APPENDIX G

TRENCH INVESTIGATION [FAULT]

CORNERSTONE
EARTH GROUP

Date: August 4, 2021
Project No.: 105-117-2

Prepared For: John Donahoe
STANFORD REAL ESTATE
3160 Porter Drive, Suite 200
Palo Alto, California 94304

Re: Trench Investigation
Portola Terrace
Alpine Road
Portola Valley, California

Dear Mr. Donohoe:

The project site is located on the west side of Alpine Road and to the south of Westridge Drive in Portola Valley, California. Stanford owns an approximately 75-acre plot of land along Alpine Road and plans to develop the flatter, approximately 6-acre portion, closest to Alpine Road. This approximately 6-acre portion was called “The Stanford Wedge” and is now being called “Portola Terrace.”

As you know, we previously performed borings and CPTs in 2017 at the site and documented our results in a draft report titled “Preliminary Geotechnical and Geologic Hazard Investigation, The Stanford Wedge, Alpine Road, Portola Valley, California” dated September 18, 2017. During our field investigation we encountered Whiskey Hill Formation (“Twh”) and the Ladera Sandstone formation (“Tl”) bedrock units (concealed beneath the overlying Quaternary Terrace Deposits. The contact between the Whiskey Hill (on the south) against the Ladera (on the north) was historically depicted as a fault (a segment of the Hermit Fault) on various published geologic maps covering the area. However, the Town’s Geologic Map and Ground Movement Potential Map (CSA, 2017) depicts the contact as a depositional contact and the fault has been removed from the map.

We have been provided with the following:

- Review letter by the Town of Portola Valley titled “Planned Unit Development, Stanford Wedge, 3532 Alpine Road, File # PLN_ARCH0021-2019,” dated August 31, 2020.
- Civil plans titled “Stanford University Portola Terrace, Planning Package, Alpine Road, Portola Valley, CA,” prepared by Sandis Civil Engineers, Planners, Surveyors, dated July 14, 2020, ASCC Submittal November 10, 2020.
- Civil plans titled “Stanford University Portola Terrace, Vesting Tentative Map, Alpine Road, Portola Valley, CA,” prepared by Sandis Civil Engineers, Planners, Surveyors, dated November 10, 2020.

We attended a meeting with Town of Portola Valley, Cotton Shires Associates (Cotton), and Stanford Real Estate on April 20, 2021 regarding the bedrock contact and understand it is desired to perform trenching at the site to confirm the location and character of the contact and, if fault related, to characterize the potential risk to the proposed structures.

Our most recent scope of services was presented in our proposals dated May 11 and June 10, 2021 and consisted of field investigation for the purpose of identifying the Whiskey Hill Formation/Ladera Formation geologic contact across the site, and assessing the character of that geologic contact.

Background - Regional Geologic Mapping

Several published regional-scale geologic maps covering the Stanford and adjacent areas have shown the contact between the Whiskey Hill formation (map symbol “Twh”) and the Ladera Sandstone formation (map symbol “Tl”) as a faulted contact, which has been identified on some maps as a segment of the “Hermit Fault” [Page and Tabor, 1967; Brabb and Pampeyan 1983; Page 1993; Brabb et al., 1998; USGS Quaternary Fault/Fold Database, 2006, and Dibblee and Minch (2007)]. This mapping of the Twh/Tl contact was adopted by the USGS for their Quaternary Fault and Fold Database.

Pampeyan’s mapping program represents some of the most extensive local mapping as it focused on the Palo Alto 7.5 minute quadrangle (Figure 1). His map shows the Twh/Tl contact as a high-angle reverse fault and his projection of the contact through the subject site was based on projecting the contact between scattered outcrops (Twh vs. Tl) within Los Trancos Creek and trending along a natural break-in-slope that trends northwesterly across the Portola Terrace site, and a limited cutslope exposure at Westridge Drive (Pampeyan, 1970 and 1993). This faulted contact is shown on all publications reviewed as obscured beneath Pleistocene stream terrace deposits (geologic unit Qst) surrounding Los Trancos Creek and projected through the adjacent subject site (Portola Terrace) located on that same Pleistocene stream terrace. Additionally, Pampeyan shows the faulted Twh/Tl contact as obscured beneath an outcrop of Plio-Pleistocene Santa Clara Formation (“QTsc”) off Alamos Drive about 790 north of the Westridge Drive cut (i.e. predates the Pleistocene). Cotton has shown this same geologic field relationship on their various iterations of the town geologic map. These field relations suggest that the fault, as mapped by Pampeyan would not be Holocene active and may be predate the Quaternary. The Hermit fault in the area is not a settled mater. For example, Kovach and Page (1995) characterize the Hermit as southwest dipping thrust at San Francisquito Creek. Page’s 1993 compilation map of the Stanford Area shows the Hermit fault as a low-angle, easterly dipping decollement surface (fault) in the general area of the Westridge Drive cut. Our observations of the Westridge Drive cut did not reveal evidence of this feature (see below). Angell et al., 1997 show the Hermit Fault in the area of the subject site as a series of discontinuous subparallel traces with some traces shown with a reverse geometry (up on the west) and other traces shown with a dextral slip sense of movement extending through Westridge Road and through the terrace at the subject site as well as the lower terraces adjacent to Los Trancos Creek. However in their kinematic cross section in that same report Angell et al., show the Hermit Fault with an oblique sense of movement with a significant vertical component of offset of the tertiary sedimentary units in the area (including the Whiskey Hill Formation) with these units offset up on the west. Hanson's evaluation of Pleistocene terraces (Bullard, 2004) in the immediate area of San Francisquito Creek also suggests vertical deformation of the terraces with a relative uplift rate of 0.15 m/kyr for the Hermit fault where it trends through the San Francisquito Creek that corresponds to a vertical rate of 5.9 inches per thousand years.

The sequence of published regional-scale mapping of more distal locations (i.e., Jasper Ridge and the Stanford Linear Accelerator) within the larger area presents a complex scenario which suggests there are unresolved questions about the nature of the Hermit fault in the general Stanford/Portola Valley region. However, the larger tectonic setting in the Stanford/Palo Alto Region is beyond the scope of this current summary.

Nevertheless, all previous geologic maps that show the Hermit fault trending through the Portola Terrace site and adjacent Los Trancos Creek terraces are consistent in showing the postulated fault as concealed beneath the stream terrace that borders Los Trancos Creek and extends into the subject site. This terrace was interpreted by Angell et al., 1997 and Hanson et al. 2004 as a late Pleistocene surface terrace and this has recently been conformed by our age dating results obtained on the terrace (see Appendix B).

Detailed Local Mapping – Town of Portola Valley

Cotton, Shires & Associates' office has served as the town geologic consultant for over nearly five decades (since 1974) and have been responsible to reviewing all consultant's investigations within the jurisdiction and for producing a town geologic map and updating that map when evolving interpretations on the geology warranted revisions to the mapping. The earliest geologic maps for both the Town of Portola Valley (William Cotton and Associates, 1984; Cotton, Shires & Associates, 2010) and the Town of Woodside (William Cotton and Associates, 1989, and 1982) adopted some of the earlier published mapping (already mentioned) which had showed the Twh/Tl contact as a faulted (i.e., a branch of the Hermit Fault). The 2017 version of the Town of Portola Valley geologic map is presented in Figure 2.

Previous Site Investigation (Cornerstone, 2017)

In 2017 we completed an investigation at the subject site which included 5 exploratory borings and 3 cone penetration tests (CPTs) (see Figure 3), mapping and a summary of our findings relevant to the geologic and preliminary geotechnical aspects of the site. Based on the sparsely spaced borings, and available published mapping, we inferred that the contact between the Twh and the Tl as trending through the central portion of the site as shown on previous Figure 2 of that 2017 report. Simultaneous with our investigation, it came to our attention that the Town's Ground Movement Potential Map had been updated by the town's geologic consultant, Cotton, Shires & Associates. This revision came as a result of Cotton's geologists reviewing consultant's geotechnical and geologic investigations in the Town of Portola Valley extending back to the previous revision of 2010 and before. In this period Cotton's geologists reinterpreted the Twh/Tl contact in the general southeastern area of Portola Valley area as depositional rather than tectonic in origin (i.e., faulted). Accordingly, for this reason they removed that segment of the Hermit Fault from their updated 2017 map. For similar reasoning, in 2017 Cotton's reviewing geologists (geologic consultant for Woodside) also removed the northern extension of the Hermit Fault (the Cañada Fault) from the Town of Woodside geologic map (Ted Sayre verbal comm, 2017). This removal had for several years been also advocated by the previous peer reviewer (Robert H. Wright) for the town of Woodside for the same reason (Bob Wright, 2004).

Consultant's Fault Investigations of Nearby Sites (2012-2016)

As part of our preparation for the current fault evaluation, we reviewed two consultants' fault investigation reports conducted on residential parcels located within several hundred feet west of the subject site. These sites were within the Town's previous fault regulatory zone along the mapped trace of the Hermit fault as depicted on the 2010 version of the Town's Geologic Map (CSA, 1020). The first of these investigations was conducted in 2013 by Murray Engineers for a residential project located at 270 Westridge Drive. That proposed building envelope was located on trend with the Twh/Tl contact as mapped by Pampeyan and their trench was located 700 feet northwest of our Trench T-1, astride the mapped Twh/Tl contact (see Figure 4). Their trench log shows a continuous sequence of interbeded sandstone, claystone and siltstone which they assigned to the Whiskey Hill formation. Their trench log shows all geologic subunits dipping moderately toward the southwest. They indicated that their excavations did not encounter evidence of faulting and their work was reviewed by Cotton Shires & Associates at that time.

The second consultant investigation that we reviewed was conducted in 2016 by Romig Engineers for a residential project located at 228 Westridge Drive. Their trench and test pit were located 1,100 feet northwest of our trench T-1, and 160 feet west of the Westridge Drive cutsope (see Figure 4). Their exploratory excavations were located to the south of the Twh/Tl contact as mapped by Pampeyan. The trench and test pit logs by Romig Engineers shows a sequence of southerly dipping, interbedded sandstone and siltstone which they assigned to the Whiskey Hill Formation. They indicated that their excavations did not encounter evidence of faulting. Their exploratory borings also identified Whiskey Hill formation. Our review of the cutslope exposures along Westridge Drive just to the south of their trench and other excavations suggests they may actually have encountered Ladera formation subunits within some of the more northerly located borings. Furthermore, the bedrock structural patterns their exposed bedrock (i.e., bedding dipping moderately to the southwest) varies substantially from the structural trends within the Ladera formation exposed at the road cut and at our trench T-1 (i.e., consistently very steep to vertical). We infer that they encountered the Whiskey Hill formation, and the Twh/Tl contact lies somewhere between their trench and test pit and the more easterly trench and test pit of Murray Engineers conducted at 270 West Ridge.

Fault Summary by NeoGeologic (2020)

Subsequent to our original Preliminary Geologic/Geotechnical Investigation (2017) of the subject site, a consulting geologist Michael Angell of NeoGeologic Consulting issued a geologic report covering the topic of the Hermit Fault in the Stanford region and specifically addressing "the presence or absence of faulting along the southeastern reach of the Hermit fault in the vicinity of Alpine Road." Angell's report relied upon a synopsis of previous published regional-scale mapping but also included a review of our geologic/geotechnical report (a Draft copy) for the subject project site (the project referred to at the time as "Stanford Wedge"). NeoGeologic did not cite any other of the dozen or more consultants' fault investigations that have been conducted in the immediate area of Westridge Drive and adjacent intersecting roads such as the investigations of Murray Engineers and Romig Engineers mentioned above. They held to the traditional interpretation and mapping that has portrayed the contact between the Twh and Tl geologic units in the immediate area of the site as a dip-slip fault (i.e., Twh up-thrown on the west versus Tl down on the east). NeoGeologic's geologist (Angell) visited field locations at San Francisquito Creek, Westridge Drive and Los Trancos Creek. They described these field localities as; "exposures [that] confirm the presence of faulting at these locations." The NeoGeologic report included two schematic drawings which were intended to represent exposures of the Tw/Tl transition at Los Trancos Creek and at Westridge Drive. A portion of their report described the Hermit Fault in the immediate area of the site as follows:

> The middle portion of the fault as mapped by Angell and others (1997) consists of several apparently discontinuous, left-stepping, en echelon mappable traces within a zone of intense shearing ~200-500 feet wide. The estimated width reflected in the mapping is consistent with the width of the fault zone observed at the three key exposures: San Francisquito Creek (~400 feet wide); the bottom of Westridge Drive (~200-250 feet wide) and Los Trancos Creek (>250 feet wide). Well-developed subhorizontal slickenlines (dragmarks) and other kinematic indicators of the direction of shearing such as drag folds and fault zone structure preserved within the zone of faulting were observed at all of these key outcrops. Field sketches of the outcrops exposed in the road cut on Westridge Drive and in the west bank of Los Trancos Creek recorded in my field notebook during my field observations in 1995 are shown in Figure 10.

This description clearly implies a strike-slip style of deformation which is inconsistent with the deformational style noted by nearly all previous authors characterizing the Hermit Fault in this area. NeoGeologic's drawing for the Westridge Drive cut shows the following: 1) sporadic exposures of Twh and Tl, 2) the contact between the Twh and Tl is shown as vertical and there is some interleaving of Twh and Tl geologic units shown on the roadcut drawing. The vertical orientation of contacts and the fact of interleaving formations is inconsistent with the established style of deformation of the Hermit Fault. We have noted however that neither drawing (creek or roadcut) presented in NeoGeologic's report actually identified or label any fault and both drawings depict areas that, based on our field observations are not continuously exposed (see our reconnaissance of these areas, below). We infer that the actual transition (contact) between the Twh/Tl was not exposed at either the creek or the roadcut and therefore could not be examined in detail. Furthermore, the road cut and creek exposures are presented and described in the report as definitive evidence of faulting but NeoGeologic's characterization of a zone "200 to 250 feet wide" (or greater than 250 feet) is inconsistent with previous research geologists' characterization of the Twh/Tl contact in this area.

Reconnaissance of Adjacent Areas

At various times during our trench logging activities, we revisited the nearby exposures within Westridge Drive and Los Trancos Creek as well as Tl type localities at Sand Hill Road and also Twh outcrops along Alpine Road south of the site. Town of Portola Valley geologist (John Wallace) and a third-party geologic reviewer (Patrick Drum of Earth Focus) also visited the Los Trancos Creek riparian corridor and exposures at Westridge Drive and the type localities for the Ladera and Whiskey Hill formations.

Westridge Drive: Our geologist performed a reconnaissance on May 14, 2021 to map and log the exposure at the road cut on Westridge Drive. Several of the previous published maps showing the Hermit Fault projecting through the roadcut at Westridge Drive intersect the road at the location of a large Oak tree at an arcing bend within the road (i.e., Pampeyan 1970, 1993; USGS Fault/Fold Database, 2006). This large Oak tree is decades old and is discernible on older aerial photos that predate the mapping of Pampeyan and others. The roadcut extending through the area of the Oak tree shows that two bedrock outcrops are located some distance apart in the general area of the Oak tree; a claystone on the west, and a sandstone on the east (see Photo Plate 1). After personnel from Cotton's office spent a day clearing this same contact at the Oak tree, we logged a section of the road cut covering this area (see our log of the roadcut in Figure 5) as did John Wallace of Cotton's office. The contact at the claystone/sandstone exposure at the Oak tree was determined to be essentially vertical and did not exhibit evidence of shearing, or slicked surfaces consistent with fault displacement. The vertical orientation of the contact is inconsistent with a thrust geometry (a thrust inclined 45°of shallower). More broadly, the overall road cut extending along this area consists of several limited bedrock outcrops separated by areas that are obscured due to soil sloughing and thick groundcover vegetation (shown on our log). Therefore the roadcut does not afford an exposure over the transition between the Twh and the Tl units as this contact can only be inferred between outcrops. For this reason, it is unlikely that previous geologists have examined the entire transition between the Tw and the Tl unit and may have inferred where the contact was located and inferred the nature of the contact based on geologic field relations seen at sparse outcrops.

The exposures reveal a series of nearly vertical beds of Ladera Formation subunits (sandstone, siltstone and claystone). The exposed geologic patterns are generally consistent with the structural trends and lithologic characteristics observed within the Ladera formation in our trench exposure.

We have projected the Twh/Tl contact through the Westridge Drive area (about 125 feet west of the large Oak Tree) based on geomorphic considerations and scattered outcrops of Ladera Formation and Whiskey Hill sandstone along Westridge Drive, and adjacent Alamos Road and Ash Lane. The previous nearby trench investigations of Romig and Murray was also considered. That immediate area is obscured by ground cover vegetation approximately 150 feet west of where some of the published maps show it. Cotton's revised 2017 town geologic map shows the contact as approximately 240 feet west of traditional mapped trace.

We believe the previous published fault mapping is based on inference between outcrops that expose differing lithologies (claystone versus silty sandstone) and that projection is not based on a continuous exposure of the transition between the formations. Using projection methods based on sparse field data is common practice in conducting regional scale mapping.

Los Trancos Creek Exposures: Our reconnaissance of Los Trancos Creek extended a distance of several hundred feet along the creek and shadowing the mapped contact of the Twh/Tl units. Los Trancos Creek is extensively overgrown with riparian trees, shrubs and groundcover vegetation and for this reason the transition between the Twh and Tl is not exposed but can only be bracketed over a distance of dozens of feet between outcrops. Performing a reconnaissance and plotting features within the creek was very difficult but was aided using modern high-technology platform based mapping applications not available to previous research geologists'. Earlier aerial photo imagery reveals that this obscured condition has existed for decades. Exposures of the geology along the creek are relatively rare or sporadically distributed and separated by obscured areas that extend over distances ranging from 20 to 60 feet or more wide. A continuous exposure of the transition between the Twh and the Tl was not exposed in the creek area. This bedrock contact transition can only be inferred between verifiable bedrock exposures which are spaced 60 feet or more apart. The distribution of bedrock exposures at the Westridge Drive cut and within Los Trancos Creek are noted on the Lidar outcrop map by John Wallace of Cotton's office (Wallace, 2021, unpublished) in Figure 4.

Review of Recent Lidar Technology

As part of our scope of current fault investigation, in May of 2021 we reviewed relatively recently available Lidar imagery covering the general vicinity of the site and adjacent areas. This satellite-based technology allows for an interpretation of geomorphic features without interference from tree cover or above-ground structures (i.e., manmade structures). Based on our review of the imagery, we noted a lack of scarps within the terraces that are adjacent to Los Trancos Creek. We noted that the natural scarp that trends through the central portion of the subject site (encountered between station 57 and 73 within our trench T-1) is arcuate in that it arcs from a westerly direction as it enters the site and bends toward the north within the site. It is not linear and therefore is more consistent with an abandoned and backfilled channel of the ancestral Los Trancos Creek. The natural slopes above (north of) the Westridge Drive do not exhibit geomorphic features indicative of active faulting (linear trough shaped depressions, sidehill benches, etc.).

Current Trench Investigation (Cornerstone, 2021)

Our current field investigation included the excavation and logging of a continuous 183-foot-long trench in the central portion of the site, which spans the mapped projection of the contact between the geologic Thw and Tl units (as projected in our earlier 2017 report and previous published maps). The trench was generally 36 inches wide and extended to depths of between 8 feet and 16 feet deep below the nearest adjacent ground surface. The trench had 2-foot-wide benching on either side in the upper 5 feet at the northern end. The trench was excavated with a Doosan 6307 excavator. Trenching began on May 24, 2021 and continued intermittently until June 4, 2021. Exposed walls were supported with hydraulic shoring, cleaned with hand tools, and then the subsurface conditions logged by our Certified Engineering Geologist. This study focused on the eastern trench wall, but the western trench wall was cleaned in select locations to expose features that were contiguous across both walls. The approximate location of the trench is shown on the Site Geologic Map, Figure 3. A detailed trench log (T-1) is presented as Log of Trench T-1, Figures 6 through 8.

During our field investigation, the trench was reviewed by the Town of Portola Valley geologist (John Wallace) and a third-party geologic reviewer (Patrick Drum of Earth Focus) on three occasions (May 26, June 1 and 4). In addition, archeologists from the Stanford Archeological Center were onsite during excavation of the trench in case cultural resources were unearthed by the trenching.

The trench was backfilled on June 3 and 4, 2021 using the Doosan 6307 excavator with bucket and compaction wheel. Water was not available onsite. A Multiquip water trailer was filled from a construction site in the area and used to moisture condition the soil. Backfill material used was the native material excavated from the trench. The backfill material was moisture conditioned with water from the trailer and placed in approximately 1½ to 2-foot lifts by the excavator bucket. The lift was then compacted by the excavator using a compaction wheel attachment. Approximately 30 linear feet of the northern end of the trench was completed on June 3rd. The remainder of the trench was backfilled on June 4th. Compaction testing was not part of the scope of work. The trench will need to be re-excavated and backfilled with engineered fill prior to development, which has been acknowledged by the client. Approximately 15 cubic yards of excavated material was remaining and relocated outside the fenced horse exercise area.

Geology Exposed in Trench: Our trench T-1 revealed Latest Pleistocene terrace deposits (geologic symbol “Qts”) overlying tilted (vertical to nearly vertical), interbedded subunits of the Ladera Sandstone formation (fine-grained sandstone, siltstone and claystone). The terrace deposits consist of crudely stratified fining-upward sequences deposited in a moderate to high energy series of short-lived flood events. A sample collected within this unit produced a radiocarbon (C_{14}) age date of 16,890 years +/- 50 BP (years before present) confirming its latest Pleistocene age. The deeper section of these deposits (north of station 27, Trench T-1) are older, represent 3 or 4 individual deposition events and may extend back to the middle Pleistocene. As a result of the high energy depositional environment, coarse basal lag deposits (consisting of coarse gravels and cobbles) have scoured into the underlying Ladera formation with some Ladera subunits scoured more extensively and deeper than adjacent geologic units. Additionally, the more weathered portions of Ladera subunits and finer-gained subunits appear to be scoured relatively deeper. These higher energy basal stream flows account for the minor apparent upward and downward steps (across bedrock contacts) along the basal contact of the terrace deposits with the underlying Ladera subunits. One of the largest apparent steps occurs at station 38 on our trench log (see Figure 6). Here the apparent step occurs at a contact between a claystone and a sandstone (see Photo Plate 2). The steeply inclined contact is not sheared and the step on the east wall is 2.8 feet downward whereas the same apparent step on the opposite (west) wall is 0.8 feet. Similar abrupt, vertical contacts exposing coarse lag cobbles juxtaposed against Tl subunits were noted along this same basal contact (Qoa overlying the Tl geologic unit) within the northwesterly creek bank of Los Trancos Creek, 500 feet southeast of our trench. The thickness of the terrace deposits varies from 2 feet to as much as 15 feet. A block of Whiskey Hill sandstone was encountered (as float) within the terrace deposits near the south end of our trench. This material consisted of an orange-brown, medium grained, massive sandstone. The sandstone was more consolidated (slightly cemented), and coarser grained that the Tl sandstone subunits encountered within our trench and at nearby exposures. It is believed this block was dislodged from a nearby outcrop of Twh at the time of the deposition of the unit (about 16,890 years BP). This postulated outcrop would be located somewhere just south of the south end of our trench.

The terrace deposits can be classified as a matrix-supported conglomerate unit (gravelly clayey sand) with cobbles that range up to 2-1/2 feet in diameter. The clasts are typically subrounded and the cobbles form up to four distinct fining upward sequences which represent individual flood events within the Pleistocene. The Ladera Formation encountered within the trench consists of fine-grained sandstone and silty sandstone (typically thin bedded to massive), and is friable, and moderately-severely weathered. The sandstone has rare mica flakes. The siltstone subunits are commonly thin bedded, moderately-severely weathered, and contain clay and fine sand as a minor constituent. The claystone is the least common subunit within the trench and is moderately severely weathered, and thin bedded to laminated. All Tl geologic subunits would be considered to be semiconsolidated. The characteristics of the Ladera formation within our trench is generally consistent with the exposed section of the Tl unit at the Westridge Drive cut and the sandstone subunits are consistent with type locality of the Tl unit at Sand Hill Road.

The exposed Ladera siltstone and claystone subunits commonly exhibited evidence of crushing to the degree that the thin bedding and laminations within these subunits were convoluted or obscured or not distinguishable. This crushing of the geologic units is due to the compressional tectonic setting of the Portola Valley area. Thin bedding and laminations was discernible in portions of some of the subunits. The overall structural trends indicate very steep to vertical bedding within subunits and between subunits. Internal bedding within subunits (where preserved) were typically co-planar with the contacts between subunits. This is nearly identical to the structural patterns and lithologies seen at the Westridge Drive exposures near where the Tw/Tl contact has been traditionally projected through. We encountered no evidence of shearing at contacts between subunits within the Ladera Formation and no evidence of offset or warping of the overlying Terrace Deposits.

Conclusions

Based on work conducted to date, we have determined the following:

1) The exposed geologic sequence within our trench consists of terrace deposits overlying a sequence of nearly vertical inclined beds belonging to the Ladera formation. We did not encounter intact Whiskey Hill formation within our trench. This revises our earlier mapping of 2017. Our previous boring logs have been revised (see Appendix C) and a design level geotechnical report will be issued after further field investigation.

2) No evidence of faulting within the trench exposure was found and no evidence of faulting at the Westridge Drive cut was found, where the Hermit fault had traditionally been projected on published maps. The terrace deposits that forms a cover over the older bedrock is sufficiently old (Latest Pleistocene) to argue that no active faulting is present in the area of our trench and the remainder of the site terrace does not show surficial evidence suggestive of active faulting. These interpretations are supported by our surface reconnaissance and review of stereo aerial photography and Lidar imagery

3) In our opinion, the Twh/Tl contact at the site is located further south of our trench T-1 and further west than shown on various published maps. The contact may in fact be located along a prominent break-in-slope located approximately 70 feet west of the end of our trench T-1 where the 2017 Town Geologic map shows it (Cotton, Shires and Associates, 2017). This is based on the trenching performed and based on the distribution of scattered outcrops identified within Los Trancos Creek and Westridge Drive by our Certified Engineering Geologist and Cotton's Certified Engineering Geologist (see Site Geologic Map, Figure 3).

4) In order to expose the Twh/Tl contact and complete an evaluation of its nature, we proposed conducting a test pit just above the natural break-in-slope and then extending a trench in a northerly direction to join with the south end of our trench T-1.

Closure

This letter has been prepared for the sole use of Stanford Real Estate and their design consultants for the referenced Portola Terrace residential project in Palo Alto, California. We trust that this gives adequate summary of field investigation conducted to date. Our professional services were performed, our findings obtained, and our recommendations have been prepared in accordance with generally accepted geotechnical engineering principles and practices at this time and location. No warranties are either expressed or implied.

If you have any questions or need any additional information, please call and we will be glad to discuss them with you.

Sincerely,

CORNERSTONE EARTH GROUP, INC.

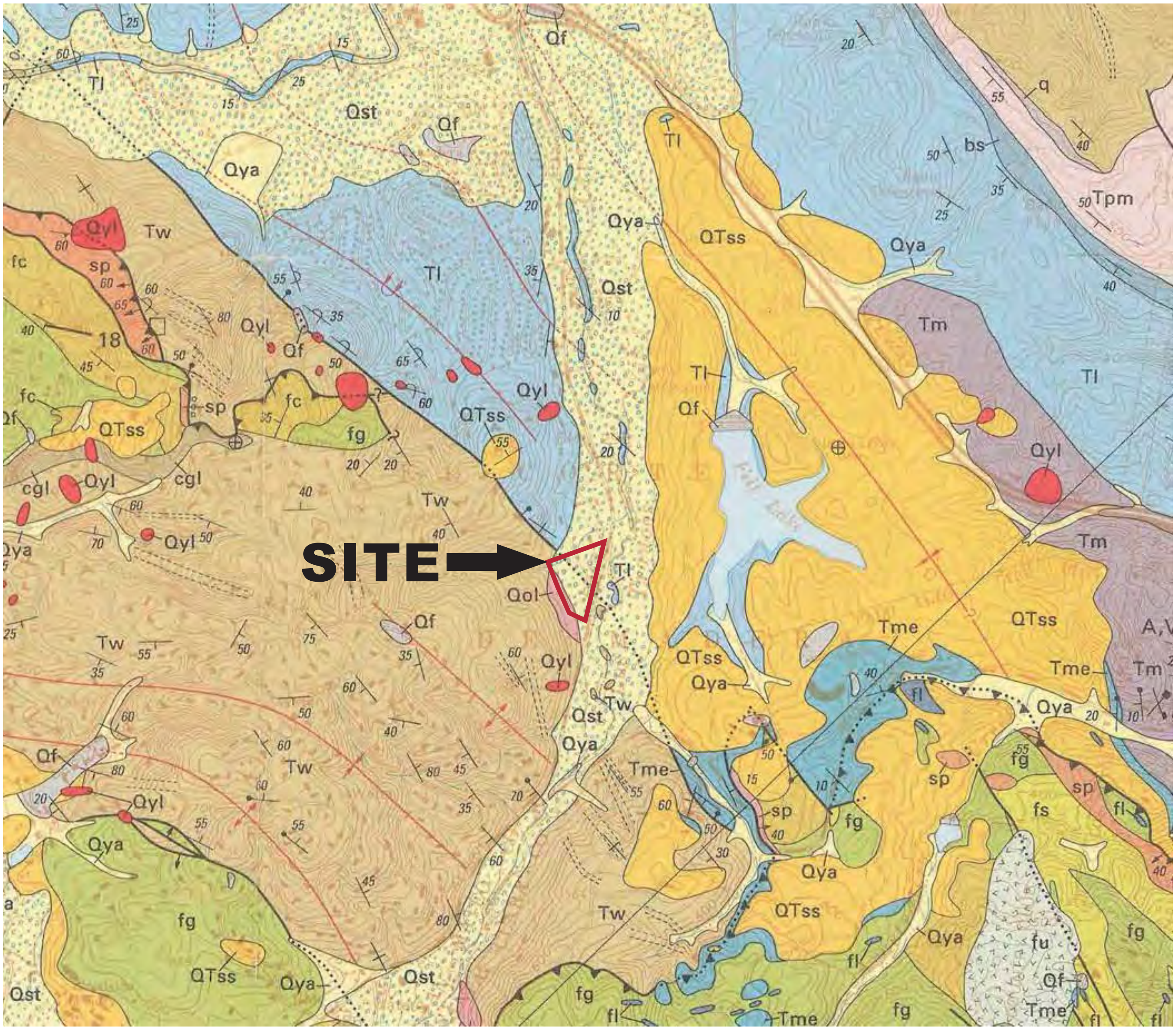
Erin L. Steiner, P.E., G.E.
Principal Engineer

ERIN L. STEINER
No. 2910
6/30/2022

Craig S. Harwood, P.G., C.E.G
Senior Engineering Geologist

CRAIG S. HARWOOD
No. 2275

Copies:	Addressee (1 via email)
Attachments:	Figure 1 – Vicinity Geologic Map (Pampeyan)
	Figure 2 – Town Geologic Map
	Figure 3 – Site Geologic Map
	Figure 4 – Cotton’s Field Map (2021) in Lidar Base
	Figure 5 – Log of Westridge Outcrop Road Cut
	Figure 6 – Log of Trench (Part 1 of 3)
	Figure 7 – Log of Trench (Part 2 of 3)
	Figure 8 – Log of Trench (Part 3 of 3)
	Photo Plate 1
	Photo Plate 2
	Appendix A: References
	Appendix B: Radiocarbon Testing
	Appendix C: Revised Boring Logs

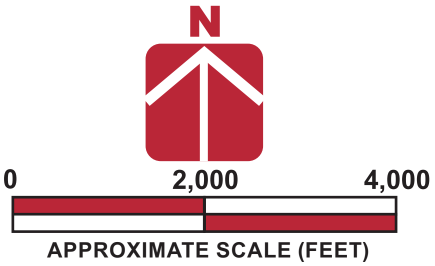


	Geologic Units
Qyl	Younger landslide deposits (Holocene)
Qol	Older landslide deposits (Holocene)
Qst	Stream terrace deposits (Holocene? and Pleistocene)
QTss	Santa Clara Formation (lower Pleistocene and upper Pliocene)
Tl	Ladera Sandstone (upper and middle Miocene)
Tw	Whiskey Hill Formation (upper to lower Eocene)

Explanation

Contact - dashed where approximate, dotted where concealed

Fault - dashed where approximate, dotted where concealed



Base: USGS, Geologic Map of the Palo Alto and Part of the Redwood Point 7.5' Quadrangles, San Mateo and Santa Clara Counties, California, by Pampeyan, 1993

CORNERSTONE
EARTH GROUP

Vicinity Geologic Map

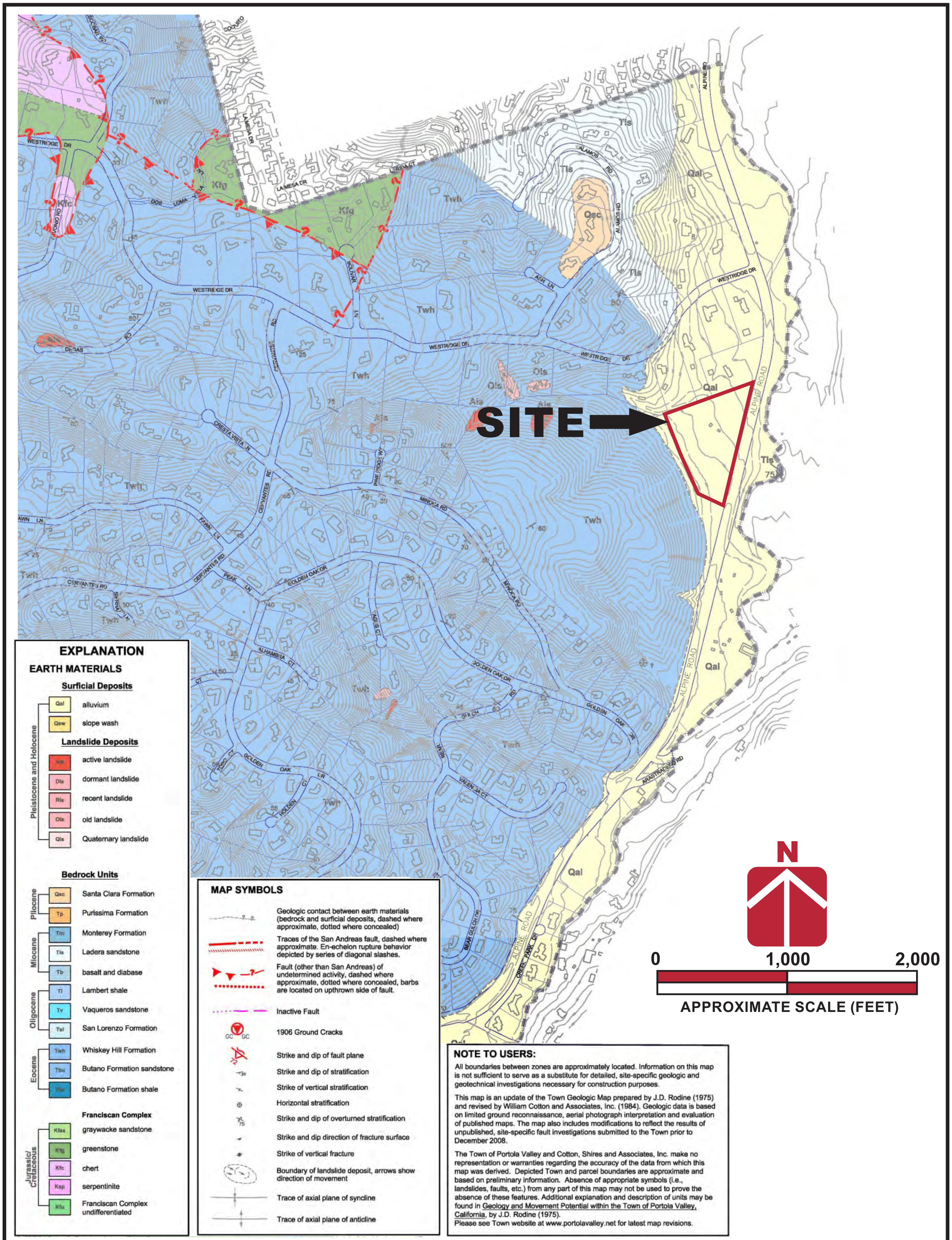
Portola Terrace
Portola Valley, CA

Project Number
105-117-2

Figure Number
Figure 1

Date
July 2021

Drawn By
RRN



NOTE TO USERS:

All boundaries between zones are approximately located. Information on this map is not sufficient to serve as a substitute for detailed, site-specific geologic and geotechnical investigations necessary for construction purposes.

This map is an update of the Town Geologic Map prepared by J.D. Rodine (1975) and revised by William Cotton and Associates, Inc. (1984). Geologic data is based on limited ground reconnaissance, aerial photograph interpretation and evaluation of published maps. The map also includes modifications to reflect the results of unpublished, site-specific fault investigations submitted to the Town prior to December 2008.

The Town of Portola Valley and Cotton, Shires and Associates, Inc. make no representation or warranties regarding the accuracy of the data from which this map was derived. Depicted Town and parcel boundaries are approximate and based on preliminary information. Absence of appropriate symbols (i.e., landslides, faults, etc.) from any part of this map may not be used to prove the absence of these features. Additional explanation and description of units may be found in Geology and Movement Potential within the Town of Portola Valley, California, by J.D. Rodine (1975).
Please see Town website at www.portolavalley.net for latest map revisions.

Base provided by Cotton, Shires and Associates, Inc., Geologic Map - Sheet 1 of 1, dated June 2017

CORNERSTONE
EARTH GROUP

Town Geologic Map

Portola Terrace
Portola Valley, CA

Project Number
105-117-2

Figure Number
Figure 2

Date
July 2021

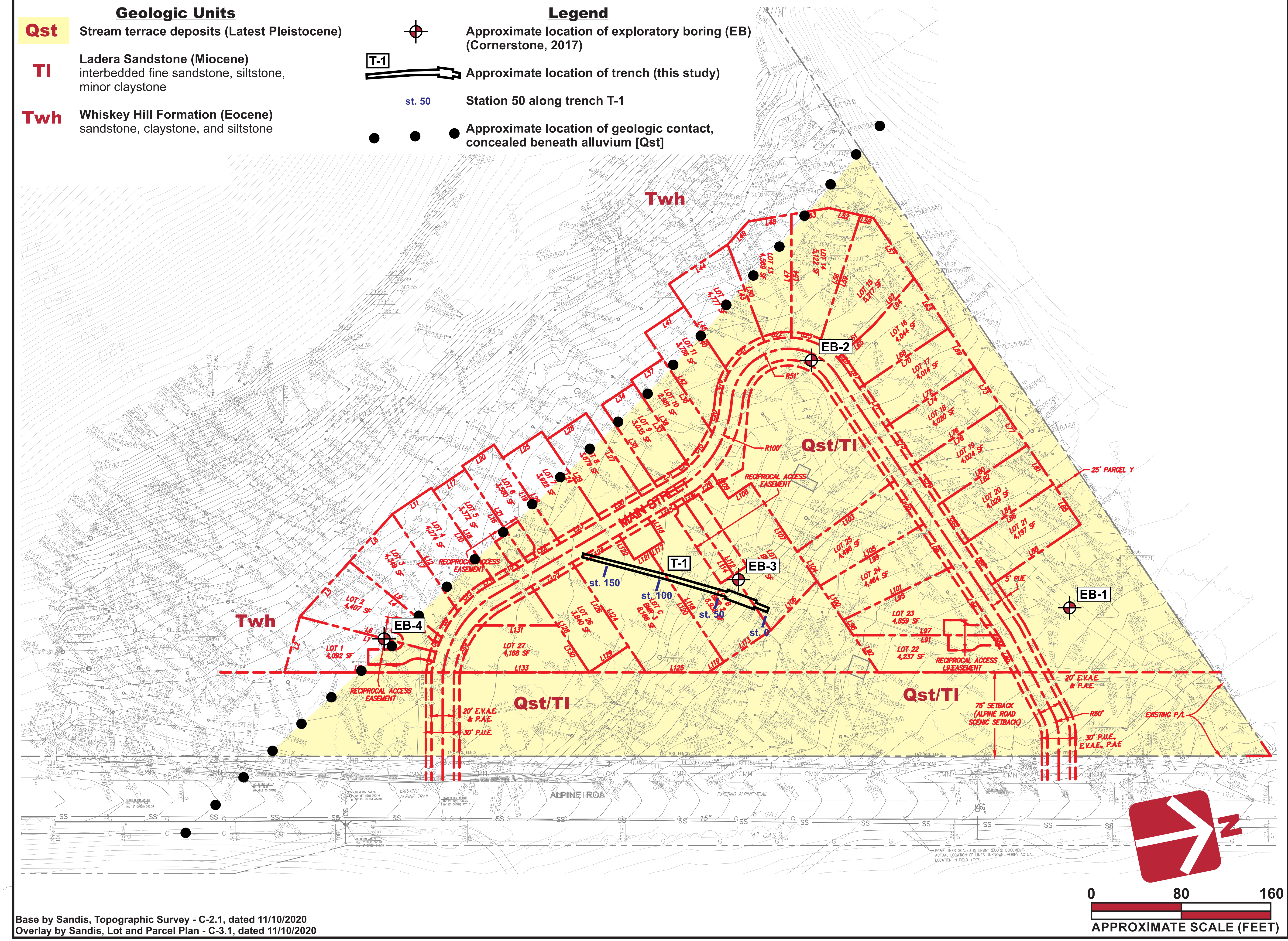
Drawn By
RRN

Geologic Units

Qst	Stream terrace deposits (Latest Pleistocene)
Tl	Ladera Sandstone (Miocene) interbedded fine sandstone, siltstone, minor claystone
Twh	Whiskey Hill Formation (Eocene) sandstone, claystone, and siltstone

Legend

⊕	Approximate location of exploratory boring (EB) (Cornerstone, 2017)
T-1	Approximate location of trench (this study)
st. 50	Station 50 along trench T-1
● ● ●	Approximate location of geologic contact, concealed beneath alluvium [Qst]



Base by Sandis, Topographic Survey - C-2.1, dated 11/10/2020
Overlay by Sandis, Lot and Parcel Plan - C-3.1, dated 11/10/2020

Project Number 105-117-2

Figure Number Figure 3

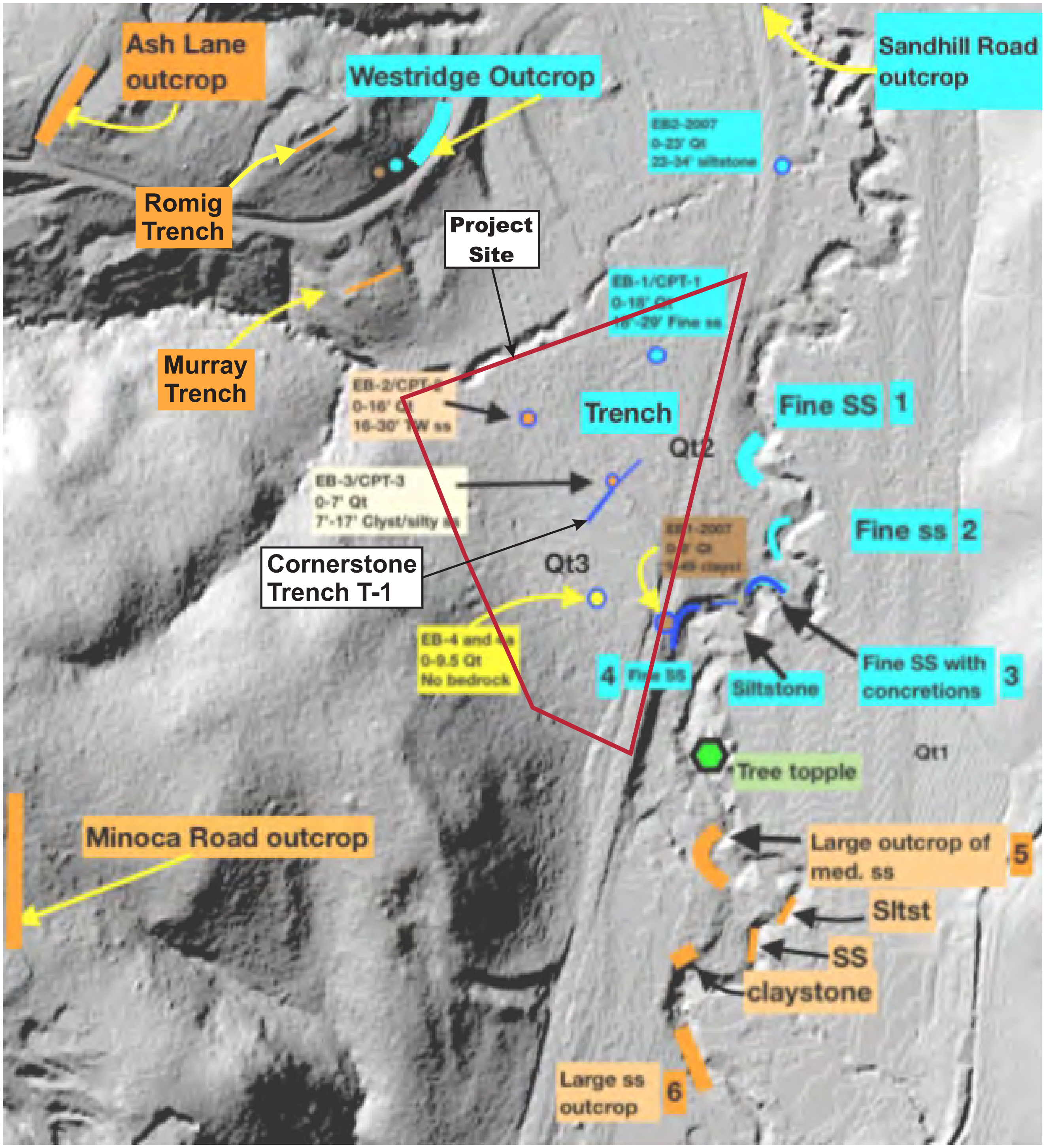
Drawn By RRN

Date July 2021

Site Geologic Plan

Portola Terrace
Portola Valley, CA

CORNERSTONE EARTH GROUP



Legend

🟧 Identified outcrop of Whiskey Hill Formation

🟦 Identified outcrop of Ladera Sandstone Formation

N

0 300 600

APPROXIMATE SCALE (FEET)

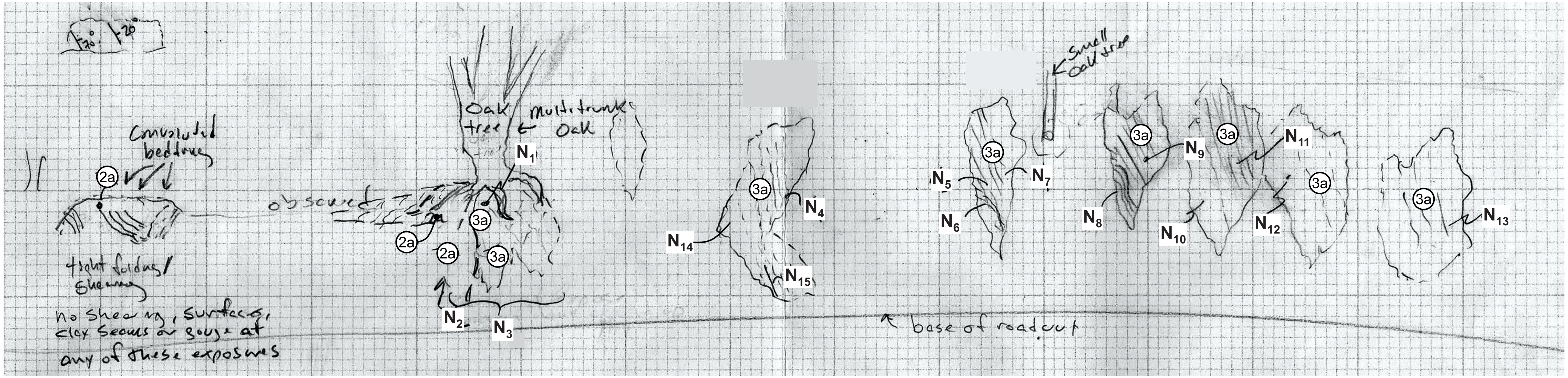
Base: Cotton, Shires & Associates, 2021

CORNERSTONE
EARTH GROUP

Cottons Field Map (2021) on Lidar Base

Portola Terrace
Portola Valley, CA

Project Number	105-117-2
Figure Number	Figure 4
Date	July 2021
Drawn By	RRN



Notes

N_1	N 5° E / 82° SE, joint set within root ball area, joint set in sandstone.
N_2	Claystone/Sandstone contact under or at tree, inferred below excavated exposed tree root, unit 2a near contact is severely weathered but identifiable.
N_3	Appears to be a thick massive bed of Tl.
N_4	Definately Tl, idendical to slope locally, N 56° W / 81° to vertical toward NE.
N_5	N 29° W / 62° NE joint set
N_6	Thin bedded Tl, N 72° W / 52° NE thin bedded.
N_7	N 48° W / 57° NE thin bedded.
N_8	Localized sandy/shear with Tl.
N_9	N 55° W / 55° NE thin bedded.
N_{10}	Medium to thick bed of white Tl.
N_{11}	N 48° W / vertical near bedding.
N_{12}	Thick bed of Tl (strained orange-brown), thin to medium to thick bedded.
N_{13}	More medium to thick beds of Tl.
N_{14}	N 5° W / 84° NE joint set throughout more massive Tl.
N_{15}	N 72° W / 66° NE bedded.

UNIT DESCRIPTONS

Stream Terrace Deposits

(2a) **Mudstone/Claystone:**
pale yellow, dry, semi-consolidated (hackly fracture), thin bedded to laminated, pervasively fractured, jointed and with sandy and shearing.

Ladera Sandstone Formation

(3a) **Fine Silty Sandstone:**
white to light gray and stained locally orange-brown, semi-consolidated, friable, thin bedded to massive, jointed and fractured.

Scale: 1” = 5’

CORNERSTONE
EARTH GROUP

Log of Westridge Outcrop Road Cut

Portola Terrace
Portola Valley, CA

Project Number
105-117-2

Figure Number
Figure 5

Date July 2021
Logged By CSH
Drawn By RRN

Notes

N_1 N 20° W / N 30° SW, contact across trench.

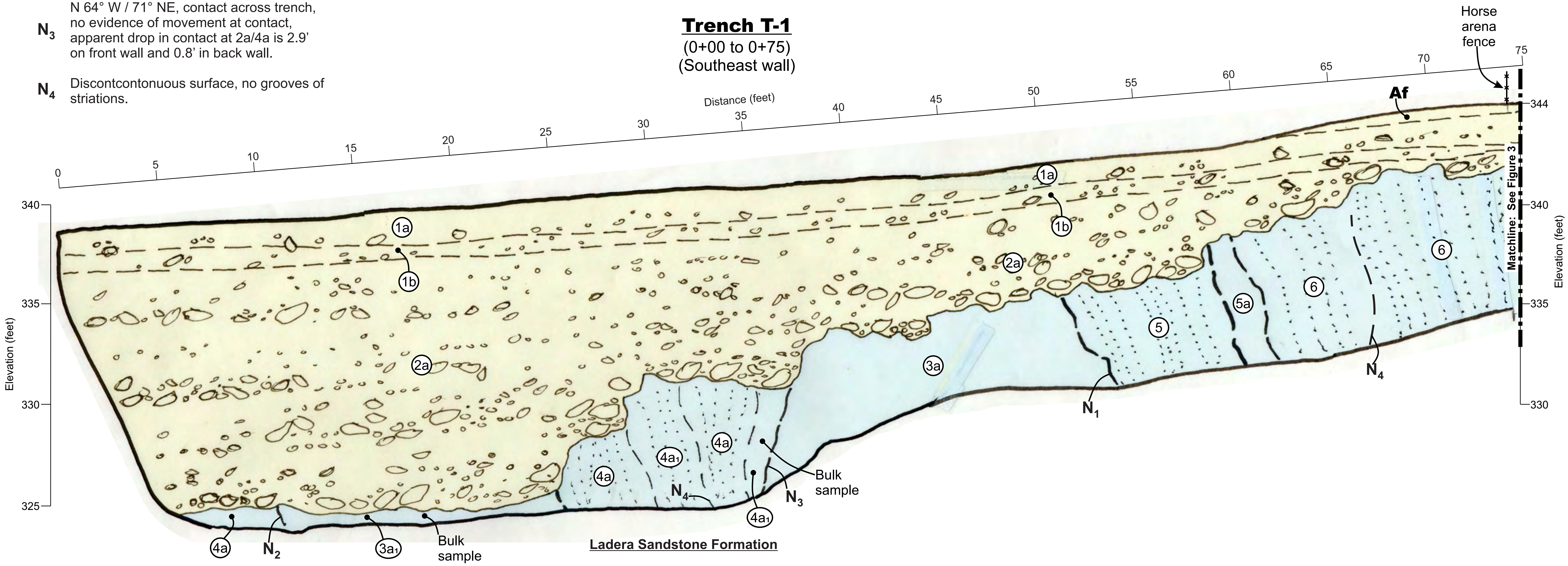
N_2 Abrupt contact, no evidence of movement.

N_3 N 64° W / 71° NE, contact across trench, no evidence of movement at contact, apparent drop in contact at 2a/4a is 2.9' on front wall and 0.8' in back wall.

N_4 Discontcontonuous surface, no grooves of striations.

Trench T-1

(0+00 to 0+75)
(Southeast wall)



UNIT DESCRIPTONS

Af **Artificial fill:** silty and clayey sand with gravel.

Residual Soil

(1a) **Lean Clay with Sand:** brown, dry, stiff, bioturbated porous, [A-horizon], Holocene.

(1b) **Sandy Fat Clay:** brown, dry, very stiff, massive, [B-horizon], Pleistocene.

Stream Terrace Deposits

(2a) **Gravelly Clayey Sand**: dark reddish brown, dry, very dense, matrix-supported, sparse cobbles, gravel is subrounded and subangular, scour and fill features and discrete gravelly horizons. Contours at least 4 fining-upward sequences in area of 0 to 0+25 feet.

Ladera Sandstone Formation

(3a) **Sandstone:** light gray and yellowish-brown, damp, semi-consolidated, massive, some clay fractured.

(3a₁) **Sandstone:** light gray and yellowish-brown, damp, semi-consolidated, massive, fractured, some clay.

(4a) **Claystone:** brown, dry, semi-consolidated, thin bedding (convoluted and crushed).

(4a₁) **Claystone:** medium yellowish-brown, dry, semi-consolidated, bedding is indistinct (crushed).

(5) **Siltstone:** varigated (gray and reddish-brown), damp, semi-consolidated, friable, thin bedded (convoluted and crushed).

(5a) **Siltstone:** varigated (very dark gray and reddish-brown), damp, semi-consolidated, friable, thin bedded (convoluted and crushed).

(6) **Fine Sandstone:** light gray, damp, semi-consolidated, friable, thin bedded, fractured, some silt.

Scale: 1" = 5'

CORNERSTONE
EARTH GROUP

Log of Trench T-1 (Part 1 of 3)

Portola Terrace
Portola Valley, CA

Project Number	105-117-2
Figure Number	Figure 6

Date	Logged By	Drawn By
July 2021	CSH/BM/KK	RRN

Notes (continued from Figure 2)

N_5 Medium-grained sand bed.

N_6 N 38° W / N 71° SW, thin bedding.

N_7 N 39° W / N 71° SW, contact across trench.

N_8 Spheroidal weathering.

N_9 N 61° W / N 60° SW, thin bedding.

N_{10} Curviplanar surface, no indications of movement.

N_{11} N 64° W / N 73° SW, contact across trench.

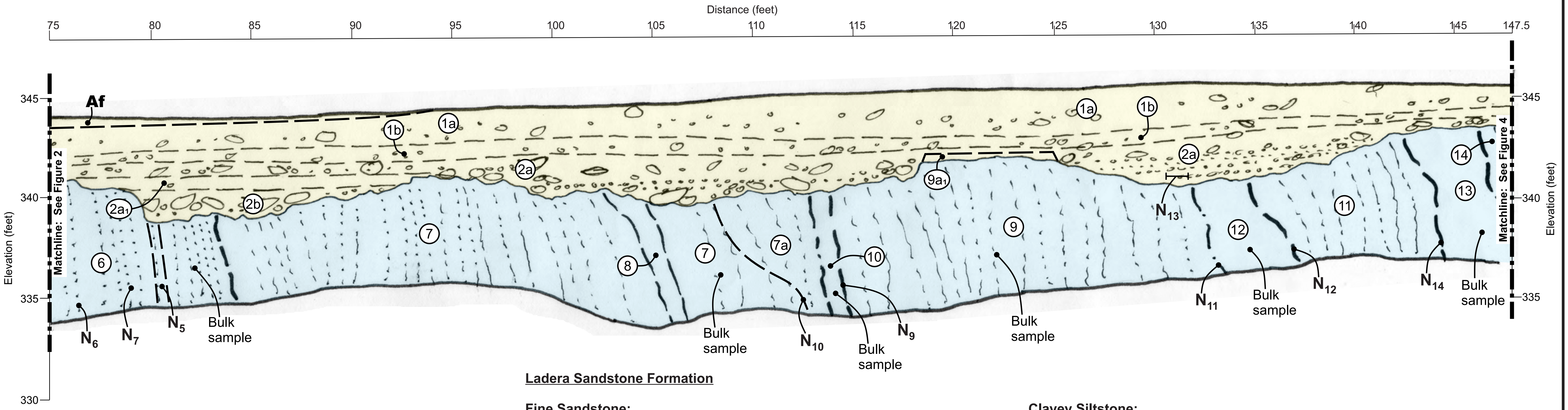
N_{12} N 23° W / N 73° SW, contact across trench.

N_{13} Bulk soil sample collected for C_{14} analysis. (16,890 yrs BF)

N_{14} N 64° W / N 78° SW, contact across trench.

Trench T-1

(continued: 0+75 to 1+47.5)
(Southeast wall)



UNIT DESCRIPTONS

Af **Artificial fill:**
silty and clayey sand with gravel.

Residual Soil

(1a) **Lean Clay with Sand:**
brown, dry, stiff, bioturbated porous, [A-horizon], Holocene.

(1b) **Sandy Fat Clay:**
brown, dry, very stiff, massive, [B-horizon], Pleistocene.

Stream Terrace Deposits

(2a) **Gravelly Clayey Sand**:
dark reddish brown, dry, very dense, matrix-supported, sparse cobbles, gravel is subrounded and subangular, scour and fill features and discrete gravelly horizons. Contours at least 2 fining-upward sequences.

Ladera Sandstone Formation

⑥ **Fine Sandstone:**
light gray, dry, semi-consolidated, friable, thin bedded, occasional interbeds of siltstone and claystone.

⑦ **Clayey Siltstone:**
dark gray and light yellow, dry, semi-consolidated, thin bedded, pervasively fractured (hackley fracturing), crushed.

(7a) **Siltstone:**
greenish gray, dry, semi-consolidated, pervasively fractured, crushed.

⑧ **Clayey Sandstone:**
light orange-brown, damp, semi-consolidated, medium-grained.

⑨ **Clayey Siltstone:**
light gray, dry, semi-consolidated, thin bedded (crushed and convoluted), pervasively fractured.

⑩ **Clayey Siltstone:**
white and medium gray, dry, semi-consolidated, thin bedded (crushed and convoluted), pervasively fractured.

⑪ **Clayey Siltstone:**
dark gray and orange, dry, semi-consolidated, thin bedded (crushed and convoluted).

⑫ **Fine Sandstone:**
light gray and orange, dry, semi-consolidated, massive, jointed and fractured, appears similar to unit 3a on Figure 2.

⑬ **Sandstone:**
light yellow-brown, dry, semi-consolidated, medium-grained, fractured.

⑭ **Siltstone:**
medium gray, damp, semi-consolidated, thin bedded (crushed and convoluted).

Scale: 1" = 5'

CORNERSTONE
EARTH GROUP

Log of Trench T-1 (Part 2 of 3)

Portola Terrace
Portola Valley, CA

Project Number 105-117-2

Figure Number Figure 7

Date July 2021

Logged By CSH/BM

Drawn By RRN

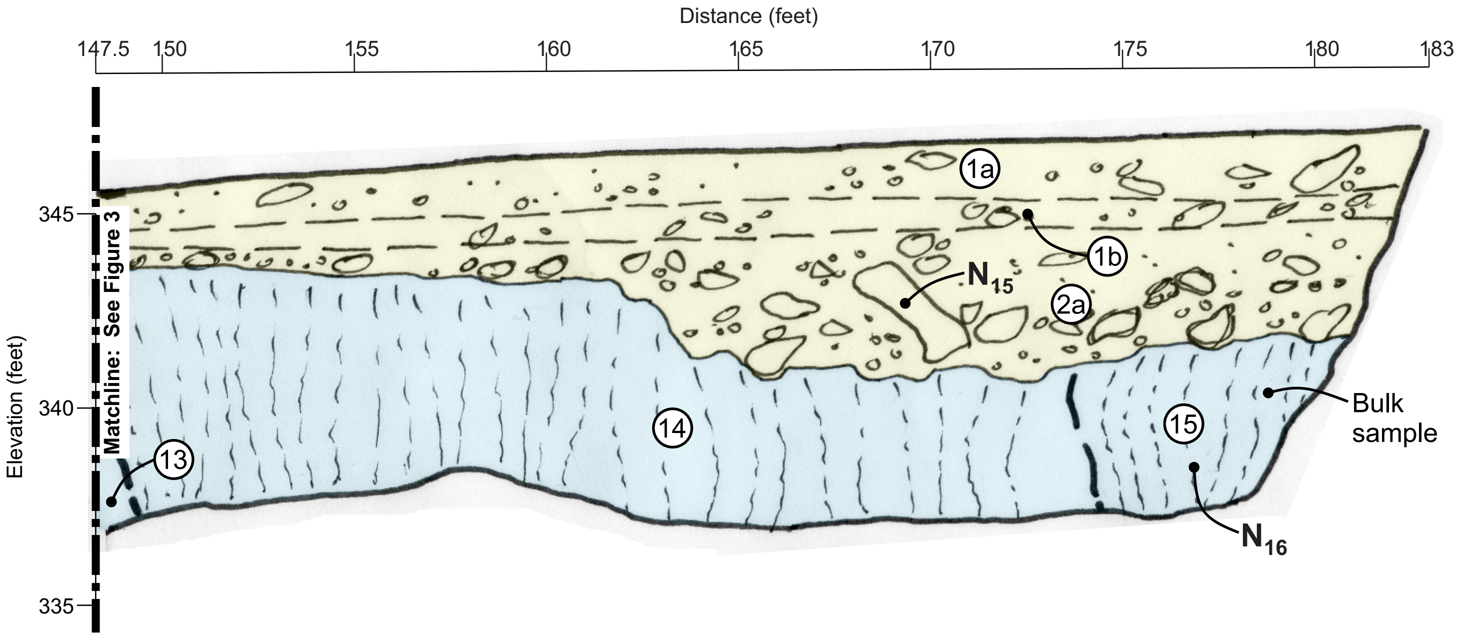
Notes (continued from Figure 3)

N_{15} Large block of Whiskey Hill Sandstone (orange-brown, coarse-grained, slightly cemented).

N_{16} N 60° W / N 86° NE, thin bedding.

Trench T-1

(continued: 1+47.5 to 1+83)
(Southeast wall)



UNIT DESCRIPTONS

Residual Soil

(1a) **Lean Clay with Sand:**
brown, dry, stiff, bioturbated porous, [A-horizon], Holocene.

(1b) **Sandy Fat Clay:**
brown, dry, very stiff, massive, [B-horizon], Pleistocene.

Stream Terrace Deposits

(2a) **Gravelly Clayey Sand**:
dark reddish brown, dry, very dense, matrix-supported, sparse cobbles, gravel is subrounded and subangular, scour and fill features and discrete gravelly horizons.

Ladera Sandstone Formation

⑬ **Sandstone:**
light yellow-brown, dry, semi-consolidated, medium-grained, fractured.

⑭ **Siltstone:**
medium gray, damp, semi-consolidated, thin bedded (crushed and convoluted).

⑮ **Sandy Siltstone:**
medium gray, dry, semi-consolidated, thin bedded, pervasively fractured.

Scale: 1” = 5’

CORNERSTONE
EARTH GROUP

Log of Trench T-1 (Part 3 of 3)

Portola Terrace
Portola Valley, CA

Project Number 105-117-2

Figure Number Figure 8

Date July 2021
Logged By CSH
Drawn By RRN

PHOTO PLATE 1

View of large Oak tree at West Ridge Road where the Twh/Tl contact has traditionally been projected trending through (see Figure 5). The claystone and sandstone contact at the tree required considerable effort to expose the contact (Photo Credit: CSH, 2021)

Same roadcut as above, adjacent to north (right) side of large Oak tree. Note sporadic nature of exposures of nearly vertical Ladera Formation subunits (see Figure 5) (Photo credit: CSH, 2021)

PHOTO PLATE 2

This easterly view spans over abrupt contact between Station 35 to Station 40. Green ribbon is placed along base of A-Horizon residual soil (unit 1a). No change in thickness of Unit 1a or underlying Unit 1b over this contact (Photo credit: CSH, 2021)

APPENDIX A: REFERENCES

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APPENDIX B: RADIOCARBON TESTING

Beta Analytic
TESTING LABORATORY

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

June 24, 2021

Ms. Erin Steiner
Cornerstone Earth Group
1259 Oakmead Parkway
Sunnyvale, California 94085
United States

RE: Radiocarbon Dating Results

Dear Ms. Steiner,

Enclosed is the radiocarbon dating result for one sample recently sent to us. As usual, specifics of the analysis are listed on the report with the result and calibration data is provided where applicable. The Conventional Radiocarbon Age has been corrected for total fractionation effects and where applicable, calibration was performed using 2020 calibration databases (cited on the graph pages).

The web directory containing the table of results and PDF download also contains pictures, a cvs spreadsheet download option and a quality assurance report containing expected vs. measured values for 3-5 working standards analyzed simultaneously with your samples.

The reported result is accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all pretreatments and chemistry were performed here in our laboratories and counted in our own accelerators here in Miami. Since Beta is not a teaching laboratory, only graduates trained to strict protocols of the ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 program participated in the analysis.

As always Conventional Radiocarbon Ages and sigmas are rounded to the nearest 10 years per the conventions of the 1977 International Radiocarbon Conference. When counting statistics produce sigmas lower than +/- 30 years, a conservative +/- 30 BP is cited for the result unless otherwise requested. The reported d13C was measured separately in an IRMS (isotope ratio mass spectrometer). It is NOT the AMS d13C which would include fractionation effects from natural, chemistry and AMS induced sources.

When interpreting the result, please consider any communications you may have had with us regarding the sample. As always, your inquiries are most welcome. If you have any questions or would like further details of the analysis, please do not hesitate to contact us.

Thank you for prepaying the analysis. As always, if you have any questions or would like to discuss the results, don’t hesitate to contact us.

Sincerely,

Chris Patrick
Digital signature on file

Chris Patrick
Vice President of Laboratory Operations

Beta Analytic, Inc.
4985 SW 74th Court
Miami, FL 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com

ISO/IEC 17025:2017-Accredited Testing Laboratory

REPORT OF RADIOCARBON DATING ANALYSES

Erin Steiner	Report Date: June 24, 2021
Cornerstone Earth Group	Material Received: June 16, 2021

Laboratory Number	Sample Code Number	Conventional Radiocarbon Age (BP) or Percent Modern Carbon (pMC) & Stable Isotopes	
Beta - 595199	**Portola Terrace Trench - Station 132.5**	**16890 +/- 50 BP**	IRMS δ13C: -23.6 o/oo

(95.4%) 18582 - 18330 cal BC (20531 - 20279 cal BP)

Submitter Material: Bulk sediment
Pretreatment: (organic sediment) acid washes
Analyzed Material: Organic sediment
Analysis Service: AMS-Standard delivery
Percent Modern Carbon: 12.21 +/- 0.08 pMC
Fraction Modern Carbon: 0.1221 +/- 0.0008
D14C: -877.86 +/- 0.76 o/oo
Δ14C: -878.91 +/- 0.76 o/oo (1950:2021)
Measured Radiocarbon Age: (without d13C correction): 16870 +/- 50 BP
Calibration: BetaCal4.20: HPD method: INTCAL20

Results are ISO/IEC-17025:2017 accredited. No sub-contracting or student labor was used in the analyses. All work was done at Beta in 4 in-house NEC accelerator mass spectrometers and 4 Thermo IRMSs. The "Conventional Radiocarbon Age" was calculated using the Libby half-life (5568 years), is corrected for total isotopic fraction and was used for calendar calibration where applicable. The Age is rounded to the nearest 10 years and is reported as radiocarbon years before present (BP), “present” = AD 1950. Results greater than the modern reference are reported as percent modern carbon (pMC). The modern reference standard was 95% the 14C signature of NIST SRM-4990C (oxalic acid). Quoted errors are 1 sigma counting statistics. Calculated sigmas less than 30 BP on the Conventional Radiocarbon Age are conservatively rounded up to 30. d13C values are on the material itself (not the AMS d13C). d13C and d15N values are relative to VPDB-1. References for calendar calibrations are cited at the bottom of calibration graph pages.

BetaCal 4.20

Calibration of Radiocarbon Age to Calendar Years

(High Probability Density Range Method (HPD): INTCAL20)

(Variables: d13C = -23.6 o/oo)

Laboratory number **Beta-595199**

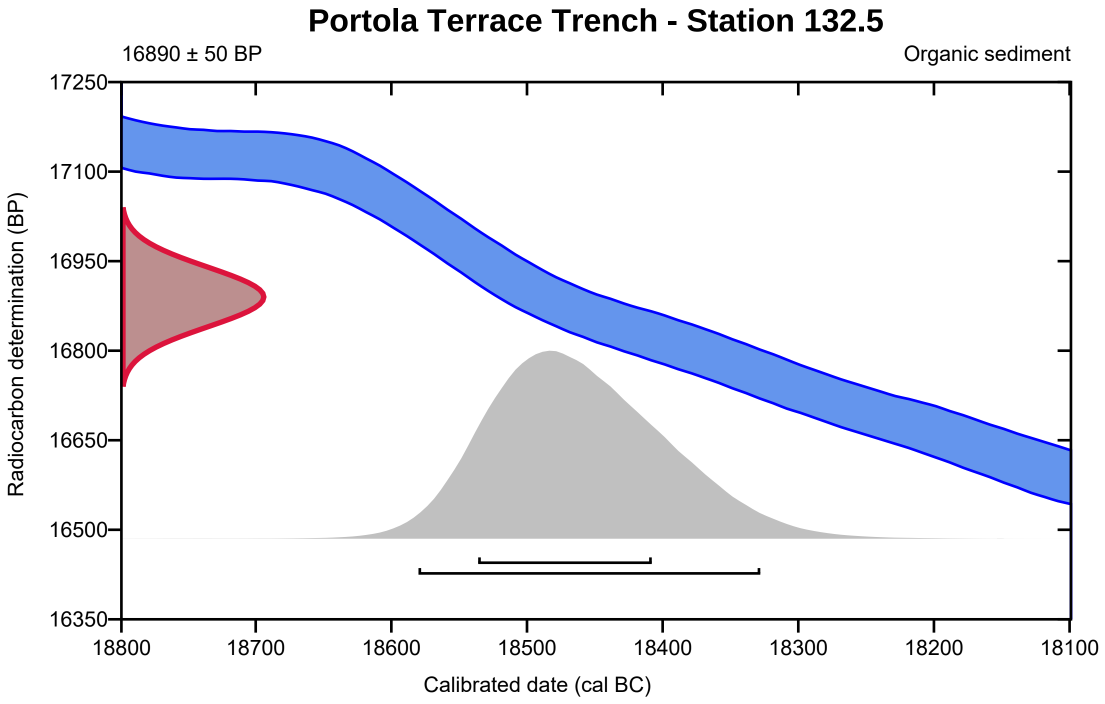
Conventional radiocarbon age **16890 ± 50 BP**

95.4% probability

(95.4%)	18582 - 18330 cal BC	(20531 - 20279 cal BP)

68.2% probability

(68.2%)	18538 - 18410 cal BC	(20487 - 20359 cal BP)



Database used

INTCAL20

References

References to Probability Method

Bronk Ramsey, C. (2009). Bayesian analysis of radiocarbon dates. Radiocarbon, 51(1), 337-360.

References to Database INTCAL20

Reimer, et al., 2020, Radiocarbon 62(4):725-757.

APPENDIX C: REVISED BORING LOGS

BORING NUMBER EB-1

CORNERSTONE EARTH GROUP

PROJECT NAME The Stanford Wedge
PROJECT NUMBER 105-117-1
PROJECT LOCATION Alpine Road, Portola Valley, CA
DATE STARTED 7/20/17 **DATE COMPLETED** 7/20/17
GROUND ELEVATION 334 FT +/- **BORING DEPTH** 29 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc.
LATITUDE 37.3905° **LONGITUDE** -122.1915°
DRILLING METHOD Mobile B-61, 8 inch Hollow-Stem Auger
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	UNDRAINED SHEAR STRENGTH, ksf
334.0	0	**Silty Sand with Gravel (SM) [Terrace Deposits-Qts]**							
333.0		**Sandy Lean Clay (CL) [Qts]** stiff to hard, moist, dark brown to brown, fine to medium sand, moderate plasticity Liquid Limit = 35, Plastic Limit = 16	22	MC-2	100	11	19	63	>4.5 ○
			23	MC-4	97	10			
329.5	5	**Lean Clay with Sand (CL) [Qts]** hard, moist, brown with light brown mottles, fine sand, moderate plasticity	17	MC-6	104	19			>4.5 ○
			46	MC-8	111	10		31	
326.0	10	**Clayey Sand (SC) [Qts]** very dense, moist, brown with light brown and olive mottles, fine to coarse sand, some fine to coarse subangular to subrounded gravel	50/6"	SPT-9		12			
322.3		**Well-Graded Sand with Silt and Gravel (SW-SM) [Qts]** very dense, moist, gray, fine subangular to subrounded gravel, some cobbles	50/4"	SPT					
320.0	15	**Well-Graded Gravel with Sand (GW) [Qts]** very dense, dry, gray, coarse gravel, fine to coarse sand, some cobbles to boulders							
316.0	20	**Clayey Sandstone [Ladera Sandstone-Tl]** moderately hard, weak, deep weathering, gray and brown mottled, fine sand	50/6"	SPT-10		14			
			50/4"	SPT-11		10			
311.0									

Continued Next Page

BORING NUMBER EB-1

CORNERSTONE
EARTH GROUP

PROJECT NAME The Stanford Wedge

PROJECT NUMBER 105-117-1

PROJECT LOCATION Alpine Road, Portola Valley, CA

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.

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 ○ HAND PENETROMETER △ TORVANE ● UNCONFINED COMPRESSION ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL 1.0 2.0 3.0 4.0
311.0			**Clayey Sandstone [Ladera Sandstone-Tl]** moderately hard, weak, deep weathering, gray and brown mottled, fine sand	50 6"	MC-12	113	13			
	25									
				50 6"	SPT-13		14			
305.0			Bottom of Boring at 29.0 feet.							
	30									
	35									
	40									
	45									

CORNERSTONE
EARTH GROUP

BORING NUMBER EB-2

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PROJECT NAME The Stanford Wedge

PROJECT NUMBER 105-117-1

PROJECT LOCATION Alpine Road, Portola Valley, CA

DATE STARTED 7/21/17 **DATE COMPLETED** 7/21/17

GROUND ELEVATION 351 FT +/- **BORING DEPTH** 30.5 ft.

DRILLING CONTRACTOR Exploration Geoservices, Inc.

LATITUDE 37.3900° **LONGITUDE** -122.1926°

DRILLING METHOD Mobile B-61, 8 inch Hollow-Stem Auger

GROUND WATER LEVELS:

LOGGED BY CSH

▽ **AT TIME OF DRILLING** Not Encountered

NOTES *-designates 2" diameter Modified Calif. Sampler

▼ **AT END OF DRILLING** Not Encountered

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

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 1.0 2.0 3.0 4.0
351.0	0		**Sandy Silty Clay (CL-ML) [Terrace Deposits-Qts]** hard, moist, reddish brown, fine sand, low plasticity Liquid Limit = 17, Plastic Limit = 13							
				18	1 MC 2	85 113	8 9	4	54	>4.5 ○
349.5			**Sandy Lean Clay (CL) [Qts]** hard, moist, reddish brown with gray mottles, fine sand, trace subrounded gravel, moderate plasticity Liquid Limit = 36, Plastic Limit = 14							
				12	SPT-3		15	22	55	>4.5 ○
	5									
				18	SPT-4		17			>4.5 ○
				28	MC-6	107	16			>4.5 ○
341.0	10		**Clayey Sand with Gravel (SC) [Qts]** medium dense, moist, brown with light brown and olive mottles, fine to coarse sand, fine to coarse subangular to subrounded gravel Liquid Limit = 31, Plastic Limit = 16							
				10	SPT-7		20	15	49	
338.5			**Well-Graded Sand with Silt and Gravel (SW-SM) [Qts]** dense, moist, brown with light brown mottles, fine to coarse sand, fine to coarse subangular gravel							
				72	MC-8	133	12		12	
	15									
				50 6"	SPT-10		23			
334.8			**Sandy Claystone [Ladera Sandstone-Tl]** moderately hard, weak, deep weathering, gray and brown mottled							
				34	SPT-11		23			
	20									
328.0			*Continued Next Page*							

BORING NUMBER EB-2

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CORNERSTONE EARTH GROUP

PROJECT NAME The Stanford Wedge
PROJECT NUMBER 105-117-1
PROJECT LOCATION Alpine Road, Portola Valley, CA

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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
328.0			**Clayey Sandstone [Ladera Sandstone-Tl]** moderately hard, weak, deep weathering, dark gray brown, fine sand	50 6"	☒ SPT					
	25									
				50 5"	☒ SPT-13*		12			
	30			50 3"	☒ SPT-14*		12			
320.8			Bottom of Boring at 30.5 feet.							
	35									
	40									
	45									

BORING NUMBER EB-3

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CORNERSTONE EARTH GROUP

PROJECT NAME The Stanford Wedge
PROJECT NUMBER 105-117-1
PROJECT LOCATION Alpine Road, Portola Valley, CA
DATE STARTED 7/20/17 **DATE COMPLETED** 7/21/17
GROUND ELEVATION 345 FT +/- **BORING DEPTH** 17 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc.
LATITUDE 37.3897° **LONGITUDE** -122.1918°
DRILLING METHOD Mobile B-61, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY CSH
▽ **AT TIME OF DRILLING** Not Encountered
NOTES *-designates 2" diameter Modified Calif. Sampler
▼ **AT END OF DRILLING** Not Encountered

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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	UNDRAINED SHEAR STRENGTH, ksf ○ HAND PENETROMETER △ TORVANE ● UNCONFINED COMPRESSION ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL 1.0 2.0 3.0 4.0
345.0	0	**Silty Sand with Gravel (SM) [Terrace Deposits-Qts]** very dense, dry, brown, fine to coarse sand, fine to coarse gravel, some cobbles	50/5"	MC-1	102	4			
343.0		**Clayey Sand with Gravel (SC) [Qts]** very dense, moist, brown with light brown and olive mottles, fine to coarse sand, fine to coarse subangular to subrounded gravel	50/4"	MC-3	99	11		20	
340.0	5	**Well-Graded Sand with Silt and Gravel (SW-SM) [Qts]** very dense, moist, gray and brown, fine to medium sand, fine to coarse subangular to subrounded gravel	50/6"	MC-5	103	8		11	
338.0		**Sandy Claystone [Ladera Sandstone-Tl]** low hardness, weak, deep weathering, reddish brown with gray mottles, high plasticity Liquid Limit = 69, Plastic Limit = 32	25	SPT-6		29	37		
	10		20	SPT-7		27			
334.0		**Silty Sandstone [Ladera Sandstone-Tl]** moderately hard, weak, deep weathering, brown with yellowish brown and reddish brown mottles brown, fine sand	50/3" 50/5"	SPT-8* SPT-9*		 11			
	15		63	SPT-10*		13			
328.0		Bottom of Boring at 17.0 feet.							
	20								

CORNERSTONE
EARTH GROUP

BORING NUMBER EB-4

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PROJECT NAME The Stanford Wedge
PROJECT NUMBER 105-117-1
PROJECT LOCATION Alpine Road, Portola Valley, CA
DATE STARTED 7/21/17 **DATE COMPLETED** 7/21/17
GROUND ELEVATION 353 FT +/- **BORING DEPTH** 8 ft.
DRILLING CONTRACTOR Exploration Geoservices, Inc.
LATITUDE 37.3890° **LONGITUDE** -122.1919°
DRILLING METHOD Mobile B-61, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY CSH
▽ **AT TIME OF DRILLING** Not Encountered
NOTES Abandoned hole, could not advance augers beyond 8'.
▼ **AT END OF DRILLING** Not Encountered

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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
353.0	0		**Clayey Sand (SC) [Terrace Deposits-Qts]** loose to medium dense, moist, yellow brown to brown, fine to medium sand, some fine subangular to subrounded gravel Liquid Limit = 21, Plastic Limit = 13	18	MC-2	103	8	8	48	
				19	SPT-3		13			
348.5	5		**Clayey Sand with Gravel (SC) [Qts]** dense, moist, brown with light brown and olive mottles, fine to coarse sand, fine to coarse subangular to subrounded gravel, some cobbles	44	MC-5	105	12			
346.0			**Well Graded Gravel with Sand (GW) [Qts]** very dense, dry, gray, fine to coarse gravel, fine to coarse sand, some cobbles to boulders							
345.0			Bottom of Boring at 8.0 feet.							
	10									
	15									
	20									

BORING NUMBER EB-4A

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CORNERSTONE
EARTH GROUP

PROJECT NAME The Stanford Wedge

PROJECT NUMBER 105-117-1

PROJECT LOCATION Alpine Road, Portola Valley, CA

DATE STARTED 7/21/17 **DATE COMPLETED** 7/21/17

GROUND ELEVATION 353 FT +/- **BORING DEPTH** 9.5 ft.

DRILLING CONTRACTOR Exploration Geoservices, Inc.

LATITUDE 37.3890° **LONGITUDE** -122.1919°

DRILLING METHOD Mobile B-61, 8 inch Hollow-Stem Auger

GROUND WATER LEVELS:

LOGGED BY CSH

▽ **AT TIME OF DRILLING** Not Encountered

NOTES Continuation of EB-4, could not advance augers beyond 9.5'.

▼ **AT END OF DRILLING** Not Encountered

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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
353.0	0	▨	Drilled to 7' before sampling. Cuttings observed are same as EB-4.							
	5									
346.0			**Well-Graded Gravel with Sand (GW)** **[Terrace Deposits-Qts]** very dense, dry, gray, fine to coarse gravel, fine to coarse sand, some cobbles to boulders	50/4" 50/1" 50/0" 50/1"	NR-6* SPT NR SPT					
343.5			Bottom of Boring at 9.5 feet.							
	10									
	15									
	20									