacent to building foundations, slabs-on-grade, or pavements. Hardscape surfaces should slope at least 2 percent towards suitable discharge facilities; landscape areas should slope at least 3 to 5 percent. Roof runoff should be directed away from building areas. Where minimal side yards are planned (10 feet or less), we recommend that area drains collect surface runoff and transmit the runoff to other suitable landscape drainage facilities to prevent ponding adjacent to building foundations. Landscape drainage such as drain inlets and storm water filtration and/or infiltration trenches should be provided to collect and transmit storm water runoff to project storm drains, and/or detention or retention facilities. Ultimately, the proposed foundations will be designed to accommodate some moisture variability within the near-surface soils; however, excessive moisture or desiccation may result in additional differential foundation movement.

6.11 PERMANENT EROSION CONTROL MEASURES

Hillside grading will require periodic maintenance after construction to reduce the potential for erosion and sloughing. At a minimum all slopes should be vegetated by hydroseeding or other landscape ground cover. The establishment of vegetation will help reduce runoff velocities, allow some infiltration and transpiration, trap sediment within runoff, and protect the soil from raindrop impact. Depending on the exposed material type and the slope inclination, more aggressive erosion control measures may be needed to protect slopes for one or more winter seasons while vegetation is establishing. For slopes with inclinations of 2:1 (horizontal:vertical), erosion control may consist of jute netting, straw matting, or erosion control blankets used in combination with hydroseeding. Both construction and post-construction Storm Water Pollution Prevention Plans (SWPPPs) should be prepared for the project-specific requirements.

SECTION 7: FOUNDATIONS

7.1 SUMMARY OF RECOMMENDATIONS

On a preliminary basis, the proposed single-family residential structures may be supported on shallow foundations provided the recommendations in the “Earthwork” section and the sections below are considered in the preliminary design. Additional exploration and analysis should be performed during the design-level investigation to confirm the foundation type and design parameters.

7.2 SEISMIC DESIGN CRITERIA

We assume that the project structural design will be based on the 2019 California Building Code (CBC), which provides criteria for the seismic design of buildings in Chapter 16. The “Seismic Coefficients” used to design buildings are established based on a series of tables and figures addressing different site factors, including the soil profile in the upper 100 feet below grade and mapped spectral acceleration parameters based on distance to the controlling seismic source/fault system. Based on our review of previous exploration and the local geology, the site is underlain by shallow bedrock with estimated shear wave velocities ranging on the order of 1,300 to 8,900 feet per second. Therefore, the site will likely be classified as Site Classification B or C for rock or soft rock conditions. The site classification should be further evaluated during the design-level geotechnical investigation.

7.3 BUILDING SETBACKS

Since the proposed residential structures would likely be supported on mat foundations, we recommend that minimum building setbacks be maintained from the bottom edge of foundations to the face of fill slopes to reduce the potential for seismic slope deformation and/or slope creep from impacting the structures. Preliminary building setbacks for varying slope heights are presented in Table 2 below; final slope setbacks should be further evaluated during the design-level investigation.

Table 2: Preliminary Building Setbacks

Slope Height (H)[1] (feet)	Foundation Type	Minimum Building Setback[2] (feet)
H < 30	PT Mat	10
30<H<>50	PT Mat	15
>50	PT Mat	20

[1] H = vertical distance between toe and crest of slope

[2] Applies to rear or side yard setback adjacent to crest of slope; if setbacks are not feasible, then supplemental foundation criteria may be required.

7.4 POST-TENSIONED MAT FOUNDATIONS

The planned residential structures can likely be supported on post-tensioned (PT) concrete mat foundations, which should be designed in accordance with the procedures developed by the Post-Tensioning Institute (latest edition) and the 2019 California Building Code.

To reduce potential differential movement, on a preliminary basis, mats should be designed for a maximum average areal bearing pressure of 500 psf for dead plus live loads; at column or wall loading, the maximum localized allowable bearing pressure should be limited to about 2,000 to 3,000 psf. When evaluating wind and seismic conditions, allowable bearing pressures may be increased by one-third. Additional reinforcing steel may be required to help span irregularities and differential settlement.

Provided that cut/fill transitions are mitigated during site grading, we estimate that differential settlements due to combined static and seismic loading will be on the order of ½ to ¾ inch or less across a typical mat foundation area unless located in a deep fill area. Structures located in fill areas greater than 20 feet deep could experience long-term total settlement on the order of 1 to 2 inches over the life of the project. Differential settlement in these deep fill areas will likely be on the order of 1 inch or less provided differential fill thicknesses are adequately mitigated during grading.

As discussed in Section 7.3, if minimum building setbacks cannot be maintained, mat foundation edges could potentially be deepened to increase the setback distance to face of slope. If considered, this would need to be evaluated on a lot-by-lot basis during the design-level investigation and final grading plan review.

SECTION 8: CONCRETE SLABS AND PEDESTRIAN PAVEMENTS

8.1 EXTERIOR FLATWORK

Exterior concrete flatwork subject to pedestrian and/or occasional light pick up loading should be at least 4 inches thick and supported on 4 to 6 inches of non-expansive fill overlying prepared subgrade. If expansive colluvial soils are adequately buried in deeper fills, concrete flatwork could potentially be constructed directly on finished compacted engineered fills that exhibit relatively low plasticity and expansion potential. Sidewalks in public street areas should be designed in accordance with City of Pleasanton design standards.

SECTION 9: VEHICULAR PAVEMENTS

9.1 ASPHALT CONCRETE

The following asphalt concrete pavement recommendations tabulated below are based on the Caltrans Highway Design Manual (latest edition), estimated traffic indices for various pavement-loading conditions, and on an assumed preliminary design R-values of 5 for roadways constructed of clay fill and 30 for roadways constructed on bedrock cut or fill. The design R-values were chosen based on experience with similar shallow bedrock conditions and engineering judgment considering the potentially variable surface conditions that may be encountered during construction.

Table 3: Preliminary Asphalt Concrete Pavement Recommendations (R-value = 5)

Design Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base* (inches)	Total Pavement Section Thickness (inches)
5.0	2.5	11.0	13.5
5.5	3.0	12.0	15.0
6.0	3.5	13.0	16.5
6.5	4.0	13.0	17.0

*Caltrans Class 2 aggregate base; minimum R-value of 78

Table 4: Preliminary Asphalt Concrete Pavement Recommendations (R-value = 30)

Design Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base* (inches)	Total Pavement Section Thickness (inches)
5.0	2.5	7.0	9.5
5.5	3.0	7.0	10.0
6.0	3.0	8.0	11.0
6.5	3.5	9.0	12.5

*Caltrans Class 2 aggregate base; minimum R-value of 78

Subgrade R-value testing should be performed during site grading to confirm the final pavement design thicknesses.

SECTION 10: LIMITATIONS

This report, an instrument of professional service, has been prepared for the sole use of Ponderosa Homes specifically to support the design of the Lester-Shriner Property Residential

Development project in Pleasanton, California. The opinions, conclusions, and preliminary recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in Northern California at the time this report was prepared. No warranty, expressed or implied, is made or should be inferred.

Preliminary recommendations in this report are based upon the soil and ground water conditions encountered during our limited subsurface exploration. Preparation of a design-level investigation is anticipated to provide additional information and refine the preliminary recommendations presented herein. If variations or unsuitable conditions are encountered during the construction phase, Cornerstone must be contacted to provide supplemental recommendations, as needed.

Ponderosa Homes may have provided Cornerstone with plans, reports and other documents prepared by others. Ponderosa Homes understands that Cornerstone reviewed and relied on the information presented in these documents and cannot be responsible for their accuracy.

Cornerstone prepared this report with the understanding that it is the responsibility of the owner or his representatives to see that the recommendations contained in this report are presented to other members of the design team and incorporated into the project plans and specifications, and that appropriate actions are taken to implement the geotechnical recommendations during construction.

Conclusions and recommendations presented in this report are valid as of the present time for the development as currently planned. Changes in the condition of the property or adjacent properties may occur with the passage of time, whether by natural processes or the acts of other persons. In addition, changes in applicable or appropriate standards may occur through legislation or the broadening of knowledge. Therefore, the conclusions and recommendations presented in this report may be invalidated, wholly or in part, by changes beyond Cornerstone's control. This report should be reviewed by Cornerstone after a period of three (3) years has elapsed from the date of this report. In addition, if the current project design is changed, then Cornerstone must review the proposed changes and provide supplemental recommendations, as needed.

An electronic transmission of this report may also have been issued. While Cornerstone has taken precautions to produce a complete and secure electronic transmission, please check the electronic transmission against the hard copy version for conformity.

Recommendations provided in this report are based on the assumption that Cornerstone will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design, and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, Cornerstone cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of Cornerstone's report by others. Furthermore, Cornerstone will cease to be the Geotechnical-Engineer-of-Record if we are not retained for these services.

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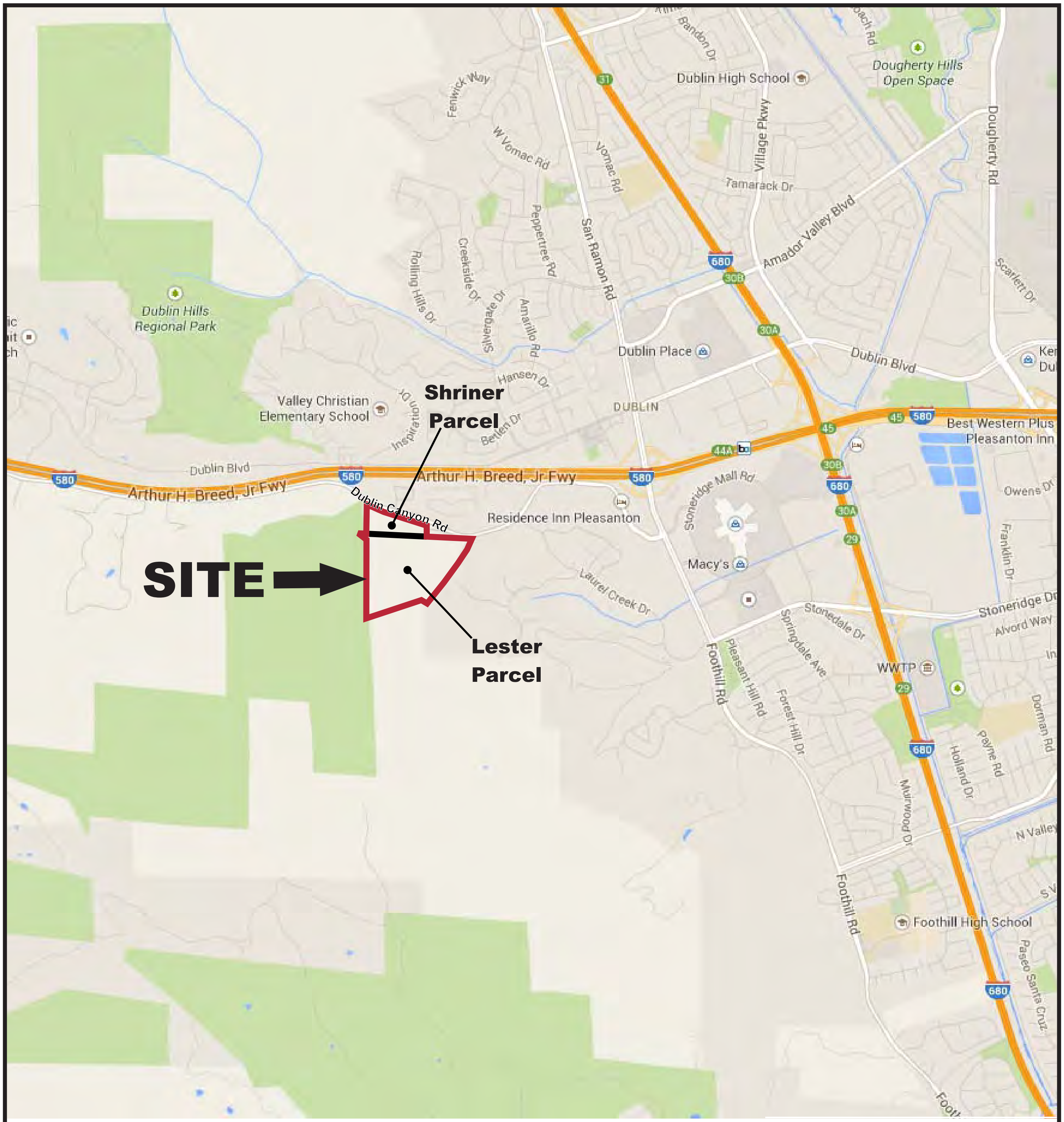
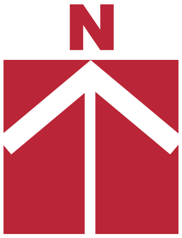


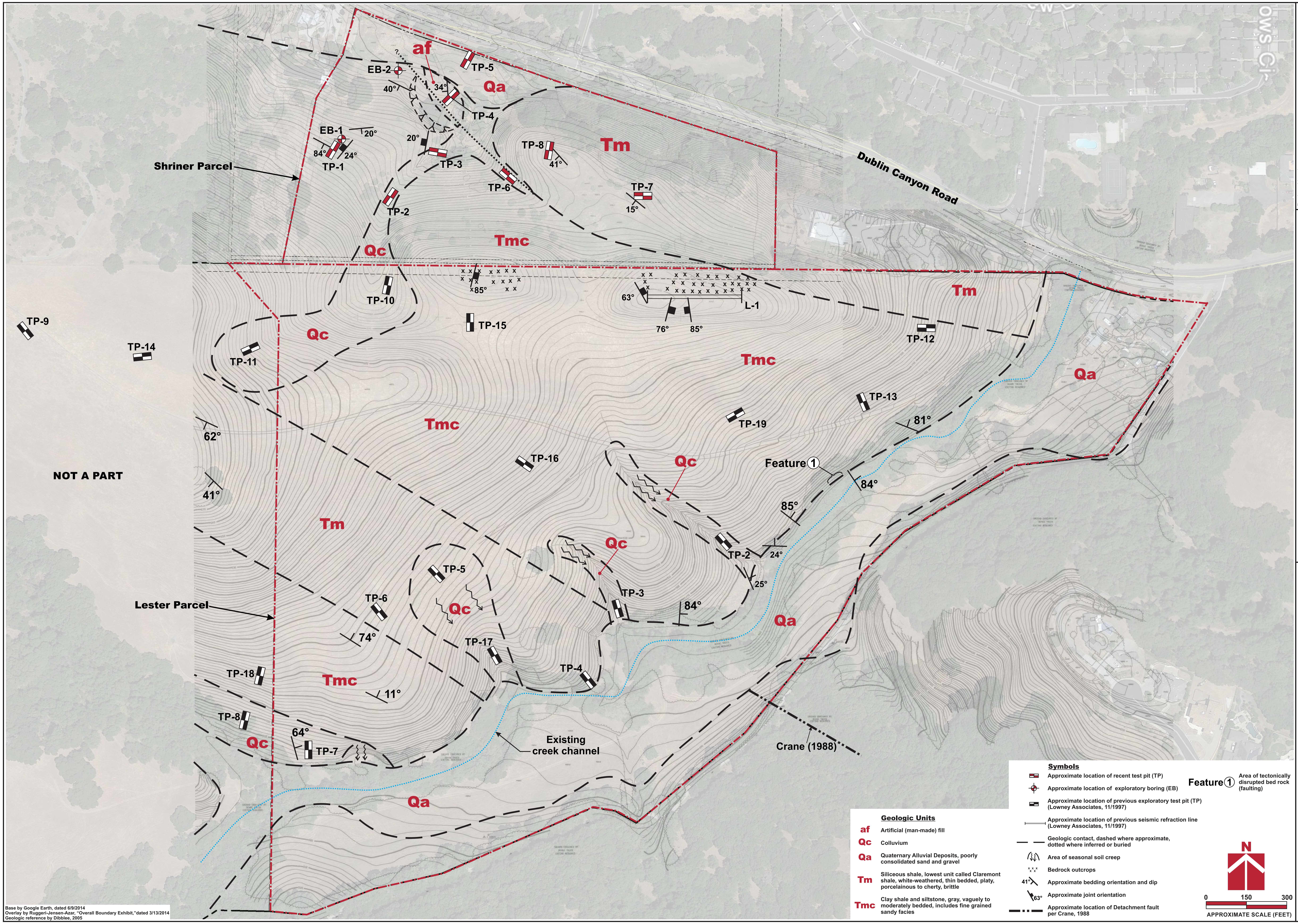


CORNERSTONE EARTH GROUP

Vicinity Map

Lester-Shriner Parcels
Pleasanton, CA

Project Number	132-8-2
Figure Number	Figure 1
Date	October 2014
Drawn By	RRN



Base by Google Earth, dated 6/9/2014
Overlay by Ruggeri-Jensen-Azar, "Overall Boundary Exhibit,"dated 3/13/2014
Geologic reference by Dibblee, 2005

Site Topography and Geologic Map

Lester-Shriner Parcels
Pleasanton, CA

Project Number
132-8-3

Figure Number
Figure 2

Date
March 2020

Drawn By
RRN

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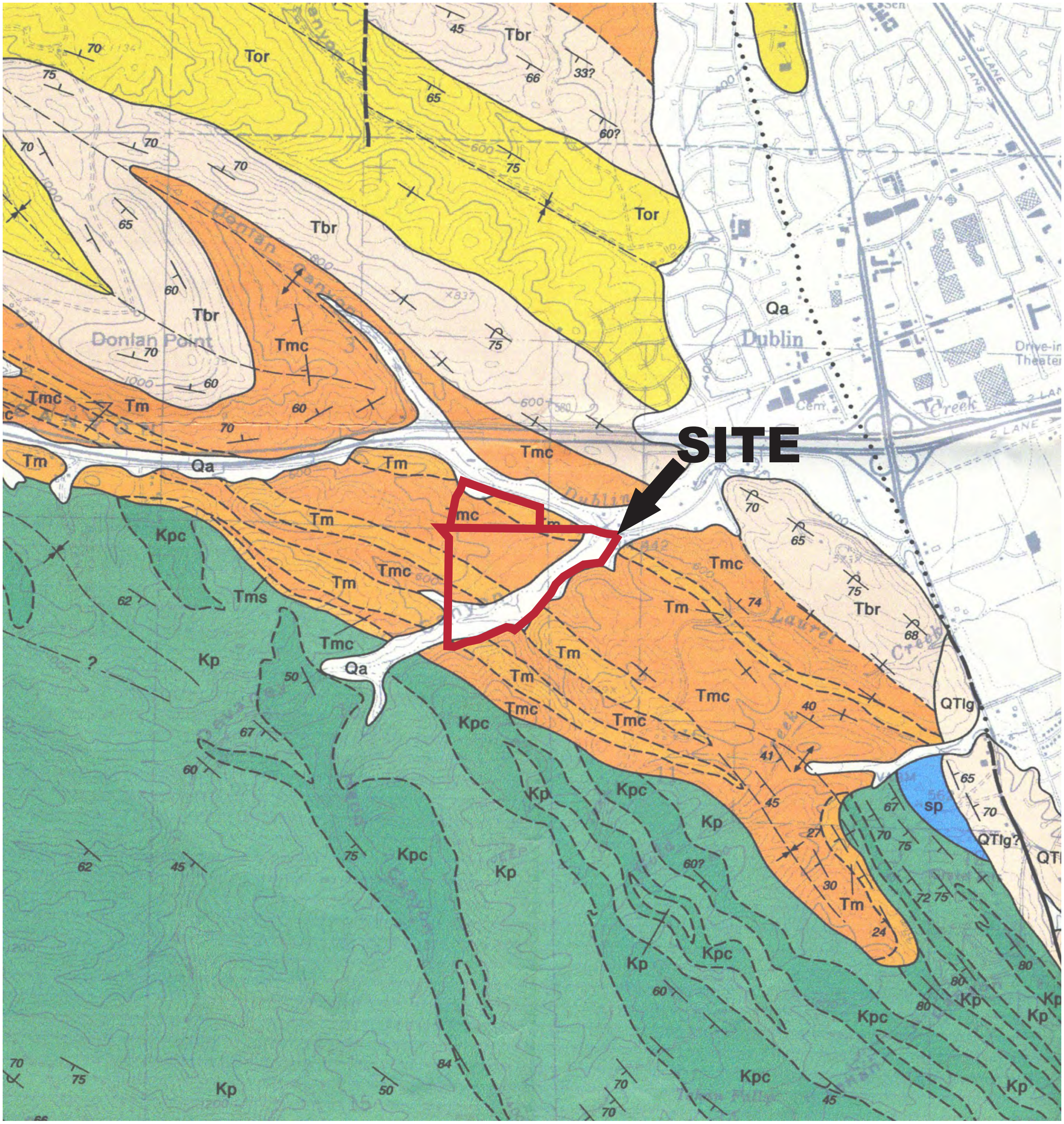
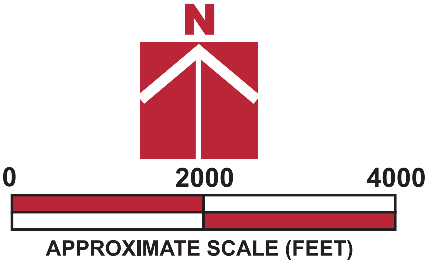


Geologic Units

Qc	Colluvium
Qa	Quaternary Alluvial Deposits, poorly consolidated sand and gravel
Tm	Siliceous shale, lowest unit called Claremont shale, white-weathered, thin bedded, platy, porcelainous to cherty, brittle
Tmc	Clay shale and siltstone, gray, vaguely to moderately bedded, includes fine grained sandy facies

Explanation

Contact- dashed where approximate, dotted where concealed



CORNERSTONE
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Vicinity Geologic Map

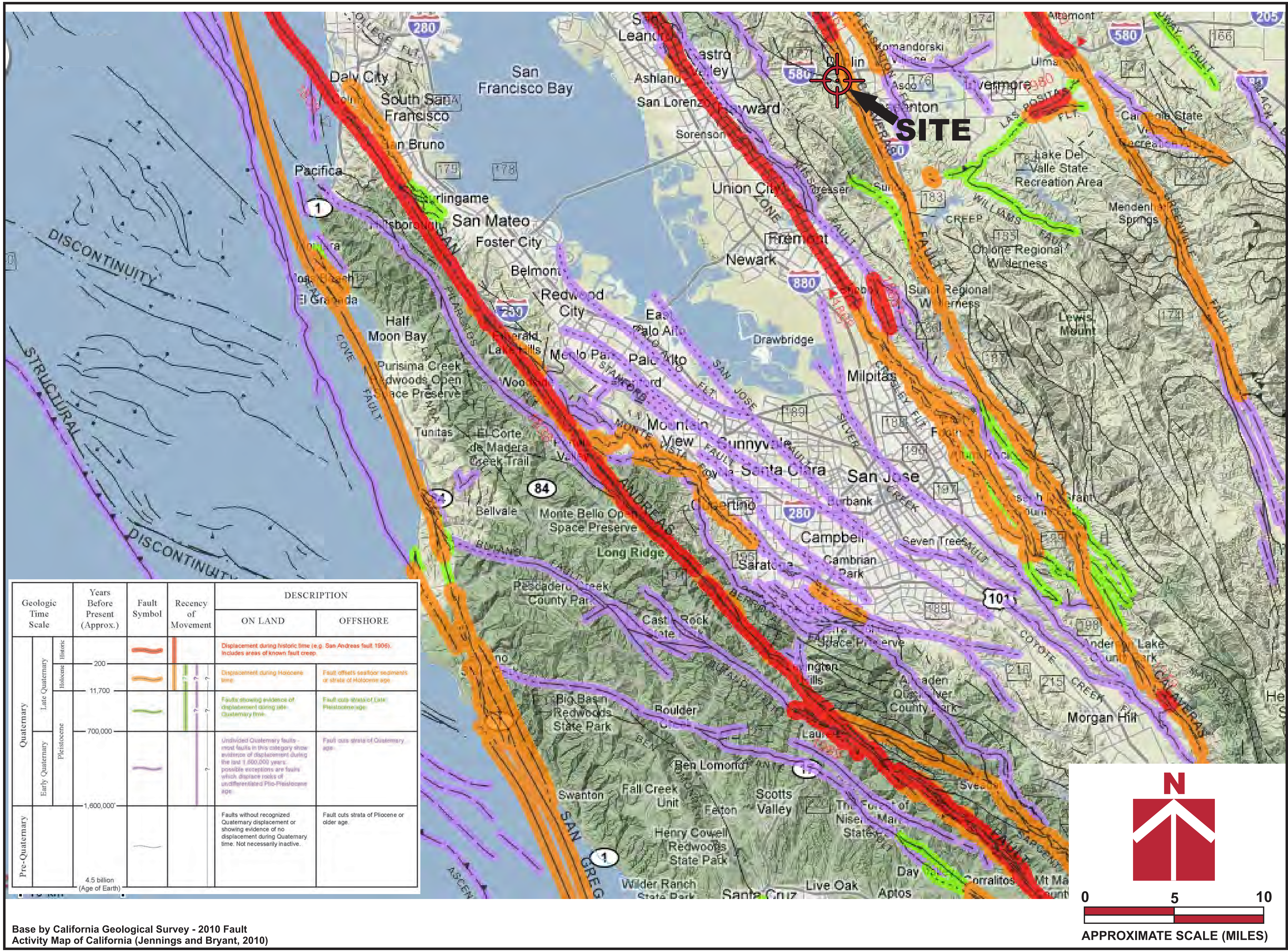
Lester-Shriner Parcels
Pleasanton, CA

Project Number 132-8-2

Figure Number Figure 3

Date October 2014

Drawn By RRN



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic		🟥		Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200	🟧	?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700	🟩	?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000	🟪	?	Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000* 4.5 billion (Age of Earth)	—		Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

Base by California Geological Survey - 2010 Fault Activity Map of California (Jennings and Bryant, 2010)

Project Number
132-8-2

Figure Number
Figure 4

Date
October 2014

Drawn By
RRN

Regional Fault Map

Lester-Shriner Parcels
Pleasanton, CA

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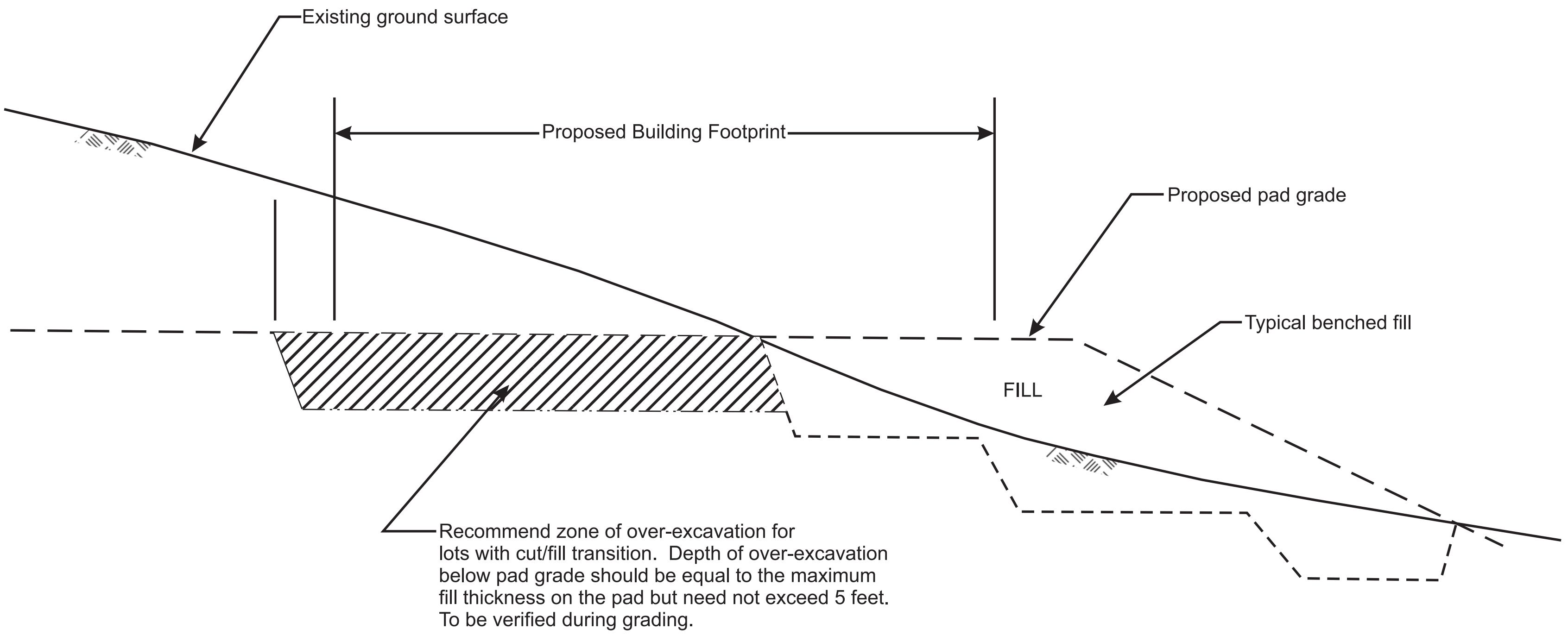


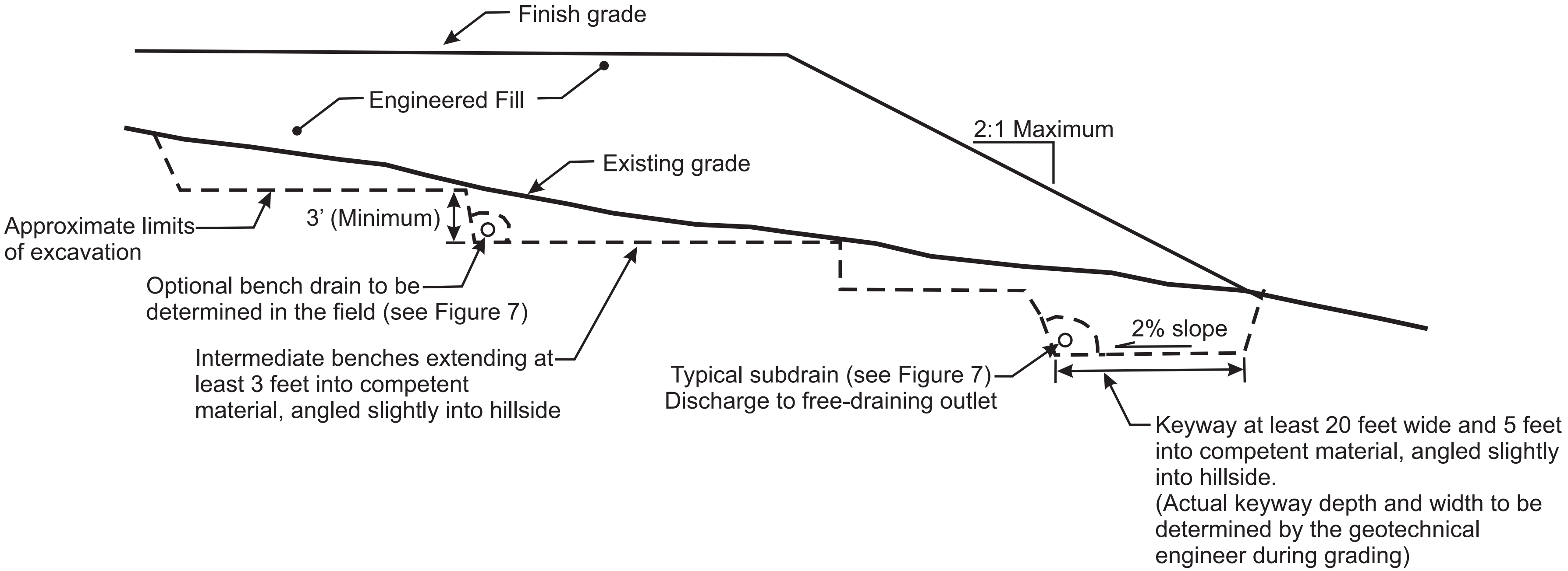
Not to scale

CORNERSTONE EARTH GROUP

Cut/Fill Transition Over-Excavation Detail

Lester-Shriner Parcels
Pleasanton, CA

Project Number	132-8-2
Figure Number	Figure 5
Date	October 2014
Drawn By	RRN



Note: **Fill slopes should be over-built at least 18 to 24 inches and trimmed to expose compacted fill.**

Not to scale

CORNERSTONE EARTH GROUP

Typical Keyway and Bench Detail

Lester-Shriner Parcels
Pleasanton, CA

Project Number	132-8-2
Figure Number	Figure 6
Date	October 2014
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DRAINAGE MATERIAL

Alternative 1

Class 2 Permeable Material
(Caltrans Standard Specs, latest edition)

Material shall consist of clean, coarse sand and gravel or crushed stone, conforming to the following gradation requirements:

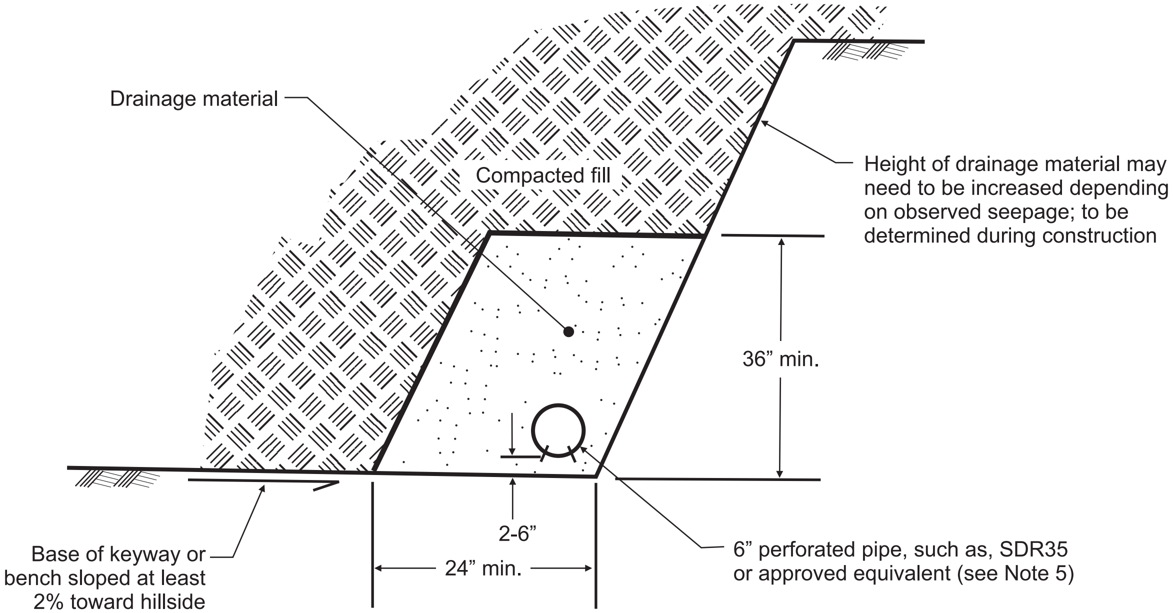
Sieve Size	% Passing Sieve
1”	100
3/4”	90-100
3/8”	40-100
#4	25-40
#8	18-33
#30	5-15
#50	0-7
#200	0-3

Alternative 2

½- to 3/4- inch Clean Crushed Rock or
Gravel Wrapped in Filter Fabric

All non-woven filter fabric shall meet the following minimum average roll values unless otherwise specified by Cornerstone Earth Group

Grab Strength (ASTM D-4632):	180 lbs.
Mass Per Unit Area (ASTM D-4751):	5 oz/yd
Apparent Opening Size (ASTM D-4751):	70-100 U.S. std. sieve
Flow Rate (ASTM D-4491):	80 gal/min/ft
Puncture Strength (ASTM D-4833):	80 lbs.



Notes:

1. 1% fall (minimum) along all keyways, benches and subdrain lines.
2. All perforated pipe placed perforations down.
3. All pipe joints shall be glued.
4. All subdrains should be discharged to a free draining outlet approved by the Civil Engineer.
5. Subdrain pipe (perforated or solid connector) should consist of SDR-35 PVC pipe when placed in fills less than 30 feet deep. SDR-23.5 PVC pipe should be used when fill is greater than 30 feet deep.

Not to scale

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Typical Keyway and Bench Subdrain Detail

Lester-Shriner Parcels
Pleasanton, CA

Project Number
132-8-2

Figure Number
Figure 7

Date
October 2014

Drawn By
RRN

APPENDIX A: CURRENT FIELD INVESTIGATION

A more recent field investigation was performed on the Shriner Parcel and consisted of a surface reconnaissance and a subsurface exploration program using track-mounted hollow-stem auger drilling equipment and 4-wheel drive backhoe equipment. Two 8-inch-diameter exploratory borings were drilled on October 7, 2014, to depths of approximately 25 to 31 feet. Eight exploratory test pits were also performed on August 30, 2014, to depths ranging from approximately 5 to 15 feet. The approximate locations of exploratory borings test pits are shown on the Site Plan, Figure 2. The soils encountered were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D2488). Boring and test pit logs, as well as a key to the classification of the soil and bedrock, are included as part of this appendix.

Exploration locations were approximated using existing site boundaries, a hand held GPS unit, and other site features as references. Exploration elevations were based on interpolation of plan contours. The locations and elevations of the borings and test pits should be considered accurate only to the degree implied by the method used.

Representative soil samples were obtained from the borings at selected depths. All samples were returned to our laboratory for evaluation and appropriate testing. Disturbed samples were obtained with 2.5-inch I.D. dry core sampler that was hydraulically pushed out in advance of the drill bit during auger drilling. The percent recovery of each 5-foot-long dry core interval is recorded on the boring log at the appropriate sample depth. The standard penetration resistance blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration (ASTM D1586). Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows required to drive the last 12 inches. The various samplers are denoted at the appropriate depth on the boring logs.

Attached boring and test pit logs and related information depict subsurface conditions at the locations indicated. Subsurface conditions at other locations may differ from conditions occurring at these exploration locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

OTHER MATERIAL SYMBOLS

- Poorly-Graded Sand with Clay
- Clayey Sand
- Sandy Silt
- Artificial/Undocumented Fill
- Poorly-Graded Gravelly Sand
- Topsoil
- Well-Graded Gravel with Clay
- Well-Graded Gravel with Silt
- Sand
- Silt
- Well Graded Gravelly Sand
- Gravelly Silt
- Asphalt
- Boulders and Cobble

SAMPLER TYPES

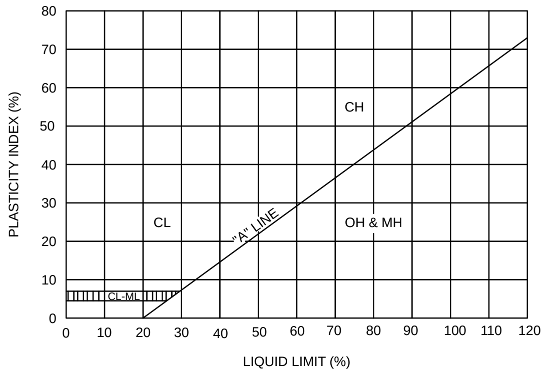
- ☒ SPT
- Modified California (2.5" I.D.)
- Rock Core
- ■ Shelby Tube
- ○ No Recovery
- Grab Sample

ADDITIONAL TESTS

CA - CHEMICAL ANALYSIS (CORROSIVITY)
CD - CONSOLIDATED DRAINED TRIAXIAL
CN - CONSOLIDATION
CU - CONSOLIDATED UNDRAINED TRIAXIAL
DS - DIRECT SHEAR
PP - POCKET PENETROMETER (TSF)
(3.0) - (WITH SHEAR STRENGTH IN KSF)
RV - R-VALUE
SA - SIEVE ANALYSIS: % PASSING #200 SIEVE
▼ - WATER LEVEL

PI - PLASTICITY INDEX
SW SWELL TEST
TC - CYCLIC TRIAXIAL
TV - TORVANE SHEAR
UC - UNCONFINED COMPRESSION
(1.5) - (WITH SHEAR STRENGTH IN KSF)
UU - UNCONSOLIDATED UNDRAINED TRIAXIAL

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / FOOT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	STRENGTH** (KSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.5
MEDIUM DENSE	10 - 30	MEDIUM STIFF	4 - 8	0.5-1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

** UNDRAINED SHEAR STRENGTH IN KIPS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST, POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION.

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LEGEND TO SOIL DESCRIPTIONS

Figure Number
A-1

HARDNESS

Soft – Reserved for plastic material alone.
Low hardness – Can be gouged deeply or carved easily with a knife blade.
Moderately hard – Can be readily scratched by a knife blade: scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
Hard – Can be scratched with difficulty: scratch produces little powder and is often faintly visible.
Very hard – Cannot be scratched with knife blade: leaves a metallic streak.

STRENGTH

Plastic or very low strength.
Friable – Crumbles easily by rubbing with fingers.
Weak – An unfractured specimen of such material will crumble under light hammer blows.
Moderately strong – Specimen will withstand a few heavy hammer blows before breaking.
Strong – Specimen will withstand a few heavy ringing blows and will yield with difficulty only dust and small flying fragments.
Very strong – Specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

WEATHERING – The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

Deep – Moderate to complete mineral decomposition: extensive disintegration: deep and thorough discoloration: many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.
Moderate – Slight change or partial decomposition of minerals: little disintegration: cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures.
Little – No megascopic decomposition of minerals: little or no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains or fracture surfaces.
Fresh – Unaffected by weathering agents. No disintegration or discoloration. Fractures usually less numerous than joints.

FRACTURING

Intensity	**Size of Pieces in Feet**
Very little fractured	Greater than 4.0
Occasionally fractured	1.0 to 4.0
Moderately fractured	0.5 to 1.0
Closely fractured	0.1 to 0.5
Intensely fractured	0.05 to 0.1
Crushed	Less than 0.05

BEDDING OF SEDIMENTARY ROCKS

Splitting Property	**Thickness**	**Stratification**
Massive	Greater than 4.0 feet	very thick-bedded
Blocky	2.0 to 4.0 feet	thick-bedded
Slabby	0.2 to 2.0 feet	thin-bedded
Flaggy	0.05 to 0.2 feet	very thin-bedded
Shaly or Platy	0.01 to 0.05 feet	laminated
Papery	less than 0.01 feet	thinly laminated

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Physical Properties of Rock Descriptions

Figure Number
A-2

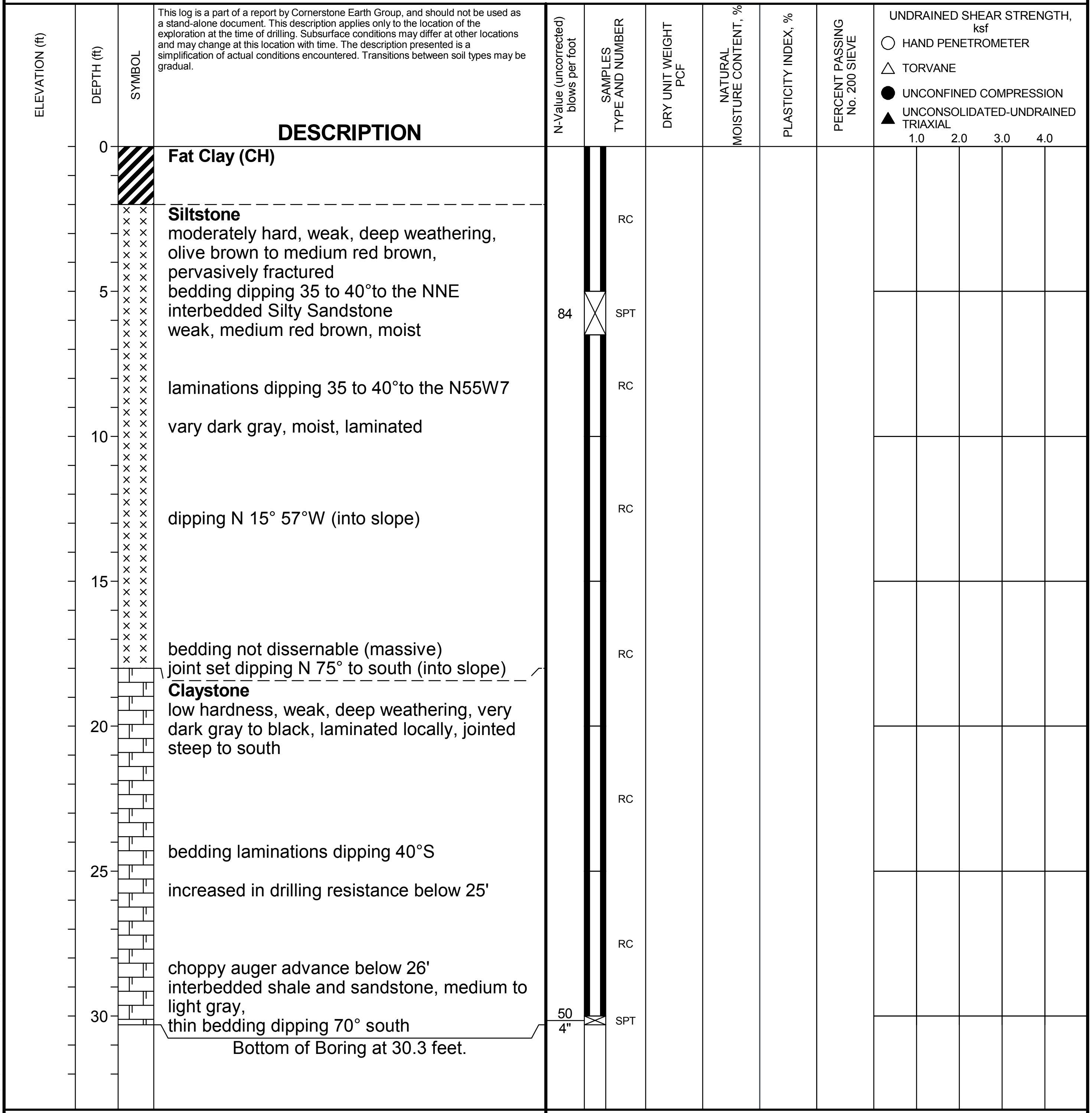
BORING NUMBER EB-1

PAGE 1 OF 1

CORNERSTONE EARTH GROUP

PROJECT NAME Lester Property
PROJECT NUMBER 132-8-1
PROJECT LOCATION Pleasanton, CA
DATE STARTED 10/7/14 **DATE COMPLETED** 10/7/14
GROUND ELEVATION **BORING DEPTH** 30.3 ft.
DRILLING CONTRACTOR Britton Exploration, Inc.
LATITUDE **LONGITUDE**
DRILLING METHOD CME 55 Track Rig, dry rock coring
GROUND WATER LEVELS:
LOGGED BY CSH
▽ **AT TIME OF DRILLING** Not Encountered
NOTES
▼ **AT END OF DRILLING** Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.



UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT, %	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE
	0	**Fat Clay (CH)**						
		Siltstone moderately hard, weak, deep weathering, olive brown to medium red brown, pervasively fractured		RC				
	5	bedding dipping 35 to 40°to the NNE interbedded Silty Sandstone weak, medium red brown, moist	84	SPT				
		laminations dipping 35 to 40°to the N55W7		RC				
	10	vary dark gray, moist, laminated						
		dipping N 15° 57°W (into slope)		RC				
	15							
		bedding not dissernable (massive) joint set dipping N 75° to south (into slope)		RC				
		Claystone low hardness, weak, deep weathering, very						
	20	dark gray to black, laminated locally, jointed steep to south						
				RC				
		bedding laminations dipping 40°S						
	25	increased in drilling resistance below 25'						
				RC				
		choppy auger advance below 26' interbedded shale and sandstone, medium to light gray,						
	30	thin bedding dipping 70° south	50 4"	SPT				
		Bottom of Boring at 30.3 feet.						

BORING NUMBER EB-2

PAGE 1 OF 1

CORNERSTONE EARTH GROUP

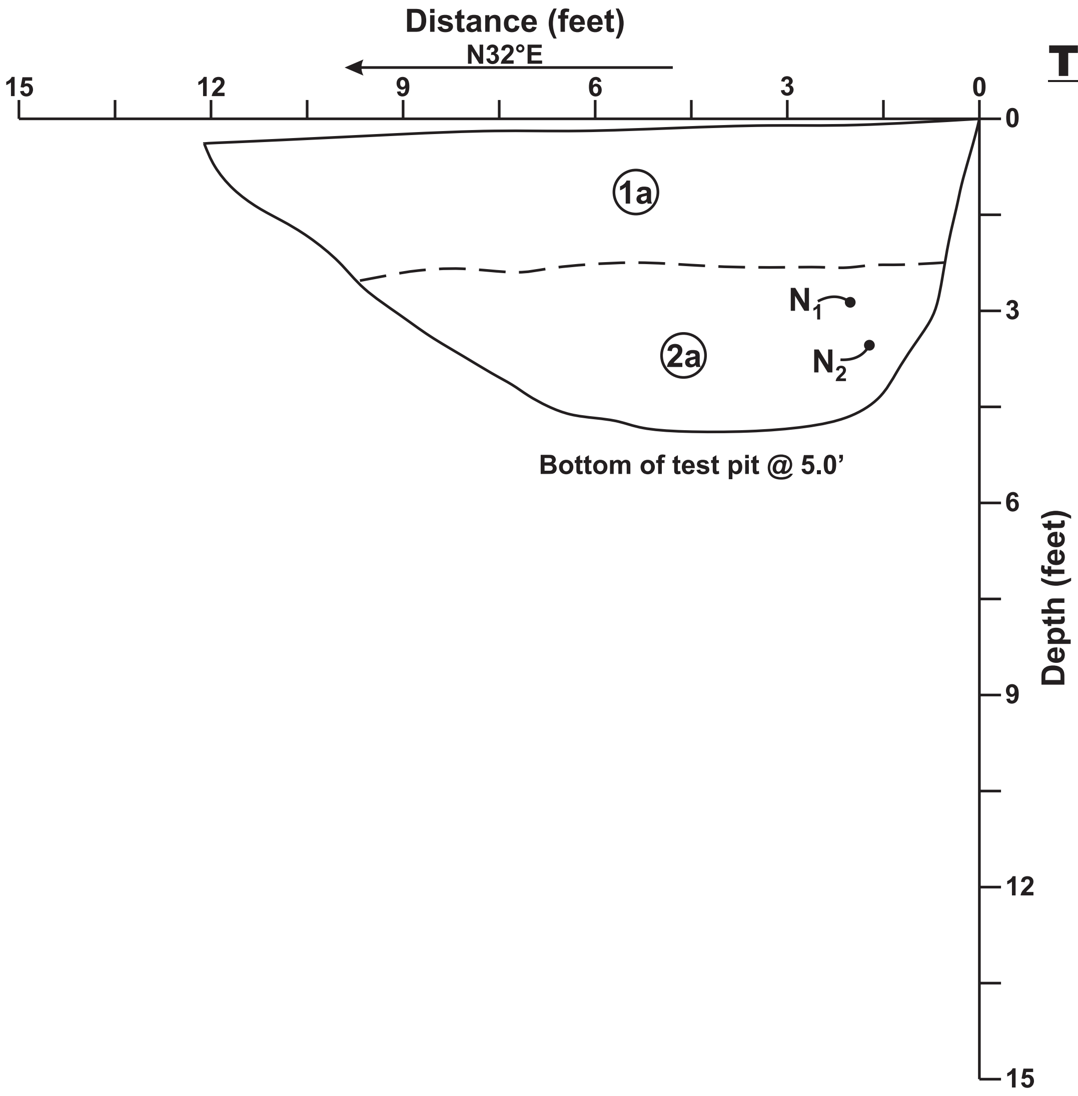
PROJECT NAME Lester Property
PROJECT NUMBER 132-8-1
PROJECT LOCATION Pleasanton, CA
DATE STARTED 10/7/14 **DATE COMPLETED** 10/7/14
GROUND ELEVATION **BORING DEPTH** 25 ft.
DRILLING CONTRACTOR Britton Exploration, Inc.
LATITUDE **LONGITUDE**
DRILLING METHOD CME 55 Track Rig, dry rock coring
GROUND WATER LEVELS:
LOGGED BY CSH
▽ **AT TIME OF DRILLING** Not Encountered
NOTES
▼ **AT END OF DRILLING** Not Encountered

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0

ELEVATION (ft)	DEPTH (ft)	SYMBOL	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT, %	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf
	0	▨	**Fat Clay (CH)**							
		×	**Sandy Siltstone** low hardness, weak to friable, deep weathering, medium yellow brown, thin bedded to laminated							
	5	×								
	10	×								
		×	laminations dipping 20-40° SW		RC					
	15	×	some fracturing in transitions in bedding dipping downslope to north							
		×			RC					
		∴	**Silty Sandstone** low hardness, weak to friable, deep weathering, very dark gray, thin bedded to laminated laminations dipping 40°N							
	20	∴			RC					
	25		Bottom of Boring at 25.0 feet.							
	30									

TP-1



1a	**Sandy Clay with gravel:** Dark gray-brown, dry, [residual soil]
2a	**Silty fine Sandstone:** Medium yellow-brown, damp, very weak, thin bedded

Notes:

N_1 = N67°W/84°SW: shear zone

N_2 = N42°E/24°NW: bedding

Scale: 1" = 3'

CORNERSTONE EARTH GROUP

Test Pit 1

Shriner-Lester Property
Pleasanton, CA

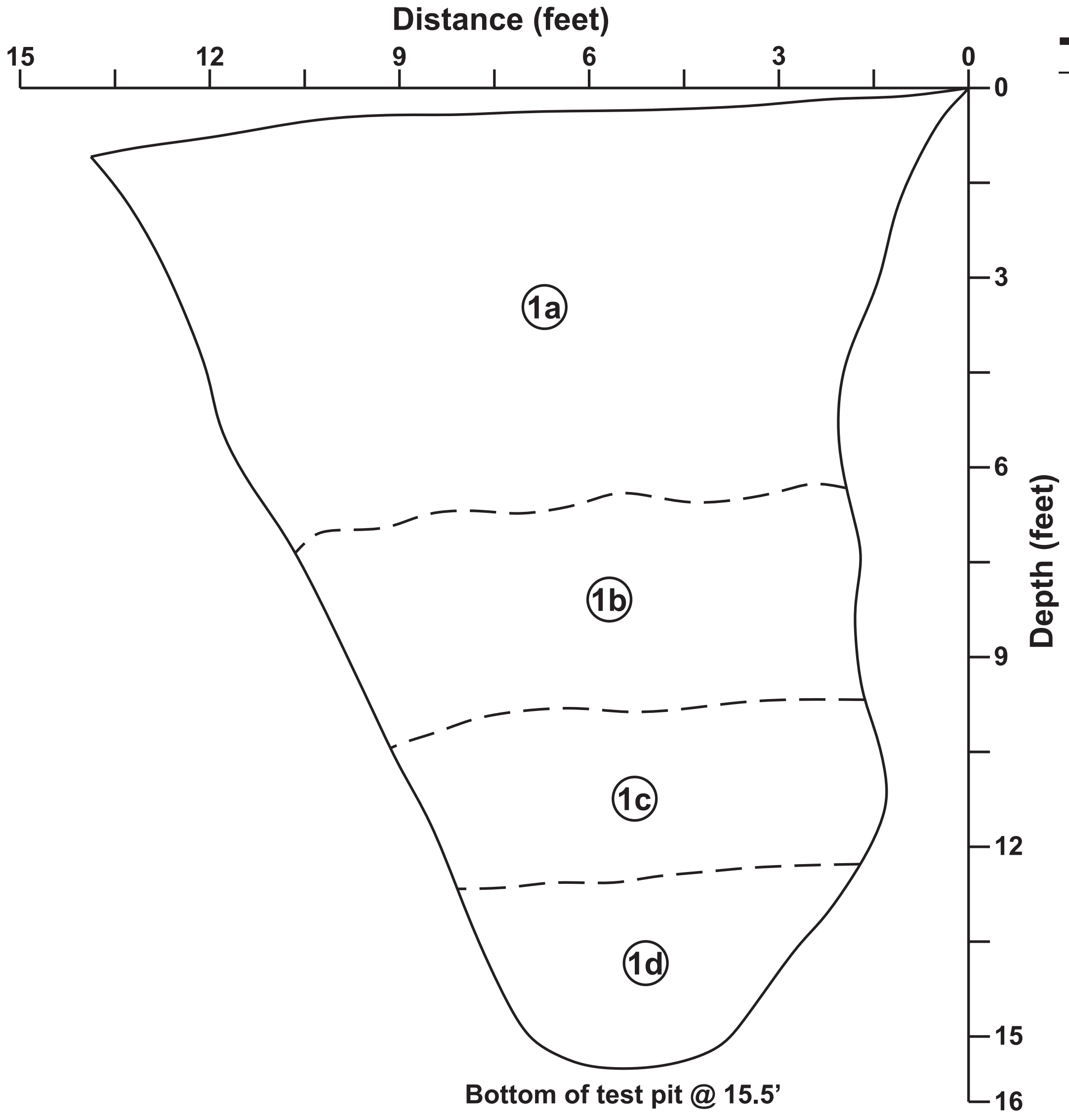
Project Number 132-8-2

Figure Number

Date September 2014

Drawn By RRN

TP-2



1a	**Silty Sandy Clay: Very dark gray-brown, damp, stiff, [Colluvium]**
1b	**Lean Clay with Sand: Dark olive brown, damp, very stiff, trace course sand, becoming moist below 8', [Colluvium]**
1c	**Lean Clay with Sand: Dark gray-brown, moist, very stiff, [Colluvium]**
1d	**Clayey fine Sand with gravel: Varigated very dark gray-brown and yellow-brown, very moist, firm, [Colluvium]**

Scale: 1" = 3'

CORNERSTONE
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Test Pit 2

Shriner-Lester Property
Pleasanton, CA

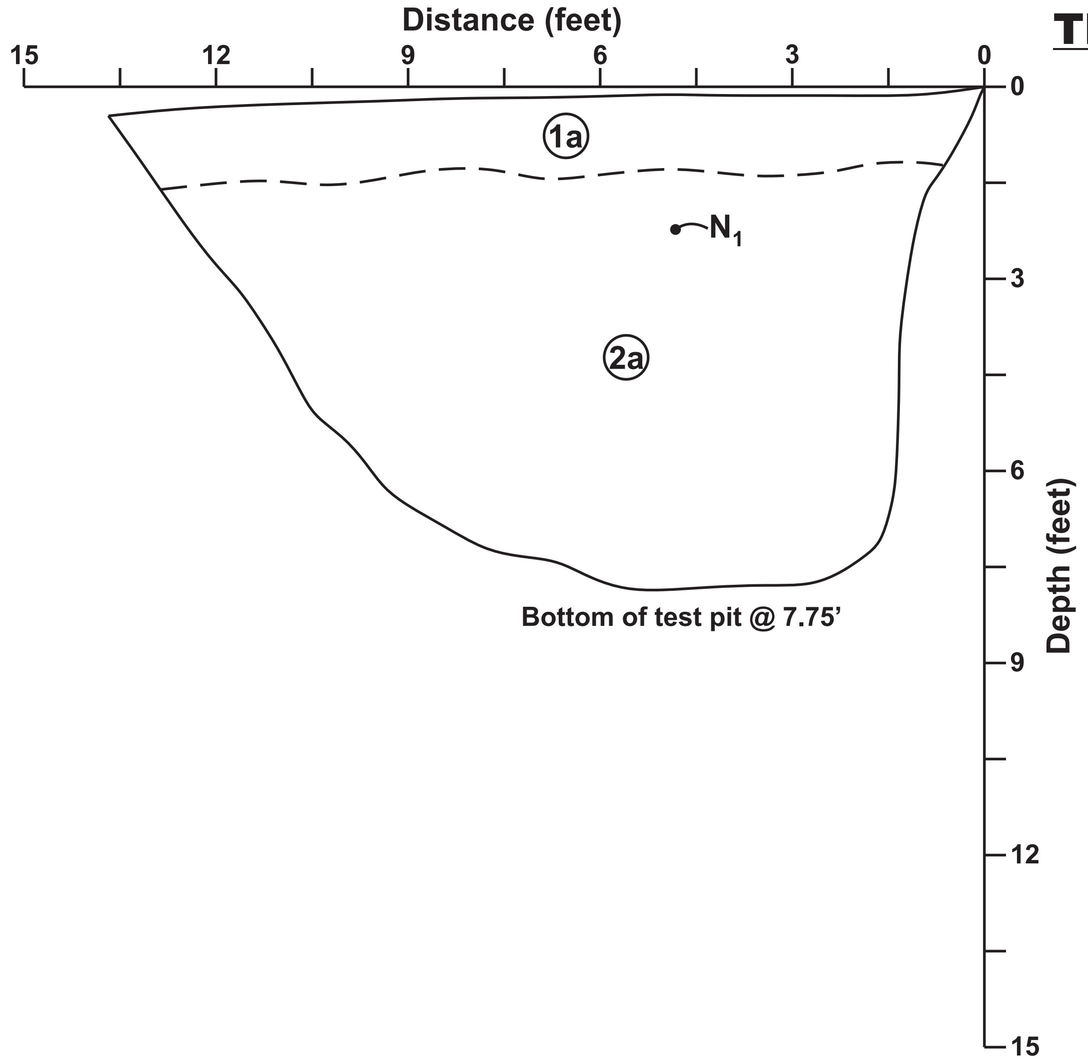
Project Number
132-8-2

Figure Number

Date September 2014

Drawn By RRN

TP-3



Bottom of test pit @ 7.75'

(1a) **Silty Clay with Sand:** Very dark gray-brown, damp, very stiff, [Colluvium]

(2a) **Fine Sandy Siltstone:** Medium yellow-brown, damp, fractured, thin bedded

Notes:

N_1 = N12°W/20°SW: bedding

Scale: 1" = 3'

CORNERSTONE
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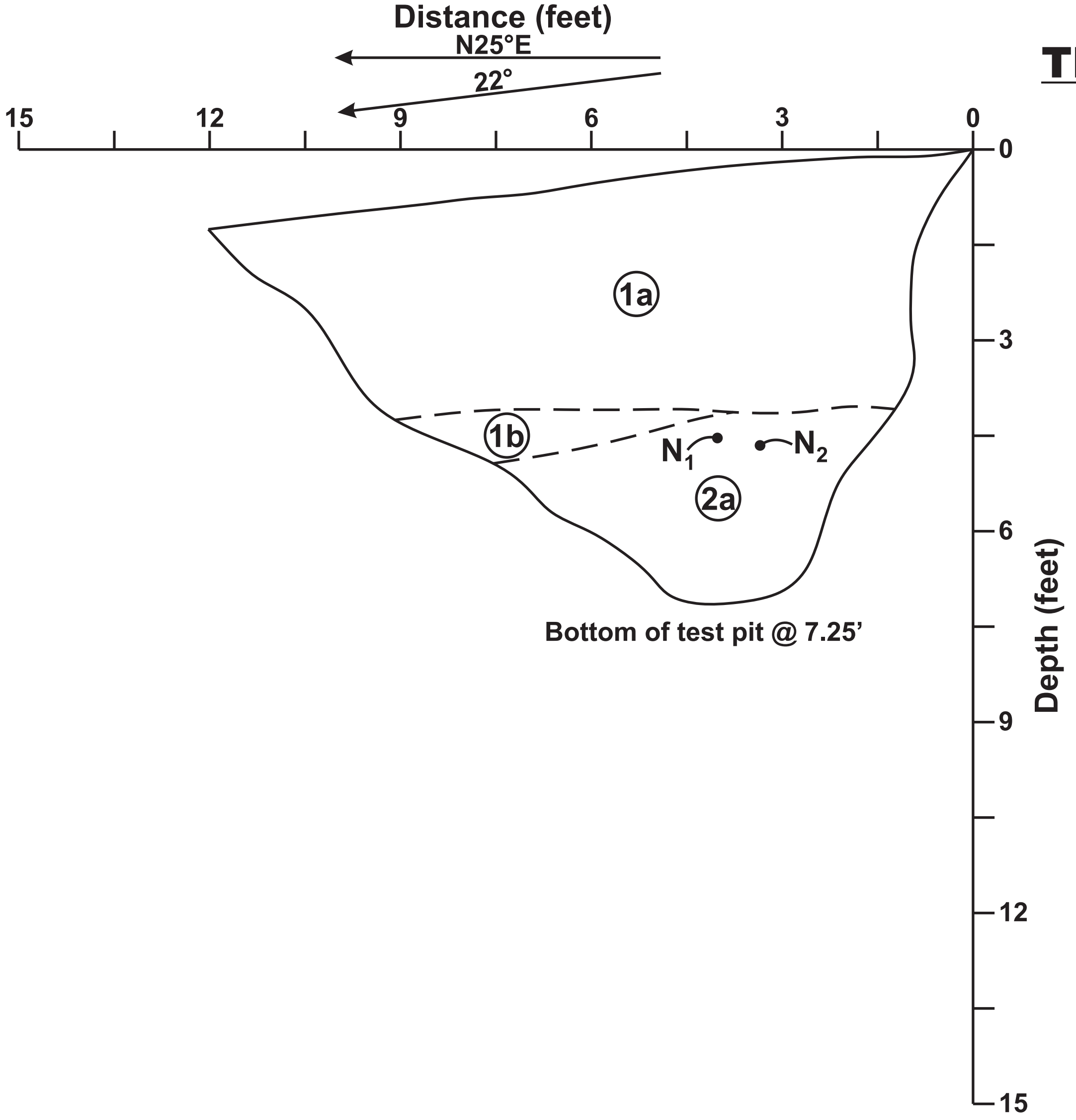
Test Pit 3	Project Number 132-8-2	
Shriner-Lester Property **Pleasanton, CA**	Figure Number	
	Date September 2014	Drawn By RRN

TP-4



Bottom of test pit @ 7.25'

1a	**Gravelly Clay:** Varigated dark brown and yellow-brown, damp, loose, [fill]
1b	**Sandy Clay:** Very dark gray-brown, damp, firm, [residual soil]
2a	**Silty fine Sandstone:** Olive, damp, weak but locally strong, thin bedded

Notes:

N_1 = N5°W/34°SW: thin bedding

N_2 = N67°W/Vertical: joint set

Scale: 1" = 3'

CORNERSTONE
EARTH GROUP

Test Pit 4

Shriner-Lester Property
Pleasanton, CA

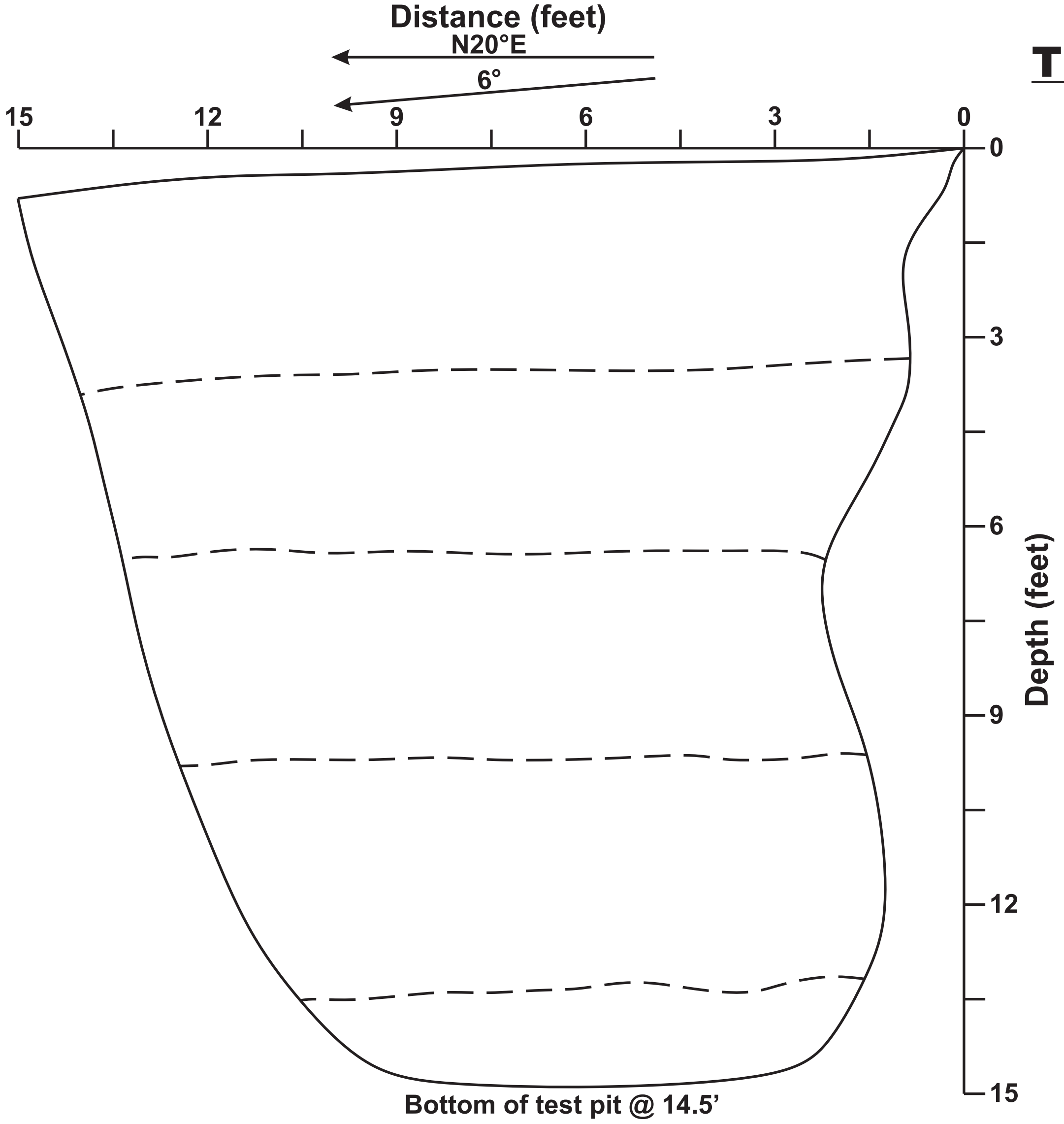
Project Number
132-8-2

Figure Number

Date September 2014

Drawn By RRN

TP-5



1a **Silty Clay: Very dark gray-brown, damp, very stiff, [residual soil]**

1b **Lean Clay: Medium brown, damp, very stiff, [residual soil]**

1c **Sandy Lean Clay: Olive brown, damp, very stiff, [old alluvium]**

1d **Sandy Clay with Gravel: olive brown, damp, very stiff, gravel is angular, shear**

2a **Siltstone: Olive brown, damp, weak, pervasively fractured, thin bedded**

Scale: 1” = 3’

CORNERSTONE
EARTH GROUP

Test Pit 5

Shriner-Lester Property
Pleasanton, CA

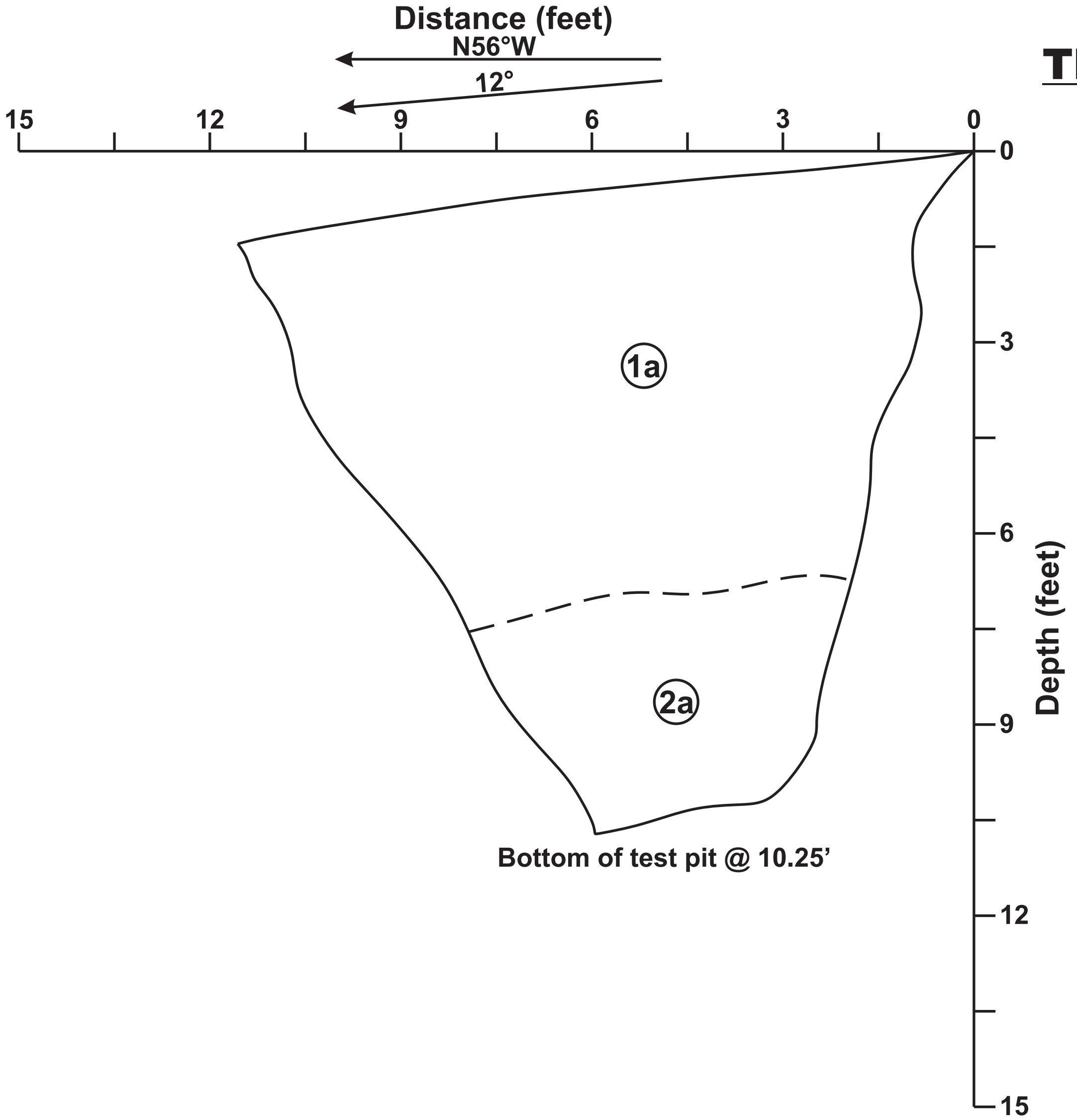
Project Number 132-8-2

Figure Number

Date September 2014

Drawn By RRN

TP-6



①a Sandy Silty Clay: Dark gray-brown, damp, very stiff

②a Silty fine Sandstone: Light yellow-brown, damp, fractured

Scale: 1" = 3'

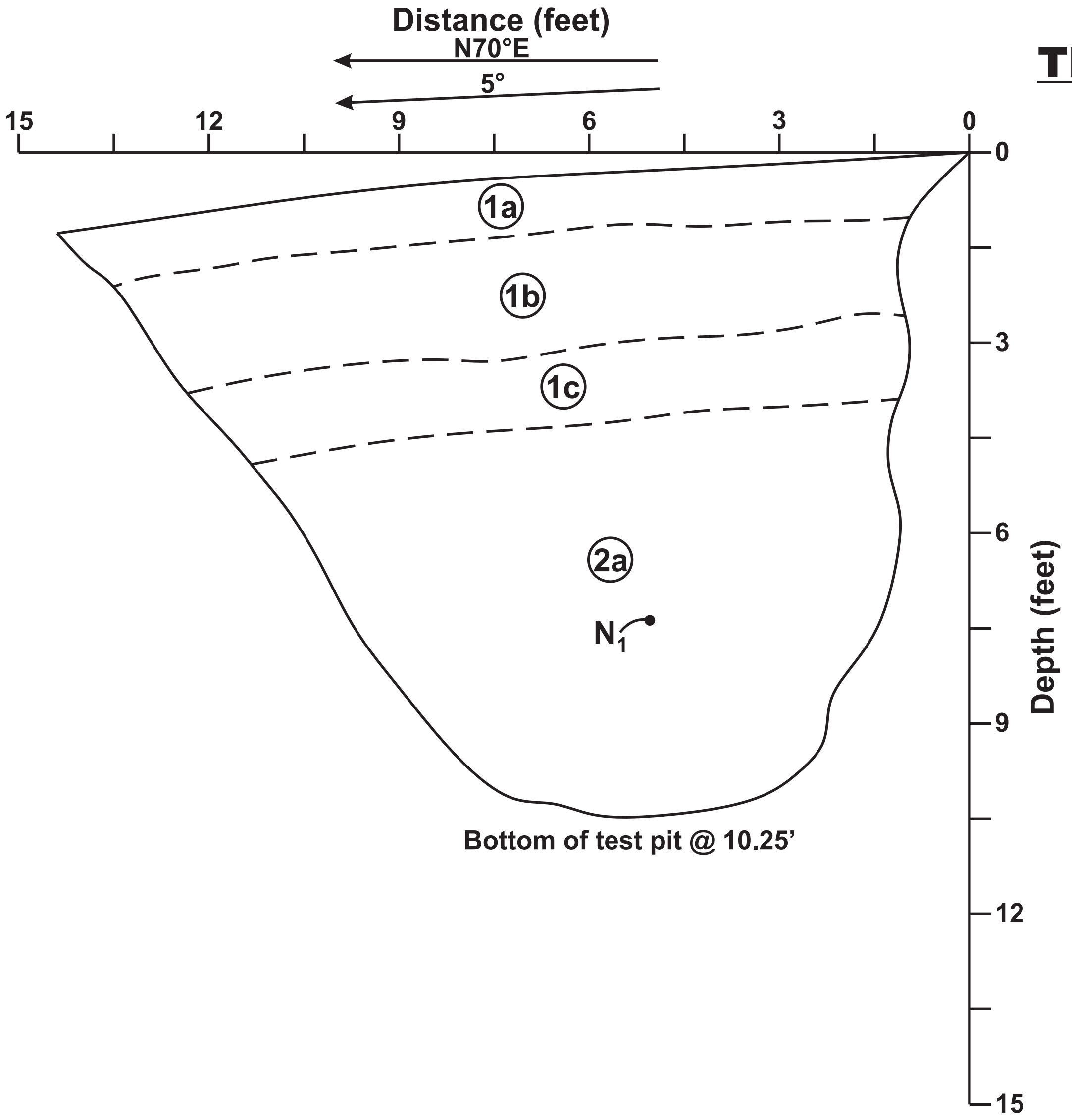
CORNERSTONE EARTH GROUP

Test Pit 6

Shriner-Lester Property
Pleasanton, CA

Project Number	132-8-2
Figure Number	
Date	September 2014
Drawn By	RRN

TP-7



(1a)	**Sandy Silt with Clay:** Dark brown, damp, stiff, [residual soil]
(1b)	**Silty Gravel:** Light yellow-brown, damp, medium dense
(1c)	**Lean Clay:** Dark gray, damp, very stiff
(2a)	**Claystone:** Olive gray, damp, very weak, thin bedded

Notes:

N_1 = N50°W/15°SW: bedding

Scale: 1" = 3'

CORNERSTONE EARTH GROUP

Test Pit 7

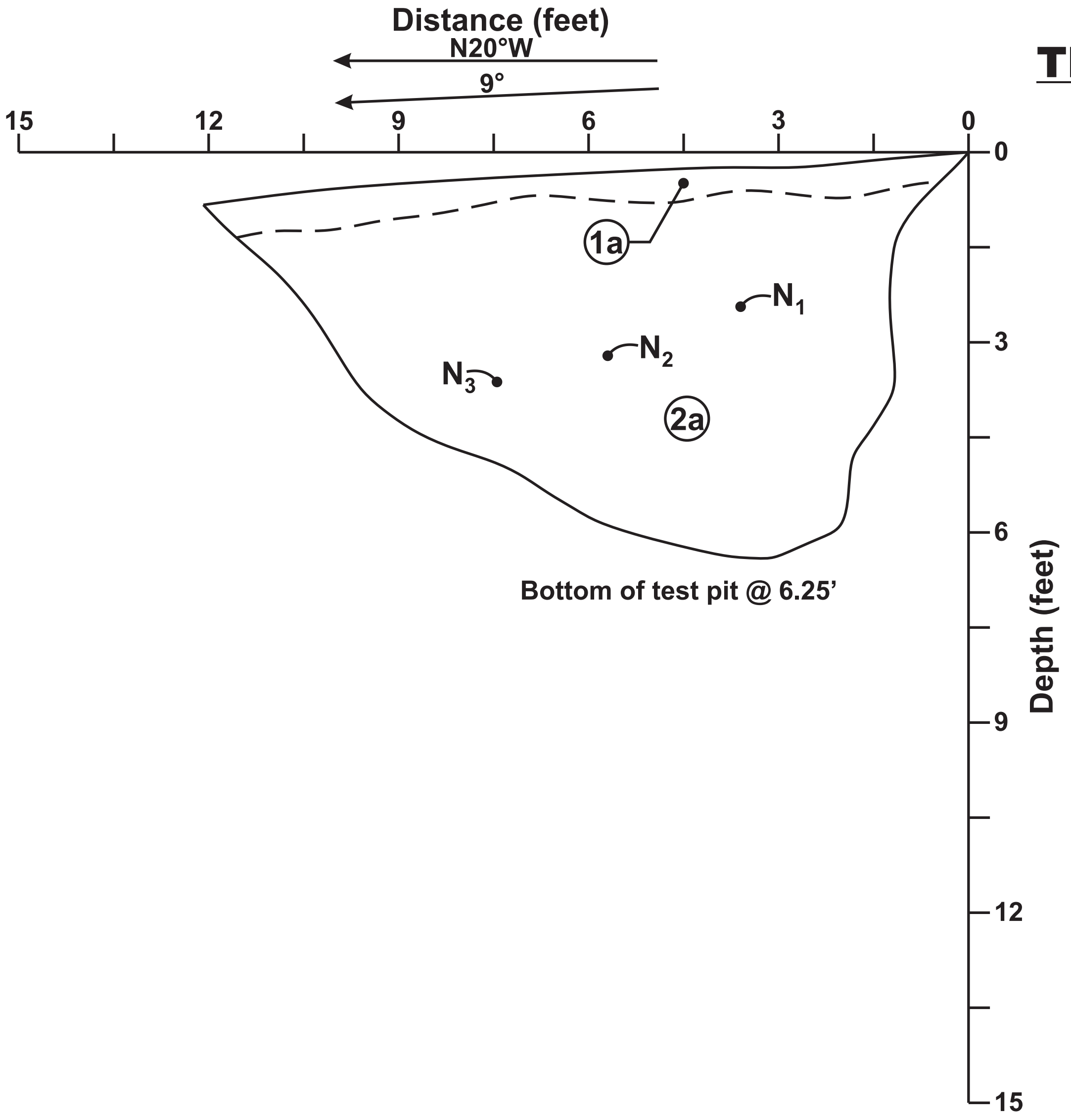
Shriner-Lester Property
Pleasanton, CA

Project Number
132-8-2

Figure Number

Date September 2014

Drawn By RRN



TP-8

① 1a Silty fine Sand: Medium yellow-brown, damp, [residual soil]

② 2a Sandstone: Light yellow-brown, damp, weak, thin bedded

Notes:

N_1 = N20°E/80°SE: joint set

N_2 = N45°W/41°NE: joint set

N_3 = N40°W/41°SW: bedding

Scale: 1" = 3'

CORNERSTONE
EARTH GROUP

Test Pit 8

Shriner-Lester Property
Pleasanton, CA

Project Number	132-8-2
Figure Number	
Date	September 2014
Drawn By	RRN

APPENDIX B: PREVIOUS SUBSURFACE AND LABORATORY TEST DATA

(LOWNEY ASSOCIATES, 1998)

We also reviewed the subsurface data performed on the Lester Property contained in the Preliminary Geotechnical and Geologic Report prepared by Lowney Associates dated March 4, 1998. The previous test pit logs and laboratory test data, as well as a key to the classification of the soil and bedrock, are included as part of this appendix.

A seismic refraction survey was also performed as part of the 1998 preliminary investigation. The seismic refraction survey data presented in the 1998 report is also included as part of this appendix.

APPENDIX A

FIELD INVESTIGATION

Exploratory Test Pits: The field investigation consisted of a surface reconnaissance and a subsurface exploration program using a rubber-tired backhoe equipment to excavate 19 exploratory test pits on October 22 and 23, 1997, to a maximum depth of 18 feet. The approximate locations of the test pits are shown on the Site Plan, Figure 2. The soils encountered were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D-2488). A summary of the subsurface conditions encountered in our test pits is summarized in Table A-1. A key to the classification of the soil and rock, are included as part of this appendix.

The locations of the test pits were approximately determined by pacing from reference, and should be considered accurate only to the degree implied by the method used. Representative bulk soil samples were obtained from the test pits at selected depths. All samples were returned to our laboratory for evaluation and appropriate testing.

TABLE A-1
SUMMARY OF EXPLORATORY TEST PITS

Test Pit Number	Depth (feet)	Description	
TP-1	0-7	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown, moist ,trace fine sand, rootlets
	7-11	**Bedrock:**	*Sandstone* - Reddish-brown to brown, highly weathered, friable, fine to medium sand, interbedded siltstone
TP-2	0-1½	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown, dry to moist, trace fine sand and gravel, trace rootlets
	1½ -5	**Bedrock:**	*Sandstone* - Light brown and reddish brown, highly weathered, very friable, fine to medium sand, interbedded siltstone
TP-3	0-5½	**Colluvium:**	*Silty Clay (CL-CH)* - Brown to dark brown, dry to moist, trace fine sand and gravel, trace rootlets
	5½-7½	**Bedrock:**	*Sandstone* - Light brown and reddish brown, highly weathered, friable, fine to medium sand, interbedded siltstone

TP-4	0-3	**Bedrock:**	*Sandstone* - Brown, moderately weathered, medium strong to strong, fine to medium sands, interbedded siltstone
TP-5	0-2	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry , trace fine sand, trace rootlets
	2-9	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown, moist, trace fine to medium sand (becomes green at 8½ feet)
	9-11½	**Bedrock:**	*Sandstone to Siltstone* - Green, highly weathered, very friable, fine to medium sand
	11½-13½	**Bedrock:**	*Sandstone to Siltstone* - Green, slightly to moderately weathered, moderately strong to strong, fine to medium sand
TP-6	0-4	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry to moist , trace fine sand, trace rootlets
	4-12	**Bedrock:**	*Sandstone* - Light brown, mottled reddish-brown, highly weathered, friable, fine sand
	12-17	**Bedrock:**	*Sandstone* - Green, highly weathered, friable, fine to medium sand
	17-18	**Bedrock:**	*Sandstone* - Gray, highly weathered, friable, fine to medium sand
TP-7	0-2½	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry to moist , trace fine sand, trace gravel, trace rootlets
	2½-5½	**Bedrock:**	*Sandstone* - Brown and reddish-brown, slightly to moderately weathered, moderately strong, fine to medium sand
TP-8	0-3	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown, moist , trace fine sand, trace gravel, trace rootlets
	3-8½	**Colluvium:**	*Silty Clay (CL)* - Brown, moist , trace sand and gravel
	8½-10½	**Bedrock:**	*Sandstone* - Brown and reddish-brown, slightly to moderately weathered, weak to moderately strong
TP-9	0-3½	**Bedrock:**	*Sandstone* - Brown and reddish-brown, slightly weathered, weak to moderately strong, moderately to highly fractured
TP-10	0-2½	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry , trace sand, trace rootlets
	2½-10½	**Colluvium:**	*Silty Clay (CL)* - Dark brown, moist , trace sand and gravel
	10½-18	**Bedrock:**	*Sandstone* - Brown and reddish-brown, moderately to highly weathered, friable, highly fractured, interbedded siltstone, less weathering with depth

TP-11	0-2	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry , trace fine sand, trace rootlets
	2-11	**Colluvium:**	*Silty Clay (CL-CH)* - Brown to dark brown, moist, trace sand and gravel (becomes green at 8½ feet)
	11-14½	**Bedrock:**	*Sandstone to Siltstone* - Gray and reddish-brown, highly to completely weathered, very friable
	14½-17½	**Bedrock:**	*Sandstone to Siltstone* - Gray and reddish-brown, highly weathered, weak, highly fractured
TP-12	0-2½	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown to black, dry to moist, trace rootlets
	2½-8	**Bedrock:**	*Sandstone* - Light brown and reddish-brown, moderately to highly weathered, friable, interbedded siltstone
	8-10½	**Bedrock:**	*Sandstone* - Light brown and reddish-brown, moderately weathered, friable, highly fractured, interbedded siltstone
TP-13	0-2½	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown to black, dry to moist, trace rootlets
	2½-4½	**Bedrock:**	*Sandstone* - Light brown and reddish-brown, moderately weathered, friable, highly fractured, interbedded siltstone
TP-14	0-1	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown, dry to moist, trace rootlets
	1-7	**Bedrock:**	*Interbedded Sandstone and Shale* - Brown and gray, moderately to highly weathered, highly fractured
	7-8½	**Bedrock:**	*Interbedded Sandstone and Shale* - Brown and gray, moderately weathered, moderately hard, highly fractured
TP-15	0-4	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry to moist, trace sand, trace rootlets
	4-7	**Bedrock:**	*Sandstone* - Light brown and reddish-brown, moderately weathered, friable, moderately to highly fractured, fine to medium sand, less weathering with depth
TP-16	0-3	**Colluvium:**	*Silty Clay (CL-CH)* - Black, mottled gray and reddish-brown, moist, trace sand, trace weathered sandstone
	3-11	**Bedrock:**	*Sandstone* - Light brown, mottled reddish-brown, completely weathered, fine to medium sand, interbedded siltstone
	11-17½	**Bedrock:**	*Siltstone to Claystone* - Gray, mottled green, highly to completely weathered, friable, sulfur odor, organics
	17-18		

		Bedrock:	*Sandstone* - Gray, highly weathered, friable, fine to medium sand
TP-17	0-2	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, dry, trace rootlets
	2-4	**Colluvium:**	*Silty Clay (CL-CH)* - Dark brown, moist, trace sand, trace weathered sandstone
	4-8½	**Bedrock:**	*Sandstone* - Mottled brown, reddish-brown and gray, highly to completely weathered, very friable, highly fractured, less weathering with depth
TP-18	0-½	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, moist, trace sand, trace weathered bedrock
	½-3	**Bedrock:**	*Sandstone* - Brown and reddish-brown, slightly to moderately weathered, strong, fractured, interbedded siltstone
TP-19	0-1½	**Colluvium:**	*Silty Clay (CL-CH)* - Brown, moist, trace sand, trace weathered bedrock
	1½-3	**Bedrock:**	*Sandstone* - Brown and reddish-brown, slightly to moderately weathered, strong, fractured, interbedded siltstone

Seismic Refraction Survey: Our seismic refraction survey was performed on October 18, 1997 to determine the rippability of the existing bedrock. Four seismic lines ranging from 165 to 220 feet long were performed across the northeast portion of the site, as shown on the Site Plan, Figure 2.

A seismic refraction survey is performed by introducing an energy source at one location, known as a shot point, and measuring the arrival time of the waves through equally-spaced intervals using geophones. Our seismic lines consisted of 12 geophones spaced at 20-foot intervals on Lines 1, 2, and 3 and at 15-foot intervals on Line 4. The energy source consisted of a sledge hammer striking a metal plate used to create compression waves (P-waves). Signals were recorded from various shotpoints along each line using a 12-channel Geometrics SmartSeis S-12 Seismograph. The plate was struck repeatedly at each shot point and the results were stacked in order to improve the signal-to-noise ratio of the records.

The seismograph recordings were then used to determine the arrival time of the P-wave from each shot point to each geophone. The waves would either travel along the surface or be refracted from an interface between materials. A refraction would occur if the materials below the interface have a greater P-wave velocity than the material above the interface. The arrivals times were then inputted into a computer program with elevation, location, and layer control information to determine the average velocities of each layer.

The results of the computer analysis of the refraction data indicate that we encountered three seismic layers beneath each line. The approximate depth to interface and range of P-wave velocities for each layer are summarized in Table A-2 below.

TABLE A-2. **SUMMARY OF REFRACTION RESULTS**

Layer Number	Approximate Depth to Interface (feet)	Estimated Layer Velocity (feet per second)
1	5-10	1,300 - 1,800
2	10-20	3,200 - 4,200
3	> 20	6,900 - 8,900

According to the Caterpillar© Performance Handbook, bedrock with velocities less than 7,000 feet per second (fps) is considered rippable by a Caterpillar D-9N tractor with Single Shank No. 9 rippers. Sandstone, siltstone, and shale bedrock with velocities up to 8,500 fps is considered rippable with a Caterpillar D-10N tractor with Single Shank No. 10 rippers. Once bedrock velocities begin approaching 9,000 to 10,000 fps, the bedrock would be marginally to non-rippable by the above mentioned equipment.

The attached test pit summary, seismic refraction data, and related information depict subsurface conditions only at the locations indicated and at the particular date designated above. Subsurface conditions at other locations may differ from conditions occurring at these test pit locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines in the table represent the approximate boundary between soil types and the transition may be gradual.

* * * * * * * * *

PRIMARY DIVISIONS				SOIL TYPE	LEGEND	SECONDARY DIVISIONS
COARSE GRAINED SOILS	MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW	○	Well graded gravels, gravel–sand mixtures, little or no fines
				GP	●	Poorly graded gravels or gravel–sand mixtures, little or no fines
			GRAVEL WITH FINES	GM	▓	Silty gravels, gravel–sand–silt mixtures, plastic fines
				GC	▨	Clayey gravels, gravel–sand–clay mixtures, plastic fines
		SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW	░	Well graded sands, gravelly sands, little or no fines
				SP	⁚	Poorly graded sands or gravelly sands, little or no fines
			SANDS WITH FINES	SM	▥	Silty sands, sand–silt–mixtures, non–plastic fines
				SC	▨	Clayey sands, sand–clay mixtures, plastic fines
FINE GRAINED SOILS	MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML	▥	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
				CL	▧	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	▥	Organic silts and organic silty clays of low plasticity
		SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH	▥	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
				CH	▧	Inorganic clays of high plasticity, fat clays
				OH	▧	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS				PT	◡	Peat and other highly organic soils

DEFINITION OF TERMS

U.S. STANDARD SIEVE SIZE — CLEAR SQUARE SIEVE OPENINGS

	200	40	10	4	3/4"	3"	12"
SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

▯ TERZAGHI SPLIT SPOON STANDARD PENETRATION

▧ MODIFIED CALIFORNIA

▥ D & M UNDERWATER SAMPLER

▮ PISTON SAMPLER

SAMPLERS

∇ AT TIME OF DRILLING

▼ MEASURED FOLLOWING DRILLING

GROUND WATER

SAND AND GRAVEL	BLOWS/FOOT*
VERY LOOSE	0–4
LOOSE	4–10
MEDIUM DENSE	10–30
DENSE	30–50
VERY DENSE	OVER 50

RELATIVE DENSITY

SILTS AND CLAYS	STRENGTH+	BLOWS/FOOT*
VERY SOFT	0–1/4	0–2
SOFT	1/4–1/2	2–4
MEDIUM STIFF	1/2–1	4–8
STIFF	1–2	8–16
VERY STIFF	2–4	16–32
HARD	OVER 4	OVER 32

CONSISTENCY

*Number of blows of 140 pound hammer falling 30 inches to drive a 2–inch O.D. (1–3/8 inch I.D.) split spoon (ASTM D–1586).
+Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D–1586), pocket penetrometer, torvane, or visual observation.

KEY TO EXPLORATORY BORING LOGS

Unified Soil Classification System (ASTM D–2487)

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE A–1

WEATHERING

FRESH	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if cystalline.	**MODERATELY SEVERE**	All rock except quartz, discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.
VERY SLIGHT	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.	**SEVERE**	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
SLIGHT	Rock generally fresh, joints stained, sand discoloration extends into rock up to 1 inch. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.	**VERY SEVERE**	All rock except quartz discolored and stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
MODERATE	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some are clayey. Rock has dull sound under hammmer and shows significant loss of strength as compared with fresh rock.	**COMPLETE**	Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small scattered locations. Quartz may be present as dikes or stringers.

HARDNESS

VERY HARD	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.	**MEDIUM**	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces abount 1 inch maximum size by hard blows of the point of a geologist's pick.
HARD	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.	**SOFT**	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
MODERATELY HARD	Can be scratched with knife or pick. Gouges or grooves to 1/4 inch deep can be excavated by hard blow or point of a geologist's pick. Hard specimen can be detached by moderate blow.	**VERY SOFT**	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

JOINT BEDDING AND FOLIATION SPACING IN ROCK*

Spacing	Joints	Bedding and Foliation
Less than 2 in.	Very close	Very thin
2 in. to 1 ft.	Close	Thin
1 ft. to 3 ft.	Moderately close	Medium
3 ft. to 10 ft.	Wide	Thick
More than 10 ft.	Very Wide	Very thick

ROCK QUALITY DESIGNATOR (RQD)**

RQD, as a percentage	Diagnostic description
Exceeding 90	Excellent
90–75	Good
75–50	Fair
50–25	Poor
Less than 25	Very poor

*Joint spacing refers to the distance normal to the plane of the joints of a single system or "set" of joints that are parallel to each other or nearly so. The spacing of each "set" should be described, if possible to establish.

**RQD should always be given as a percentage. Diagnostic description is intended primarily for evaluating problems with tunnels or excavation in rock. RQD = 100 (lengths of core in pieces 4 in. and longer/length of run)(1 in. = 25.4 mm; 1 ft. = 0.305 m)

KEY TO BEDROCK DESCRIPTIONS

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE A–2

APPENDIX B

LABORATORY INVESTIGATION

The laboratory testing program was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site and to aid in verifying soil classification.

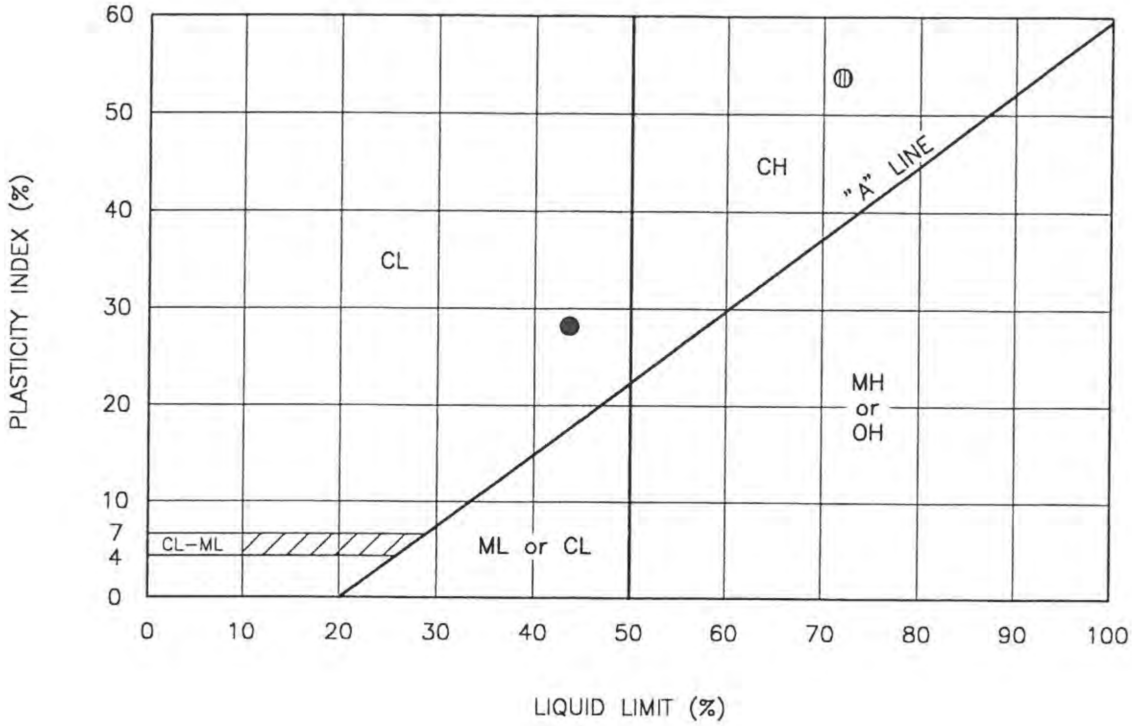
Moisture Content: The natural water content was determined (ASTM D-2216) on all samples of the materials recovered from the test pits, as summarized in Table B-1.

TABLE B-1. **MOISTURE CONTENT DATA**

Test Pit Number	Sample Number	Estimated Depth (feet)	Moisture Content (percent)	Test Pit Number	Sample Number	Estimated Depth (feet)	Moisture Content (percent)
TP - 4	1	0 - 3	8	TP - 10	1	2½ - 10½	27
TP - 5	1	2 - 9	24	TP - 10	2	10½ - 17	24
TP - 5	2	9 - 11½	14	TP - 11	1	11 - 14½	31
TP - 5	3	11½ - 13½	2	TP - 11	2	14½ - 17½	26
TP - 6	1	0 - 4	15	TP - 12	1	2½ - 8	18
TP - 6	2	4 - 12	25	TP - 14	1	7 - 8½	13
TP - 6	3	12 - 17	27	TP - 16	1	0 - 3	22
TP - 6	4	17 - 18	33	TP - 16	2	11 - 17½	32
TP - 7	1	0 - 2½	7				
TP - 7	2	2½ - 5½	12				
TP - 8	1	0 - 3	11				
TP - 8	2	3 - 8½	16				
TP - 8	3	8½ - 10½	12				

Plasticity Index: Plasticity Index determinations (ASTM D-4318) were performed on two samples of the subsurface soils to measure the range of water contents over which these materials exhibit plasticity. The Atterberg Limits were used to classify the soil in accordance with the Unified Soil Classification System and to evaluate the soil expansion potential. Results of these tests are presented on Figure B-1.

* * * * * * * * *



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	PASSING #200 SIEVE (%)	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
●	TP–8/1	3.0	11	44	28	––	–0.2	CL
◍	TP–16/1	3.0	22	72	53	––	0.1	CH

11/97•EB

PLASTICITY CHART AND DATA

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

FIGURE B–1
1080–6B

E.2 - Updated Geotechnical Review

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Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

February 12, 2025
Project No. 403620002

Ms. Mary Bean
FirstCarbon Solutions
1350 Treat Boulevard, Suite 380
Walnut Creek, California 94597

Subject: Update Geotechnical Review
Hidden Canyon Residences and Preserve
Dublin Canyon Road
Pleasanton, California

Dear Ms. Bean:

In accordance with your request, we have performed a geotechnical review of additional documents for the proposed Hidden Canyon Residences and Preserve project in Pleasanton, California. The purpose of our review was to provide an opinion regarding whether the consultant, Cornerstone Earth Group, has adequately addressed issues regarding slope stability and provided adequate recommendations for preparation of the proposed residential building pads. Ninyo & Moore previously performed a review of geotechnical reports prepared by Cornerstone Earth Group, dated October 22, 2014, and October 9, 2017. Our conclusions and recommendations were presented in our Geotechnical Review letter, dated October 25, 2019. For this current study, we have been provided the following documents for our review:

- Cornerstone Earth Group, 2020, Updated Preliminary Geotechnical & Geologic Report, Lester-Shriner Property Residential Development, Dublin Canyon Road, Pleasanton, California, dated March 31.

- Cornerstone Earth Group, 2022, Geotechnical Response to Comments, Hidden Canyon – Lester/Shriner Property, Dublin Canyon Road, Pleasanton, California, dated May 3.

- Ponderosa Homes, 2023, Project Description Overview, “Hidden Canyon”, Lester & Shriners Property, City of Pleasanton, Alameda County, California, dated March.

- Ruggeri-Jensen-Azar, 2024, Vesting Tentative Map, Tract 8569 – Hidden Canyon (Lester and Shriner’s Property), City of Pleasanton, Alameda County, California, dated July 31.

SITE AND PROJECT DESCRIPTION

The site is located on the south side of Dublin Canyon Road, encompasses approximately 128 acres of hillside property, and is comprised of two parcels known as the Shriner and Lester parcels

(VTM, 2024). The Shriner parcel is located in the northwest corner of the site, adjacent to Dublin Canyon Road, and the larger Lester parcel covers the remaining portion of the project. Most of the site is undeveloped and used for cattle grazing, and covered with annual grasses and a few scattered trees. The natural slopes are predominately southeast and northeast facing, up to 200 feet in height, and are moderately steep inclined with slope ratios of about 5H:1V to 2½H:1V (horizontal to vertical). Steeper slopes with ratios of about 2H:1V are present along Devaney Canyon. The southeast-facing slopes drain into Devaney Canyon, which is a major tributary to Dublin Creek.

The proposed project includes construction of 30 single-family residential lots, paved roadways, and graded slopes (VTM, 2024). Fill slopes planned for the site are approximately 35 feet high or less. One 2H:1V cut slope planned behind Lots 13/14 is approximately 50 feet high (Cornerstone, 2022). Cut/fill transitions are anticipated for some of the proposed building pads. Hillside grading techniques including the construction of keyways and buttresses are proposed as part of the earthwork construction.

SUBSURFACE EXPLORATION

A preliminary field exploration was performed in 1997 by Lowney Associates on the Lester parcel and in 2014 by Cornerstone Earth Group on the Shriner parcel. The Lowney exploration included 19 test pits excavated to depths ranging from 3 to 18 feet. Thirteen of the 19 test pits were conducted on the Lester parcel. The Lowney exploration also included seismic refraction surveys to assess the rippability of the underlying bedrock. The locations of the test pits and seismic refraction surveys, the test pit logs, results of the seismic refraction surveys, and limited laboratory test results from the Lowney study are included in the Cornerstone Earth Group (2020) report.

The 2014 Cornerstone Earth Group study on the Shriner parcel included 8 test pits excavated to depths ranging from approximately 5 to 15 feet. Two supplemental borings were performed on the western end of the Shriner parcel to depths ranging from approximately 25 to 31 feet. Geologic mapping of the site was conducted by Cornerstone Earth Group in 2014, and presented on Figure 2 of their 2020 report. Limited laboratory testing was conducted by Lowney (1998). The Cornerstone Earth Group (2020) did not perform any laboratory testing as part of their study.

GEOLOGIC SUMMARY

The geologic conditions at the site are described in the Cornerstone Earth Group (2020) report, which references published regional geologic maps that cover the area (Dibblee, 1980; Dibblee and Minch, 2005; Graymer et al., 1996). Based on their report and regional geologic maps, the site is underlain by Miocene age marine sedimentary rocks. The underlying sedimentary rock types include sandstone, siltstone, and siliceous shale. These rock units are folded and transected by northwest trending faults. The faults are considered inactive and are not located in an Alquist-Priolo Earthquake Fault Zone (CDMG, 1982). Bedding within the rock units is moderately to steeply dipping and varies in direction due to localized folding and faulting. The sedimentary rocks are overlain by colluvial soils up to 13 feet in thickness (Cornerstone Earth Group, 2020).

The landslide hazard map by Majmundar (1996) shows the sloping portions of the Lester parcel within an area marginally susceptible to landsliding, and an area having a relatively high susceptibility to landsliding on the western end of the Shriners parcel. The previous investigation by Lowney Associates (1998) shows four shallow landslides within colluvium filled swales on the south-facing slopes above Devaney Canyon on the Lester parcel. Cornerstone Earth Group (2020) evaluated these landslide features and concluded these features are not the result of slope movements but are the result of seasonal downhill creep of the surficial colluvial soils. The Cornerstone Earth Group (2020) recommended the colluvial material be removed and replaced as an engineered fill buttress. Cornerstone Earth Group (2020) also evaluated the larger suspected landslide mass mapped by Majmunder (1996) on the western end of the Shriner parcel. They drilled two borings and excavated one test pit within the suspected landslide mass and concluded that a landslide is not present.

GEOLOGIC ISSUES AND GEOTECHNICAL CONCERNS

Our review focused on issues regarding slope stability and recommendations for preparation of the proposed building pads. The following summaries describe how the geotechnical consultant addressed these issues:

Slope Stability

The Cornerstone Earth Group (2020) report includes a discussion regarding the stability of the natural slopes and proposed cut and fill slopes. They described the presence of colluvial material that will be susceptible to creep and potential slope instability on the slopes above Devaney Canyon and a possible larger landslide mass on the Shriner parcel depicted on a regional landslide hazard map prepared by Majmundar (1996). The colluvial materials are depicted on Figure 2 of their 2020 report and are mapped in the swales that drain into Devaney Canyon. They recommended that the colluvial material be over-excavated and replaced as an engineered fill buttress. In some areas where colluvium over-excavation below keyways is not feasible, they indicated it may be necessary to stabilize the keyways with buried stitch piers, subsurface drains and/or geosynthetic grids.

Cornerstone Earth Group (2022) indicated that detailed mitigation recommendations regarding the on-site colluvial materials will be presented in future design-level geotechnical reports.

For the larger suspected landslide mass on the Shriner parcel, Cornerstone Earth Group (2020) drilled two borings, EB-1 and EB-2, and used a dry rock coring technique to observe the underlying bedrock within the limits of the suspected landslide mass. Based on the subsurface information collected from the borings and one test pit, and their review of aerial photographs, they concluded that the landslide was not present.

For proposed cut and fill slopes, Cornerstone Earth Group (2020) recommended that all cut slopes in bedrock have a maximum inclination of 2H:1V, and all cut slopes should be observed by an engineering geologist during site grading to confirm that cuts exposed relatively competent, favorably bedded rock. For fill slopes derived from on-site soil or bedrock, they recommended a maximum ratio of 2H:1V, and that fill slopes be overbuilt and trimmed back, exposing engineered fill when complete. If adverse bedding conditions are encountered during site grading, some slopes may need to be over-excavated and re-constructed as a buttress fill slope.

Cornerstone Earth Group (2020) recommended that south-facing cut slopes greater than 10 feet high be over-excavated and reconstructed as an engineered fill buttress. Their report also includes preliminary recommendations for keyway sizes, construction parameters, and subdrainage. In general, they recommended that fill placed on existing ground inclined at 6:1 or greater, or new cut slope buttress fills, should be benched into the existing slope and a keyway constructed at the toe of the fill. Keyways are recommended to be at least 5 feet below grade or into competent bedrock, be at least 20 to 25 feet wide, and be angled slightly into the slope. Typical keyway and bench detail is shown on Figure 6 in the Cornerstone Earth Group (2020) report.

Building Pad Preparation

The Cornerstone Earth Group (2020) report includes recommendations for preparation of the proposed building pads and specific recommendations for building pads where a cut/fill transition may occur. They recommended over-excavation of the cut portion of the pad in order to provide a more uniform thickness of fill beneath the pads where a cut/fill transition occurs. They recommended a minimum of 5 feet of over-excavation in the cut portion for these pads. Typical cut/fill transition-over-excavation detail is shown on Figure 5 in the Cornerstone Earth Group (2020) report.

Design-Level Geotechnical Evaluation

The Cornerstone Earth Group (2020) report recommended that a design-level geotechnical investigation be performed for the project once detailed site development plans are available. The design-level investigation findings will be used to confirm the preliminary recommendations for design and construction.

GEOTECHNICAL REVIEW CONCLUSIONS AND RECOMMENDATIONS

Following our review, we conclude that the geotechnical consultant has provided preliminary recommendations for slope stabilization and pad preparation that are appropriate for the proposed development. We concur with the consultant that a design-level geotechnical and engineering geologic study is needed for the project. The design-level study should include additional subsurface exploration, laboratory testing, slope stability analysis, and preparation of recommendations in conformance with the applicable version of the California Building Code.

LIMITATIONS

The geotechnical services described in this report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions and opinions presented in this report. Our conclusions are based on our review of the references listed.

We appreciate the opportunity to be of service.

Sincerely,
NINYO & MOORE

SCOTT M. JOHNSON
No. 2295

Scott M. Johnson, PG, CEG
Principal Engineering Geologist

Marlene Watson

Marlene Watson, PE, GE
Principal Engineer

MARLENE K. WATSON
No. 2538

SMJ/MKW/mlc

Attachment: References

Distribution: (1) Addressee (via e-mail)

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Ponderosa Homes, 2023, Project Description Overview, “Hidden Canyon”, Lester & Shriners Property, City of Pleasanton, Alameda County, California, dated March.

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E.3 - UC Berkeley Museum of Paleontology Records Search Results

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From: Patricia A Holroyd
To: Matthew Dionisio
Cc: Cultural Resources; Joe Stewart
Subject: Re: Records Search Request for 2148.0016 Hidden Canyon Residential Project
Date: Tuesday, March 25, 2025 8:02:12 AM
Attachments: Outlook-hetmi3u2.png
Addicott 1986 RRF to Hill.pdf
Monterey Group localities.xlsx

Dear Matthew,

I have conducted a review of the University of California Museum of Paleontology records for paleontological resources in or near your project area. We have no record of prior finds from the direct project area, but that is likely due to lack of prior access. Based on the geologic mapping of the area [Dibblee, T.W. and Minch, J.A., 2005, Geologic map of the Dublin quadrangle, Contra Costa and Alameda Counties, California, Dibblee Geological Foundation, Dibblee Foundation Map DF-164, 1:24,000], most of the project area is underlain by Miocene rocks of the Monterey Fm. or Group. These rocks have only been previously accessible in road cuts northwest of the project site along I-580.

I have attached an Excel file with the locality coordinates and cataloged specimen information for localities exposed along the highway northwest of your site. To date, only vertebrate specimens have been cataloged individually. So, I've also attached a USGS report on referred fossils that includes taxonomic information about the invertebrates from these sites. The invertebrate specimens were originally part of the collections at the USGS in Menlo Park and are now held here, but are not yet individually cataloged.

Billing will arrive separately from our campus business office.

Thank you, Pat Holroyd

Patricia A. Holroyd, Ph.D.
Senior Museum Scientist
Museum of Paleontology
University of California
Berkeley, CA 94720

On Thu, Mar 6, 2025 at 4:41 PM Matthew Dionisio <mdionisio@fcs-intl.com> wrote:

> Hello,
>
> My name is Matthew Dionisio and I am an environmental services analyst at FirstCarbon Solutions, an environmental compliance and consulting firm.

FirstCarbon Solutions is providing services for the Hidden Canyon Residential Project and is requesting a records search.

Would you be able to provide a records search within a 2-mile radius of the project site?

As required, I have attached a project map and provided information on the project location and our billing information for an invoice.

Project Location:

- Bounded by:
    - Dublin Canyon Road and Kingdom Hall of Jehovah's Witnesses to the North
    - Devany Creek to the East and South
    - East Bay Regional Park District lands and dense vegetation to the South
    - Open space and dense patches of vegetation to the West.
- Contains four Assessor's Parcel Numbers (APNs): 941-2500-002, 941-2500-003, 941-2600-002-06, and 941-2700-002.

Contact and Billing Information:

- **Email:** @ap@fcs-intl.com
- **Address:** FirstCarbon Solutions 250 Commerce Street, Suite 210 Irvine, CA 92602.

If you have any questions, you can contact me @mdionisio@fcs-intl.com

Thank you and have a great rest of your week!

Sincerely,
Matthew

Matthew Dionisio
Environmental Services Analyst I, Environmental Services

Mobile (925) 786-6232
PST

FCS

An ADEC Innovation

ucmp_coll	loc_ID_nu	loc_name	other_loc_no	epoch	grp	formation	lat_decima	long_deci	loc_description
I	D6335			Miocene		Sobrante	37.708	-121.982	Area collection made on the hill slopes just north of the freeway as it passes thru Dublin canyon. (Freeway 580). Fm. now mapped as Briones
I	D6336	Dublin Canyon		Miocene		San Pablo	37.700	-121.983	North side of freeway (580) in Dublin Canyon.
I	IP9192	Dublin qu	USGS Cenozoic M6608	Miocene	Monterey		37.698	-121.977	See report on referred fossils
I	IP9193	Dublin qu	USGS Cenozoic M6609	Miocene	Monterey		37.699	-121.980	See report on referred fossils
I	IP9194	Dublin qu	USGS Cenozoic M6610	Miocene	Monterey		37.700	-121.985	See report on referred fossils
I	IP9195	Dublin qu	USGS Cenozoic M6611	Miocene	Monterey		37.699	-121.983	See report on referred fossils
I	IP9196	Dublin qu	USGS Cenozoic M6612	Miocene	Monterey	Sobrante S	37.703	-121.995	See report on referred fossils
I	IP9197	Dublin qu	USGS Cenozoic M6613	Miocene	Monterey	Sobrante S	37.703	-121.995	See report on referred fossils
I	IP9198	Dublin qu	USGS Cenozoic M6614	Miocene		Monterey	37.703	-121.998	See report on referred fossils
I	IP9202	Hollis Car	USGS Cenozoic M6618	Miocene	Monterey	Sobrante S	37.707	-122.001	See report on referred fossils
I	IP9207	Dublin qu	USGS Cenozoic M6623	Miocene	Monterey		37.698	-121.978	See report on referred fossils
I	IP9713	Edom Roa	USGS Cenozoic M8839	Miocene F	Monterey	Sobrante S	37.704	-122.000	Ledger: "California, Alameda County, Dublin 7.5' quadrangle. Approx. Latitude: 37 deg 42'09" Longitude: 121 deg 59'30". Specimens collected 1.8 miles east of Edom Road overpass on the north side of Highway 580, on a hill top about 90-100 feet above highway level. In bulldozed area. Sobrantess or Claremont shale. Collector: Field No: none" Updated georeference based on distance from Eden Canyon Road overpass to 37.704357 -121.999596 +/- 200 meters. Edom appears to be a misspelling of Eden. Added TRS info. PAHolroyd 24Mar2025
I	IP9714	Edom Roa	USGS Cenozoic M8840	Miocene.F	Monterey	Sobrante S	37.702	-121.987	Ledger: "California, Aladema County, Dublin 7.5' quadrangle. Approx. Latitude: 37 deg 42', Longitude: 121 deg 59'30". Specimens collected from bulldozed hill top about 45 to 100 feet above highway level, 1.8 miles east of Edom Road overpass on the north side of 580 highway. Sobrante sandstone or Claremont shale. Collector:: Field No: none" Updated georeference based on distance from Eden Canyon Road overpass to 37.700226 -121.986785 +/- 200 meters. Edom appears to be a misspelling of Eden. Added TRS info. PAHolroyd 24Mar2025
V	V5601	Eden Creek 1		Miocene	Monterey	Sobrante S	37.704	-122.022	
V	V5602	Eden Creek 2		Miocene	Monterey	Sobrante S	37.704	-122.021	
V	V78084	Dublin Canyon 1		Miocene		Claremont	37.704	-121.993	

FORM 9-1861 (OCT 1972)

U.S. GEOLOGICAL SURVEY

REPORT ON REFERRED FOSSILS

LINE UP TYPE XX

1

LINE UP TYPE XX

STRATIGRAPHIC RANGE: Miocene

GENERAL LOCALITY: California

QUADRANGLE OR AREA: Various quadrangles as listed below

KINDS OF FOSSILS: Mollusks

REFERRED BY: James M. Hill, Chemical Resources Branch

REPORT PREPARED BY: W. O. Addicott

SHIPMENT NUMBER: OER-76-8M

REGION: Alameda Co.

DATE RECEIVED: 05/06/76

STATUS OF WORK: Complete

DATE REPORTED: 06/22/76

This report is based upon several collections of mollusks from Miocene formations in the northernmost part of the Diablo Range, east of San Francisco Bay. Very few age determinations can be made from this material owing to poor conditions of preservation; accordingly, age determinations are cited only for those collections in which age diagnostic mollusks could be identified. This kind of preservation seems to be characteristic of Miocene formations of this area.

Field loc. 1-8-3 (USGS Cenozoic loc. M6614). 3,100 feet N, 2,850 feet W of SE cor. sec. 5, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Sobrante Sandstone.

Bivalve:
PATINOPECTEN cf. P. HAYWARDENSIS (Lutz)

Age and correlation: middle Miocene, *Temblor* Stage of the Pacific Coast chronology.

Environment: middle to inner neritic (sublittoral) zone at depths greater than about 20 metres.

Field loc. 1-6-9 (USGS Cenozoic loc. M6613). 3,200 feet N, 2,000 feet W of SE cor. sec. 5, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Sobrante Sandstone.

Bivalve:
PATINOPECTEN sp.

Age: probably middle Miocene inasmuch as this genus appears in the middle Miocene and is not known to occur in late Miocene formations in California. Moreover, the fragment resembles the material from loc. M6614. @

FORM 9-1861 (OCT 1972)

U.S. GEOLOGICAL SURVEY

LINE UP TYPE XX

REPORT ON REFERRED FOSSILS

2 XX.

STRATIGRAPHIC RANGE

GENERAL LOCALITY (STATE, COUNTRY, OCEAN, ETC.)

QUADRANGLE OR AREA

KINDS OF FOSSILS

REFERRED BY

REPORT PREPARED BY

SHIPMENT NUMBER OER-76-8M

REGION

DATE RECEIVED

STATUS OF WORK

DATE REPORTED

Field loc. 11-13-3 (USGS Cenozoic loc. M6615). 900 feet S, 950 feet W of NE cor. sec. 4, T. 6 S., R. 1 E., Calaveras Reservoir 7-1/2 minute quadrangle. Oursan Sandstone?

Bivalve:
?MACOMA sp.

Field loc. 1-7-3 (USGS Cenozoic loc. M6611). 1,750 feet N, 1,300 feet E of SW cor. sec. 4, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Monterey Group.

Fish or shark remains

Field loc. 1-14-7 (USGS Cenozoic loc. M6623). 1,300 feet N, 2,900 feet E of SW cor. sec. 4, T. 3 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Monterey Group.

Bivalve:
Undetermined fragment

Field loc. 12-17-4 (USGS Cenozoic loc. M6618). Hollis Canyon, 300 feet S, 600 feet E of NW cor. sec. 5, T. 3 S., R. 1 W., Hayward 7-1/2 minute quadrangle. Sobrante Sandstone.

Bivalve:
Pectinid fragment, possibly a small PATINOPECTEN

Field loc. 11-4-3 (USGS Cenozoic loc. M6622). 1,000 feet S, 950 feet W of NE cor. sec. 4, T. 6 S., R. 1 E., Calaveras Reservoir 7-1/2 minute quadrangle. Claremont Shale.

B

FORM 9-1861 (OCT 1972)

U.S. GEOLOGICAL SURVEY

LINE UP TYPE

XX

REPORT ON REFERRED FOSSILS

3

LINE UP TYPE

XX

STRATIGRAPHIC RANGE

SHIPMENT NUMBER 0ER-76-8M

GENERAL LOCALITY (STATE, COUNTRY, OCEAN, ETC.)

REGION (COUNTY, PROVINCE, N.A., ETC.)

QUADRANGLE OR AREA

DATE RECEIVED MO. DAY YR.

KINDS OF FOSSILS

STATUS OF WORK

REFERRED BY

DATE REPORTED

REPORT PREPARED BY

Field loc. 11-4-3 (USGS Cenozoic loc. M6622) (continued)

Bivalve:
TELLINA?

Field loc. 12-29-9 (USGS Cenozoic loc. M6608). 1,250 feet N, 3,050 feet E of SW cor. sec. 4, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Monterey Group undifferentiated.

Bivalve:
YOLDIA cf. Y. TEMBLORENSIS Anderson and Martin

Age: probably middle Miocene.

Environment: probably neritic zone.

Field loc. 12-29-11 (USGS Cenozoic loc. M6609). 1,450 feet N, 2,250 feet E of SW cor. sec. 4, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Monterey Group.

Bivalves:
?SECURELLA - internal mold
SPISULA sp. - internal mold
Undetermined fragment

Field loc. 11-4-2 (USGS Cenozoic loc. M6621). 2,350 feet N, 1,550 feet E of SW cor. sec. 23, T. 4 S., R. 1 W., Niles 7-1/2 minute quadrangle. Oursan Sandstone.

Bivalves:
NUCULANA (SACCELLA) sp. - short, trigonal species
NUCULANA OCHSNERI (Anderson and Martin) @

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U.S. GEOLOGICAL SURVEY

LINE UP TYPE

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REPORT ON REFERRED FOSSILS

4

LINE UP TYPE

XX

STRATIGRAPHIC RANGE

SHIPMENT NUMBER OER-76-8M

GENERAL LOCALITY (STATE, COUNTRY, OCEAN, ETC.)

REGION (COUNTY, PROVINCE, STATE, ETC.)

QUADRANGLE OR AREA

DATE RECEIVED

KINDS OF FOSSILS

STATUS OF WORK

REFERRED BY

DATE REPORTED

REPORT PREPARED BY

Field loc. 11-4-2 (USGS M6621) (continued)

Bivalves:
TELLINA EMACERATA (Conrad)?
Undetermined bivalve

Age: probably middle Miocene

Environment: neritic or sublittoral zone, probably deeper than about 15-20 metres.

Field loc. 10-8-1 (USGS Cenozoic loc. M6619). 2,350 feet N, 950 feet E of SW cor. sec. 23, T. 4 S., R. 1 W., Niles 7-1/2 minute quadrangle. Hambre Sandstone.

Bivalves:
ANADARA sp.
NUCULANA sp.
TELLINA?

Field loc. 1-7-2 (USGS Cenozoic loc. M6610). 2,000 feet N, 250 feet E of SW corner section 4, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Monterey Group.

Gastropod:
NASSARIUS sp.

Bivalves:
PROTOTHACA TENERRIMA (Carpenter)?
SOLEN sp. - frag.
SPISULA sp.
TELLINA aff. T. EMACERATA (Conrad) @

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U.S. GEOLOGICAL SURVEY

LINE UP TYPE XX

REPORT ON REFERRED FOSSILS

LINE UP TYPE XX

STRATIGRAPHIC RANGE

SHIPMENT NUMBER OER-76-8M

GENERAL LOCALITY (STATE, COUNTRY, OCEAN, ETC)

REGION (COUNTY, PROVINCE, STATE, ETC)

QUADRANGLE OR AREA

DATE RECEIVED (DA YR)

KINDS OF FOSSILS

STATUS OF WORK

REFERRED BY

DATE REPORTED

REPORT PREPARED BY

Field loc. 1-7-1 (USGS M6610) (continued):

Age: probably middle Miocene or younger, but not certain owing to qualified determinations.

Environment: middle or inner sublittoral (or neritic) zone.

Field loc. 9-16-1 (USGS Cenozoic loc. M6616). Fire road 350 feet SW of junction with Hampton Road in T. 1 N., R. 3 W., Briones Reservoir 7-1/2 minute quadrangle.

Bivalves:
ANADARA?
CYCLOCARDIA sp.
SECURELLA sp.
SOLEN sp.

Age: owing to the fragmental nature of this material and poor preservation, it isn't possible to definitely say whether the collection is from the Sobrante Formation or the San Ramon Formation. Perhaps more material would produce additional taxa that would be diagnostic of provincial age.

Field loc. 1-6-5 (USGS Cenozoic loc. M6612). 5,200 feet N, 2,000 feet W of SE cor. sec. 5, T. 2 S., R. 1 W., Dublin 7-1/2 minute quadrangle. Sobrante Sandstone.

Gastropod:
MARGARITES?

Bivalves:
ACILA cf. A. MUTA Clark
NUCULANA OCHSNERI (Anderson and Martin)
Undetermined minute Venerid @

REPORT NOT TO BE QUOTED OR PARAPHRASED IN PUBLICATION WITHOUT A FINAL RECHECK BY THE PALEONTOLOGY AND STRATIGRAPHY BRANCH.

FORM 9-1861 (OCT 1972)

U.S. GEOLOGICAL SURVEY

REPORT ON REFERRED FOSSILS

LINE UP TYPE XX

6 LINE UP TYPE XX

STRATIGRAPHIC RANGE

SHIPMENT NUMBER OER-76-8M

GENERAL LOCALITY STATE, COUNTRY, OCEAN, ETC.

REGION COUNTY, PROVINCE, SEA, ETC.

QUADRANGLE OR AREA

DATE RECEIVED DAY

KINDS OF FOSSILS

STATUS OF WORK

REFERRED BY

DATE REPORTED

REPORT PREPARED BY

Field loc. 1-6-5 (USGS M6612) (continued):

Scaphopod:
DENTALIUM?

Age and correlation: early Miocene? The small ACILA suggests that this unit could be as old as early Miocene inasmuch as this species is not known to occur in younger formations. Alternatively, this could be a range extension into middle Miocene strata. Additional material, hopefully with a broader assemblage of mollusks, would be most helpful in resolving this apparent problem.

Field loc. 10-8-2 (USGS Cenozoic loc. M6620). 2,350 feet N, 950 feet E of SW cor. sec. 23, T. 4 S., R. 1 W., Niles 7-1/2 minute quadrangle. Same locality as M6619. Hambre Sandstone

Gastropod:
CANCELLARIA sp.

Bivalve:
NUCULANA sp.

Field loc. 9-17-3 (USGS M6617). Fire road 850 feet E of junction with Hampton Road, in T. 1 N., R. 3 W., Briones Reservoir 7-1/2 minute quadrangle. Tice Shale.

Bivalves:
DELECTOPECTEN PECKHAMI (Gabb)
NUCULANA sp.
TELLINA sp.

Continued in OER-76-8M, Part A ə